

Eremalche kernensis
(Kern mallow)

**5-Year Review:
Summary and Evaluation**



White-flowered Kern mallow from the Lokern area; pistillate flowers on left. Photos by Denis Kearns, Bureau of Land Management



Pink-flowered Kern mallow from the Carrizo Plain National Monument, photo on left shows both pistillate and perfect flowers. Photos by Denis Kearns, Bureau of Land Management

**U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
Sacramento, CA**

August 2013

5-YEAR REVIEW

Eremalche kernensis (Kern mallow)

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

Eremalche kernensis (Kern mallow) is an herbaceous annual plant in the Malvaceae (mallow family) that occurs on alkali flats and eroded hillsides of the southern San Joaquin Valley and adjacent areas of California. The species is often found growing under and around *Atriplex spinifera* (spiny saltbush), and *A. polycarpa* (common saltbush) (Service 1998) or *Ephedra californica* (desert tea) (De Vries 2012); at higher elevations (up to 1524 meters or 5000 feet) *E. kernensis* grows at the base of *Juniperus californicus* (California juniper) in the juniper scrub community (Appendix A; De Vries pers. comm. 2012). *Eremalche kernensis* typically grows in areas where shrub cover is less than 25 percent and average herbaceous cover ranges from 48 to 80 percent. As with many arid-land annuals, the density, phenology (i.e., timing of different stages in the life cycle), reproduction, and population size can vary greatly depending on rainfall.

Methodology Used to Complete This Review:

The Sacramento Fish and Wildlife Office (SFWO) prepared this review following the Region 8 guidance issued in March 2008. We used information from the Recovery Plan, survey information from experts who have been monitoring various localities of this species, and the California Natural Diversity Database (CNDDDB) maintained by the California Department of Fish and Game. The Recovery Plan and personal communications with experts were our primary sources of information used to update the species' status and threats. We received no information from the public in response to our Federal Notice initiating this 5-year review. This 5-year review contains updated information on the species' biology and threats, and an assessment of that information compared to that known at the time of listing or since the last 5-year review. We focus on current threats to the species that are attributable to the Act's five

listing factors. The review synthesizes all this information to evaluate the listing status of the species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

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Federal Register (FR) Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register on April 3, 2006 (71 FR 16584).

Listing History:

Original Listing

FR Notice: 55 FR 29361

Date of Final Listing Rule: July 19, 1990

Entity Listed: *Eremalche kernensis*, a plant species.

Classification: Endangered

Review History: No other 5-yr reviews have been prepared for this species.

Species' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for *Eremalche kernensis* is 2 according to the Service's Recovery Data Call for the Sacramento Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). This number indicates that the taxon faces a high degree of threat and has a high potential for recovery.

Recovery Plan or Outline

Name of Plan or Outline: *Recovery Plan for Upland Species of the San Joaquin Valley, California*

Date Issued: September 30, 1998

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Endangered Species Act defines “species” as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. Because the species under review is a plant, the DPS policy is not applicable, and the application of the DPS policy to the species’ listing is not addressed further in this review.

Information on the Species and its Status

Species Biology and Life History: *Eremalche kernensis* is an herbaceous annual plant in the Malvaceae (mallow family) with more or less erect stems that are usually 2.5 centimeters (1 inch) to nearly 50 centimeters (20 inches) in length, often with ascending basal branches that are densely stellate-hairy near the tips (Service 1998; Andreasen and Bates 2012). The species is of indeterminate growth habit, with flowers borne in the axils (i.e., the point at which a leaf or a stem branches off from a stem). Larger plants produce more branches, and therefore, more flowers (Taylor and Davilla 1986; Mazer et al. 1993). Plants have either perfect flowers (i.e., having both pistils and stamens) or pistillate flowers (i.e., without stamens), a condition known as gynodioecy. *E. kernensis* is the only member of the genus *Eremalche* exhibiting gynodioecy; all of the other members have perfect flowers only (Bates 1992; Andreasen and Bates 2012). Populations of *E. kernensis* can be gynodioecious, comprising plants with perfect flowers and plants with pistillate flowers. The flowers have five petals, and the pistillate flowers are smaller than the perfect flowers. Flower color is white to more or less purple, drying darker. The fruits are divided into 9-19 segments (Andreasen and Bates 2012) although pistillate flowers tend to produce more seeds (8-19 per fruit) than do perfect flowers (7-13 per fruit) (Mazer et al. 1993).

