

Alkali Mariposa-Lily (*Calochortus striatus*)

Legal Status

State: S2¹

California Rare Plant

Rank: 1B.2²

Federal: Bureau of Land Management Sensitive; U.S. Forest Service Sensitive

Critical Habitat: N/A

Recovery Planning: N/A



Photo courtesy of Dr. Heath McAllister.

Taxonomy

Alkali mariposa-lily (*Calochortus striatus*) is a perennial bulbiferous herb in the lily family (Liliaceae) (Jepson Flora Project 2011). Alkali mariposa-lily was described by S.B. Parish in 1902 (IPNI 2011). Although it appears that alkali mariposa-lily has been uniformly accepted as distinct since 1940, it was once considered by some to be synonymous with *C. palmeri* based partly on confusion of type specimens (Greene and Sanders 2006).

Alkali mariposa-lily stands approximately 1 to 4.5 decimeters (3.9 to 17.7 inches) in height (Munz and Keck 1968). A full physical description of the species can be found in the *Jepson eFlora* (Jepson Flora Project 2011) and Greene and Sanders (2006).

Distribution

General

Alkali mariposa-lily occurs in Southern California and western Nevada (Jepson Flora Project 2011). Within Southern California, alkali mariposa-lily occurs in Tulare, Kern, Los Angeles, and San Bernardino counties (CNPS 2011). More specifically, this species

¹ **S2:** Imperiled.

² **1B:** Rare, threatened, or endangered in California and elsewhere; **X.2:** Fairly threatened in California.

occurs in southern Sierra Nevada; in the Mojave Desert; at the north base of the San Bernardino and San Gabriel Mountains; and in the southern San Joaquin Valley (Figure SP-P01; CDFW 2013a; Jepson Flora Project 2011; Munz and Keck 1968). Of the 102 total occurrences recorded in the California Natural Diversity Database (CNDDDB), 87 are in the Plan Area (CDFW 2013a). It is rare in Nevada, with only three occurrences recorded (NNHP 2001).

Distribution and Occurrences within the Plan Area

Historical

Of the 294 localities documented in the Plan Area, 18 are considered historical. Localities considered historical have not been observed since 1989, or were recorded in 2005, but have been extirpated or possibly extirpated. They range from Kelso Valley southeast to Twentynine Palms with most localities at or near Edwards Air Force Base (AFB) (Figure SP-P01) (CDFW 2013a). The 276 remaining localities recorded since 1990 and presumed extant are discussed below.

Recent

The recent localities (i.e., since 1990) of alkali mariposa-lily reported in the Plan Area by the CNDDDB range from Red Rock Canyon State Park southeast to Joshua Tree National Park. The majority of localities are located on or in the vicinity of Edwards AFB (CDFW 2013a). Alkali mariposa-lily populations are most concentrated in the metapopulation that ranges from Lancaster to Edwards AFB (CDFW 2013a). A total of 126 localities are located on Edwards AFB, and 120 of these are managed by the Department of Defense (DOD), while 6 are privately owned. Other public localities include two on lands managed by the Department of Parks and Recreation (DPR) at Red Rock Canyon State Park, four on lands managed by Los Angeles County, one on lands managed by the National Park Service (NPS) at Joshua Tree National Park, one on lands managed by the BLM, and 15 on lands managed by Rosamond Community Services. About 108 localities are on privately owned land and ownership is unknown for 19 localities (CDFW 2013a).

Natural History

Habitat Requirements

Alkali mariposa-lily grows in seasonally moist alkaline habitats such as alkaline meadows and seeps, and ephemeral washes, within chaparral, chenopod scrub, and Mojavean desert scrub (CNPS 2011; CDFW 2013a; Jepson Flora Project 2011). Alkali mariposa-lily grows in calcareous sandy soil (Fiedler 1985, cited in Greene and Sanders 2006). It prefers claypans and sand dunes, especially along drainages, in halophytic (associated with saline soils) saltbush scrub (Edwards AFB 2002). Periodic natural inundation is important to alkali mariposa-lily (Edwards AFB 2002), however, alkali mariposa-lily has been reported as absent from areas with surface salts or areas with permanent standing surface water (Mitchell 1988, cited in Greene and Sanders 2006). This species ranges in elevation from 224 to 5,240 feet (BLM 2010; CDFW 2013a).