As with many arid-land annuals, the form, density, phenology (timing of different stages in the life cycle), and reproduction of *Eremalche kernensis* vary greatly depending on precipitation. *Eremalche kernensis* populations may respond to the extreme interannual variation in precipitation experienced by California’s climate by germinating and growing profusely the first wet year following a drought, and then declining in subsequent years as more robust native and non-native species crowd them out, until the next drought/wet cycle. This pattern appears to be typical of native annual forbs in the San Joaquin Valley (Minnich 2008, Warrick 2012). In the Lokern area, seeds typically germinate in January and February, and plants begin blooming in March. Fruit production begins within a few days after flowers appear; flower and fruit production may continue into May if sufficient moisture is available. The seeds fall from the

fruits as soon as they are mature. Seeds are capable of germinating in the following growing season, but at least some remain ungerminated. The duration of seed viability in the soil is not known. Seed dispersal agents are unknown but probably include small animals and wind (Taylor and Davilla 1986; Mazer et al. 1993; E. Cypher unpubl. observ. as cited in Service 1998). Preliminary studies have shown that insects facilitated pollination of *E. kernensis*, but wind may also pollinate the flowers, and apomixis (seed set without fertilization) has not been ruled out (Mazer et al. 1993).

Habitat or Ecosystem: *Eremalche kernensis* is found in arid habitats in the southern San Joaquin Valley, on the Carrizo Plain, in the Cuyama Valley and in the Transverse Ranges; elevations range from 240 to 1524 meters (5,000 feet) (Appendices A and B; Service 1998; De Vries 2010, 2011). At the lower elevations up to about 610 meters (2,000 feet) (about 914 meters or 3,000 feet on the Carrizo Plain), *E. kernensis* is found in grassland and saltbush scrub habitat on soils variously described as “alkaline”, “light alkaline”, “non-alkaline”, “alluvial”, “shale”, “clay-like”, “hard, gravelly slopes”, “loose, whitish-gray, loamy”, and “dry sandy loam” (Appendix A). *Eremalche kernensis* is commonly found growing under and among *Atriplex spinifera* (spiny saltbush) and *A. polycarpa* (common saltbush) in grassland and saltbush scrub habitats; other common associates are *Bromus madritensis* ssp. *rubens* (red brome), *Erodium cicutarium* (red-stemmed filaree), *Lasthenia minor* (woolly goldfields), *Layia pentachaeta* ssp. *albida* (Sierran layia) and *Schismus barbatus* (Mediterranean grass) (Appendix A; Service 1998). At mid-range elevations between about 610 and 914 meters (about 2,000 and 3,000 feet), *E. kernensis* is commonly associated with *Ephedra californica* (desert tea) (Appendix A). At higher elevations, above 914 meters (3,000 feet), *E. kernensis* occurs in juniper woodland, on soils described as “gravelly”, “shale” and “silty”, and is found growing under and among *Juniperus californicus* (California juniper) (Appendix A; De Vries 2011).

The southern San Joaquin Valley and adjacent area has been described as the “San Joaquin desert” by Germano, et al. (2011). Annual precipitation is usually less than 25.4 centimeters (ten inches), and there is great interannual variation. The average annual precipitation at four monitored stations near *Eremalche kernensis* occurrences was: Delano, CA for years 1906-2012: 18.36 centimeters (7.23 inches); Buttonwillow, CA for years 1940-2012: 14.33 centimeters (5.64 inches); New Cuyama Fire Station, CA for years 1974-2012: 19.91 centimeters (7.84 inches); Maricopa, CA for years 1911-1993: 15.06 centimeters (5.93 inches), with peak rainfall occurring at all stations in January-March (WRCC 2012).

Classification and Changes in Taxonomic Classification or Nomenclature: The name *Eremalche kernensis* is retained by the Service for the listed taxon, pending further biosystematic investigation. There has been much uncertainty and confusion regarding the identification and the taxonomic status of *E. kernensis*, centering on flower color, gender and range (Service 1998). Following is a brief chronology of the species.

The uncertainty dates back to the original description of the genus *Eremalche*, first published by E. L. Greene in 1906 to resolve some inconsistencies within the genus *Malvastrum*. Greene re-assigned three desert annual species: *Malvastrum parryi*, *M. exile* and *M. rotundifolium* to *Eremalche* (previously Gray (1897) had placed *M. parryi* under *M. exile*). All authors have since agreed that the three taxa re-assigned by Greene constitute a group, although some have differed

on where that group should reside. Some authors ignored the classification *Eremalche*, and placed *Malvastrum* under the genus *Sphaeralcea* (Rydberg 1913; Jepson 1925,1936). Wolf reinstated *Eremalche* in 1938 and added a fourth species, *E. kernensis*, based on a specimen collected in the Temblor Valley north of McKittrick in Kern County. This classification did not gain acceptance until a formal description and keys to the species were published by Wiggins (1951), and Kearny (1956). Kearney was not completely convinced that *E. kernensis* was specifically distinct from *E. parryi*, suggesting that *E. kernensis* arose as a hybrid of *E. parryi* and *E. exilis*. Munz (Munz and Keck 1973) retained *Eremalche* in the genus *Malvastrum* in his 1959 flora, but later added *Eremalche* to the 1968 supplement. Twisselman (1967) opened up the possibility that *E. kernensis* might be a subspecies of *E. parryi*, and Hoover considered *E. kernensis* to be “merely a localized form of *E. parryi*” (Hoover 1970, page 195). Leonelli (1986), undertook the first biosystematic studies of *Eremalche* when he investigated the relationship between *E. kernensis*, *E. parryi* and *E. exilis*. He found that *E. kernensis* and *E. parryi* were both highly variable with regard to morphologic features, and proposed a new classification, which did not gain acceptance. Taylor and Davilla (1986) considered the species *E. kernensis* to be valid, and were the first since Gray to recognize gynodioecy in *Eremalche*. Bates’ 1992 revision of the genus included *E. kernensis* as a subspecies of *E. parryi*. Systematic studies carried out by Andreasen et al., (2002) and Andreasen (2005) on the three taxa *E. kernensis*, *E. parryi* and *E. exilis*, , showed that a hybrid origin of *E. kernensis* with *E. parryi* and *E. exilis* as parents was unlikely, but did not resolve the evolutionary lineage of *E. kernensis* as separate from that of *E. parryi*. The use of *E. parryi* ssp. *kernensis* has gained acceptance, although Andreasen recently noted that “more individuals need to be investigated to evaluate the status of the endangered taxon” (Andreasen 2012), and that additional DNA markers would need to be sampled (Andreasen pers. comm. 2012).

Gray was the first to describe flower gender in this group, in his *Synoptical Flora of North America*, noting in his description of *M. exile*: “flowers of different plants of two intergrading sorts, one chiefly pistillate with small white, roseate, or violet-purple petals (3 to 5 lines long), the other much larger, perfect and with petals violet-purple (6 to 10 lines long)” (Gray, 1897 page 308). Gray also recognized that *M. parryi* was not gynodioecious, lumping it with *M. exile* and describing it as a “form with larger and perfect flowers”. Gender was not discussed again by any authors until almost 100 years later, and is now considered a diagnostic character for *Eremalche kernensis* (Bates 1992; Andreasen and Bates 2012).

Spatial Distribution and Abundance: Historically, *Eremalche kernensis* was thought to have a very restricted range. The original species description delineates its range as the area between the towns of McKittrick and Buttonwillow, in the Temblor Valley in western Kern County, California (Wolf 1938), an area known locally as Lokern. At the time of listing, *E. kernensis* was known from only six locations in this approximately 40 square mile area; four of those occurrences were extant in 1990 (Service 1990, 1998). The Recovery Plan (Service 1998) recognized populations of pink-flowered plants in Buena Vista Valley, Elk Hills, Lost Hills, McKittrick Hills, Stockdale, the Temblor Range (all in Kern County), and Corcoran (Kings County), Cuyama Valley (Santa Barbara County), and Pixley (Tulare County). In 2002 Andreasen et al., found that many previous records of *E. kernensis* in the San Joaquin Valley were likely misidentified and were actually *E. exilis*. The known range of *E. kernensis* was then

truncated to a narrow band along Lokern Road in western Kern County as approximately 15 years' worth of records were annotated (Cypher 2002a, 2004).