Some associated species include saltgrass (*Distichlis spicata*), rushes (*Juncus* spp.), sedges (*Carex* spp.), beardgrass (*Polypogon* sp.), dock (*Rumex* sp.), alkali sacaton (*Sporobolus airoides*), beardless wildrye (*Elymus triticoides*), dwarf checkerbloom (*Sidalcea malviflora*), rabbitbrush (*Chrysothamnus* sp.), Baltic rush (*Juncus balticus*), and yellow sweetclover (*Melilotus indicus*) (CDFW 2013a). Table 1 lists primary habitat associations and parameters for the alkali mariposa-lily.

Table 1. Habitat Associations for Alkali Mariposa-Lily

Land Cover Type	Habitat Designation	Habitat Parameters	Supporting Information
Chaparral, chenopod scrub, Mojavean desert scrub, meadows, and seeps	Primary	Calcareous sandy soils, alkaline, seasonally moist, 224 to 5,240 feet elevation	CNPS 2011; Greene and Sanders 2006; BLM 2010; CDFW 2013a

Reproduction

Alkali mariposa-lily blooms from April to June (CNPS 2011). Alkali mariposa-lilies have perfect flowers (i.e., which contain both the male

and female reproductive parts) (Tollefson 1992, cited in Greene and Sanders 2006). The plants arise from small membranous-coated bulbs. It is unknown whether reproduction is most commonly from seedling establishment or bulb division (Greene and Sanders 2006). Alkali mariposa-lily is pollinated by bees and flies (Tollefson 1992, cited in Greene and Sanders 2006). Although seed dispersal mechanisms for this species are unknown, seeds of some other species of *Calochortus* are gravity-dispersed (Miller et al. 2004).

Ecological Relationships

Other than the habitat associations and pollination by bees and flies described above, little is known of the life history and ecological relationships of alkali mariposa-lily.

Abundances of alkali mariposa-lily fluctuate substantially from year to year (NatureServe 2011). The bulb remains dormant and may not sprout in dry years, and the bulb may not compete well since the species is not found in stands of tall grasses (Greene and Sanders 2006).

Population Status and Trends

Global: G2, Imperiled (NatureServe 2011, Conservation Status last reviewed 2009)

State: S2, Imperiled (CDFW 2013b)

Abundance figures are complicated by large fluctuations from year to year, making population trends difficult to assess (NatureServe 2011). Despite its relatively wide distribution, the majority of the populations are small with the exception of the metapopulation that ranges from Lancaster to Edwards AFB (CDFW 2013a). A majority of the species' known occurrences are within California, with the exception of several occurrences in western Nevada.

At Red Rock Canyon in the Plan Area there were 44 plants reported in 1988, 13 in 1989, 133 in 1990, and 1,200 in 2003 (CDFW 2013a).

There are as many as 165,000 plants in 67 areas documented on Edwards AFB (Greene and Sanders 2006). Approximately 3,641 plants were observed in the center colony in 1995. Outside of Edwards AFB, approximately 400 plants were reported at three sites

around Lancaster in Los Angeles County in 1988, but this likely represents an underestimate of the population of alkali mariposa-lily in this area (Greene and Sanders 2006). In San Bernardino County, 50 to 100 plants were reported in 1982 at Box “S” Springs; fewer than 50 were reported at the edge of Cushenbury Springs in 1981; 30 to 40 plants were seen at Rabbit Springs in 1980; approximately 1,500 plants were reported in 1989 at Paradise Springs; and 2 plants were observed north of Paradise Springs in 1989 (CDFW 2013a). Also in San Bernardino County, fewer than 1,000 individuals were seen at Joshua Tree National Park in 2004 (CDFW 2013a).

Threats and Environmental Stressors

Alkali mariposa-lily is threatened by urbanization, grazing, trampling, road construction, hydrological alternations, and water diversions that lower the water table (CNPS 2011). It is also threatened by military operations, dumping, and grading (NatureServe 2011).