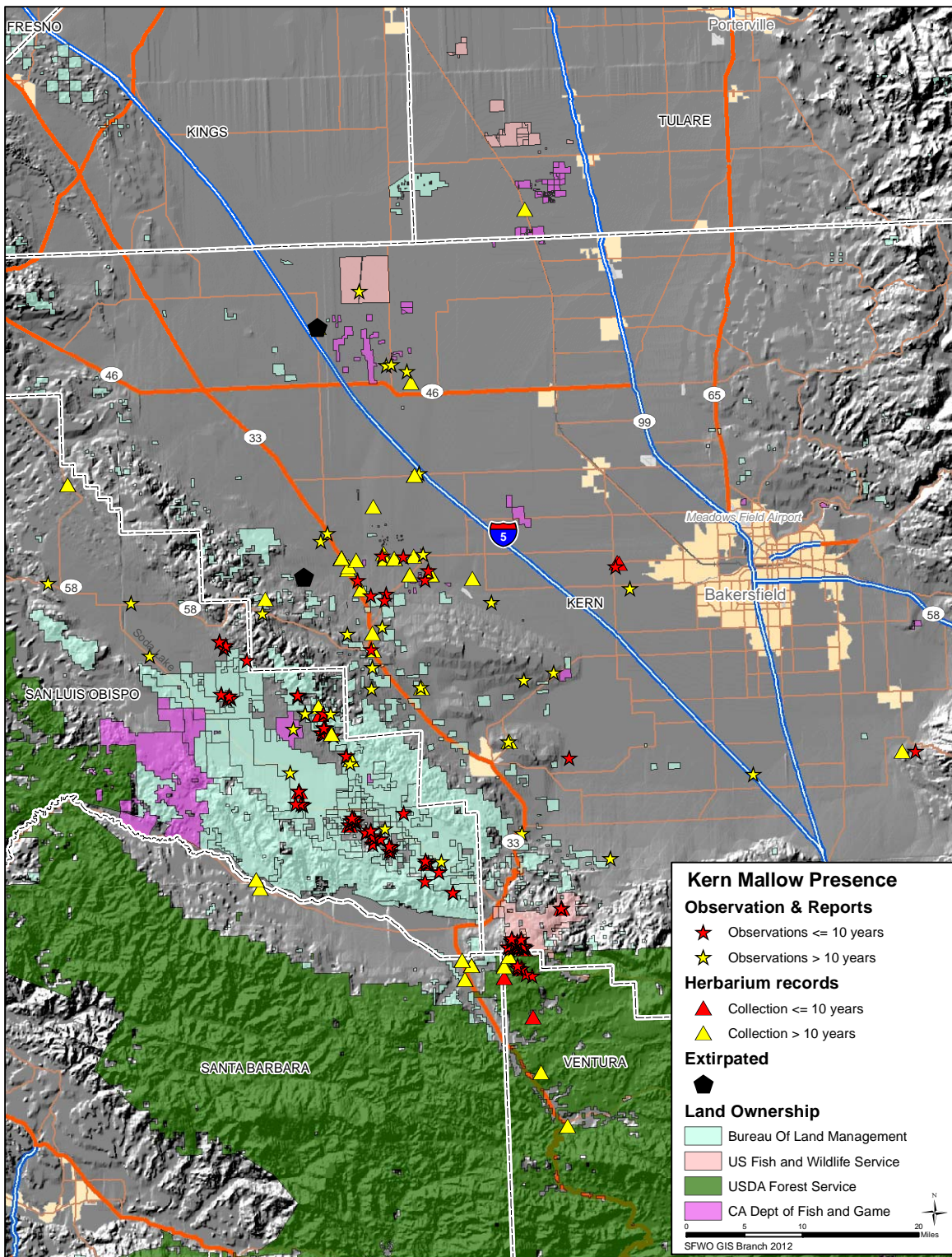
More recently, extant populations of *Eremalche kernensis* have been found at locations in San Luis Obispo, Santa Barbara and Ventura counties, and herbarium collections have been verified from San Luis Obispo, Santa Barbara, Ventura and Tulare counties. Appendices A and B contain occurrence information compiled by Elizabeth Painter at the Santa Barbara Botanic Garden, and edited by the Service for the 5-year review (an attempt was made to remove records considered duplicate, and exact location information was removed). Appendix A contains information from various sources, including professional botanists, published research papers, unpublished reports and the California Natural Diversity Data Base; Appendix B includes information from herbaria at academic institutions throughout California, and the Consortium of California Herbaria. Appendix A contains 212 records; 209 of those are presumed extant. Appendix B contains 182 records. Records that have been verified within the last ten years have been denoted as such in both appendices; many records remain to be verified as to location, and whether *E. kernensis* is extant at those locations.