The greatest threat to alkali mariposa-lily is the lowering of water tables, which alters the seasonally moist alkaline habitat that this species requires. Urbanization in the Lancaster area is likely the second most severe threat to this species since the largest populations are concentrated near Lancaster (CDFW 2013a; Greene and Sanders 2006). Large populations along Sierra Highway that are primarily on private land and receive minimal protection are in danger of extirpation from expanding urbanization from Lancaster (CDFW 2013a; Greene and Sanders 2006).

Road construction also threatens this species. Historically, extirpations or population declines occurred with construction of Highway 18 at Whiskey Springs in the 1920s; with the expansion of Kaiser Cement, now Mitsubishi Cement Corp., in 1988 that included diking the flow of the spring and adding a parking lot at Cushenbury Springs; and with the development of a site with 300 plants near Radio Tower Meadow in 1989 (Greene and Sanders 2006; Deacon 2007).

Trampling and grazing may also severely reduce alkali mariposa-lily’s reproductive capacity. A survey around Lake Isabella found that plants in ungrazed areas were taller, more robust, and more numerous than those in cattle grazed areas. From 1984 to 1991 low-

intensity horse grazing was tested at The Nature Conservancy's Kern River Preserve to determine the effect that soil disturbance and reduction of competing grasses and weeds would have on alkali mariposa-lily productivity. The grazed alkali mariposa-lily population did not experience a substantial increase or decrease compared to non-grazed control populations under low-intensity grazing (Tollefson 1992, cited in Greene and Sanders 2006). Pavlik et al. (2011) also documented strong impacts by mammalian herbivores on alkali mariposa-lily growth and reproduction in two consecutive years at Ash Meadows National Wildlife Refuge.

Although it may not be a more widespread problem, ongoing monitoring at The Nature Conservancy's Kern River Preserve suggests that competition from taller grasses, such as beardless wildrye (*Elymus triticoides*) and non-native barley (*Hordeum* spp.), may contribute to population declines (Tollefson 1992, cited in Greene and Sanders 2006).

Conservation and Management Activities

Thirty-nine alkali mariposa-lily occurrences are recorded on the Edwards AFB (CDFW 2013a). The Edwards Air Force Base Integrated Natural Resources Management Plan offers general conservation measures based on an ecosystem approach with a general goal of conserving and improving the habitat that would benefit all native species (Edwards AFB 2002). One of the goals included in the Plan is to review project plans to ensure drainage patterns are not changed in areas where listed or sensitive species, such as alkali mariposa-lily, occur (Edwards AFB 2002). Populations at the Nature Conservancy's Kern River Preserve populations are currently protected from development (Greene and Sanders 2006). Additional populations are on public and private lands with unknown conservation and management activities.

Data Characterization

Population trends are difficult to assess due to the large year-to-year fluctuations (NatureServe 2011). Some key components of the life history of the species have not been characterized. The most common mode of reproduction is not known. In addition, seed dispersal mechanisms are not known. However, because there is information

available for other similar species of *Calochortus*, and because there is recent occurrence information available for this species, there is sufficient information available to characterize this species.

Management and Monitoring Considerations

Because population numbers fluctuate widely year to year, alkali mariposa-lily requires long-term monitoring to detect population trends. Possible measures to maintain or restore the water table at its historic level and to remove or modify existing obstructions to natural spring or seep flows would benefit the species and should be discussed with land managers. Trampling and grazing by cows should be prevented by fencing known population sites. Although it has yet to be tested for this species, control of introduced weeds could reduce competition for resources, and thus improve reproductive capability (Greene and Sanders 2006). Protection from herbivores is essential for achieving stable or increasing population trends (Moore, pers. comm. 2012).

Species Modeled Habitat Distribution

This section provides the results of habitat modeling for alkali mariposa-lily, using available spatial information and occurrence information, as appropriate. For this reason, the term “modeled suitable habitat” is used in this section to distinguish modeled habitat from the habitat information provided in Habitat Requirements, which may include additional habitat and/or microhabitat factors that are important for species occupation, but for which information is not available for habitat modeling.

There are 188,549 acres of modeled suitable habitat for alkali mariposa-lily in the Plan Area. Appendix C includes a figure showing the modeled suitable habitat in the Plan Area.