Figure 1 is a map of the occurrences of *Eremalche kernensis* for which precise locations were known, as of December, 2012. Of the occurrences listed in Appendix A, 155 (73 percent) were verified within the last ten years; the remaining 57 (27 percent) are older than ten years and have not been verified recently. This information is reflected in Figure 1.

Federal lands account for 59 percent of the records in Appendix A (Table 1). Seventy-four percent of the federal lands are under the authority of the Bureau of Land Management (65 percent; Carrizo Plains National Monument), the Forest Service (7 percent – Los Padres National Forest Ballinger Canyon Off-highway Vehicle Area), and the Department of Defense (2 percent). The remaining 33 percent of federal lands are under the authority of the Service (Bitter Creek and Kern National Wildlife Refuges).

Population numbers are extremely variable as *Eremalche kernensis* is profoundly influenced by precipitation and drought cycles. Records can vary from year to year, and a lack of *E. kernensis* at a location one year can be followed by hundreds the next. One location in Kern County had a population of 500-1,000 plants in 1986, then 10,000+ in 1989, then 500-1,000 in years 1991 and 1993, then 1 plant in 2008 (Appendix A, page 7; CNDDDB 2012). Most records have only been surveyed one time.

C. B. Wolf summed up this dilemma very well in his description of the species: “The region from which *Eremalche kernensis* comes is one which has not been thoroughly botanized, due largely to the rapidity with which the scanty vegetation springs up and disappears in the occasional season of sufficient rainfall. As a consequence, one can rarely return to a given locality in this region with assurances of finding a species formerly collected there.” (Wolf 1938, page 67).



Source: ESRI; California Natural Diversity Database 2012; E. Painter, unpubl. data 2012

Figure 1. Known occurrences of *Eremalche kernensis* as of December, 2012. Red means observations or collections were made within the last ten years; yellow means observations or collections are older than ten years.

Table 1. *Eremalche kernensis* records and ownership by county (data from Appendix A)

| Land Ownership | Kern | | San Luis Obispo | | Ventura | | Total | Percentage of all records |
|----------------------------|-----------------------|------------------------------|-----------------------|------------------------------|-----------------------|------------------------------|-------|---------------------------|
| | Records within county | Percent of records in county | Records within county | Percent of records in county | Records within county | Percent of records in county | | |
| Federal | 37 | 29% | 80 | 63% | 9 | 7% | 126 | 59% |
| State | 1 | 25% | 3 | 75% | 0 | 0% | 4 | 2% |
| Private | 19 | 76% | 6 | 24% | 0 | 0% | 25 | 12% |
| Combination Public/Private | 7 | 88% | 1 | 13% | 0 | 0% | 8 | 4% |
| Unknown | 29 | 59% | 20 | 41% | 0 | 0% | 49 | 23% |
| Total | 93 | 44% | 110 | 52% | 9 | 4% | 212 | 100% |

Genetics: In the Recovery Plan, the Service calls for genetic research to identify what were considered at the time to be questionable populations of *Eremalche kernensis* outside of the Lokern area, and to establish the relationship between *E. kernensis* and the morphologically similar and more common *E. exilis*. Genetic research has since shown that there is no evidence of gene flow between sympatric populations (i.e., populations within the same geographic area) of *E. kernensis* and *E. exilis*, which alleviates concerns about the loss of genetic distinctiveness of *E. kernensis* through hybridization with *E. exilis* (Andreasen et al. 2002; Cypher 2002a; Andreasen 2005).

Other genetic research attempted to establish the relationship between *Eremalche kernensis* and the more common *E. parryi*. Studies using DNA markers could not resolve the evolutionary lineage of *E. kernensis* as distinct from that of *E. parryi* (Andreasen 2005). However, *E. kernensis* may be a very recently divergent lineage that has not yet diverged significantly from *E. parryi* in rDNA transcribed spacer sequences (Andreasen 2005). Additional DNA markers (such as AFLP or microsatellites) would need to be tested to determine if *E. kernensis* should be included as a subspecies of *E. parryi* (Andreasen pers. comm. 2012).