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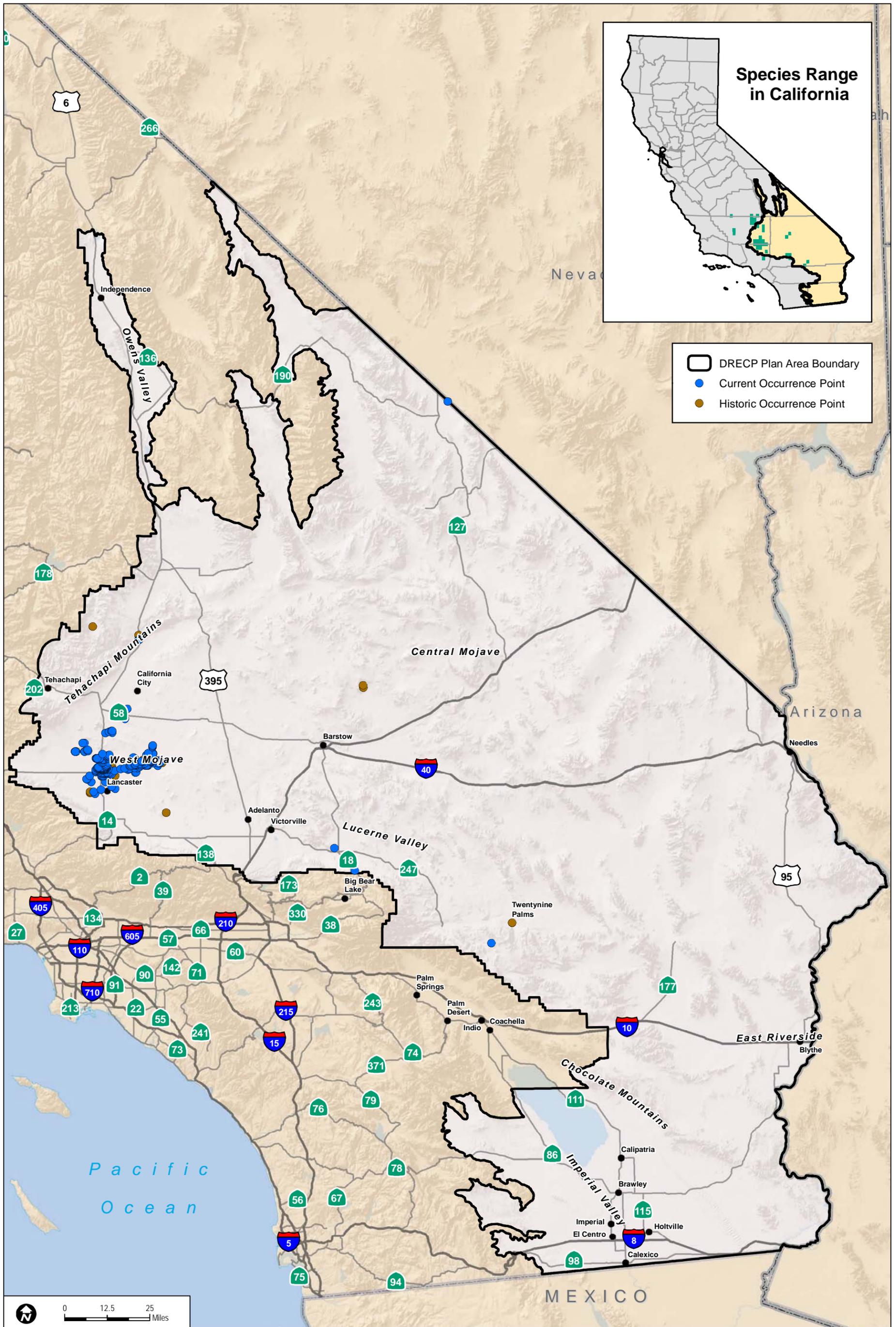
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Sources: ESRI (2014); DRECP Species Occurrence Database (2013), CWHR (2008)

FIGURE SP-P01
Alkali Mariposa Lily Occurrences in the Plan Area