Species-specific Research and/or Grant-supported Activities: Following is a very brief synopsis of Service-funded research, ongoing studies, and a seed-collection program, that have taken place since *Eremalche kernensis* was listed.

The Service has funded two studies of *Eremalche kernensis*, both conducted by Dr. Katarina Andreasen. In 2002 Andreasen et al. investigated the distribution of *E. exilis* in California. If the species' distribution overlapped with that of *E. kernensis*, the hypothesis was that *E. kernensis* may be of hybrid origin between *E. exilis* and the more widespread taxon, *E. parryi*. Molecular and morphological data were analyzed, and the conclusions were that *E. exilis* is more widespread than previously believed, and its range overlaps that of *E. kernensis*, but *E. kernensis* did not arise as a hybrid between *E. exilis* and *E. parryi*. They also found that perfect flowers of *E. exilis* had been mistaken for those of *E. kernensis*, and concluded that the range of *E. kernensis* may be even smaller than had been previously believed.

The second Service-funded study culminated in an unpublished report by Dr. Andreasen and Dr. Bruce Baldwin of the University of California, Berkeley (Andreasen and Baldwin, 2003) the results of which were also reported in a published paper (Andreasen 2005). The purpose of this study was to investigate whether or not *E. kernensis* was distinct from *E. parryi*. The results of the study did not resolve *E. kernensis* as an evolutionarily distinct lineage, but could indicate that it is a very recently divergent lineage that is still actively diverging.

The Center for Natural Lands Management manages the Lokern Preserve in Kern County, and is conducting a long-term study (begun in 2001) of the effects of non-native grasses and rainfall variability on *Eremalche kernensis*. The goals of the study are to assess the effects of a grass-specific herbicide on *E. kernensis* and the plant community in general, and to evaluate the effects of rainfall variability on *E. kernensis* and other plants in the preserve (Warrick, 2012). The 2012 synopsis covers two severe droughts and two wet periods, and showed that *E. kernensis* population numbers peaked in the first wet year following each drought, and then declined in consecutive wet years as taller forbs or grasses became dominant. These results were the same whether the sample plots were treated with grass-specific herbicide or were untreated. The results indicate that drought-precipitation cycles may be more important than the presence of non-native vegetation in some circumstances.

The Santa Barbara Botanic Garden (SBBG) is a member of the Center for Plant Conservation, and maintains an active conservation collection of seeds, primarily of state and federally listed species from the central coast region of California (Wilken, pers. comm. 2012). These seeds are held for research and recovery purposes. In 2010 the SBBG became involved in a cooperative project with the BLM to secure seed collections of sensitive species from BLM lands, particularly the Carrizo Plain National Monument (CPNM), and has collected *Eremalche kernensis* seeds from several sites on the CPNM.

Five-Factor Analysis

The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Threats to *Eremalche kernensis* identified in the 1990 final listing rule include destruction and adverse modification of habitat due to agricultural land conversion, water development and exploration, off-road vehicle use, oil and gas exploration and development, maintenance and expansion of existing transmission corridors, installation of telecommunication and electrical line construction, mineral extraction, and livestock grazing. These factors continue to threaten *E. kernensis*, along with the added threats of construction of high speed rail, and the construction and operation of solar facilities in *E. kernensis* habitat. Of 212 known records (Appendix A), about 59 percent are located on Federal lands subject to grazing, off-highway vehicles or other uses; 35 percent are located on private land or land where the ownership status was not known, and 2 percent were protected on state-owned preserves.

Habitat Conversion: At the time of listing, 96 percent of the native habitat in the San Joaquin Valley had been modified to accommodate agriculture and urbanization (Service 1990). Natural lands continue to be converted to agricultural and urban uses. Habitat lands in the San Joaquin Valley once converted to agriculture are now increasingly used for residential and commercial development. According to the California Department of Conservation (2012), an average of 43,343 acres per year was converted to urban lands from 1984-2008.

Conversion of native habitat into agricultural fields continues to be a threat to *Eremalche kernensis*. Since the mid-1990s, the interagency Lokern Coordination group has discussed a cooperative acquisition and management plan for the conceptual 44,000-acre Lokern Natural Area to preserve habitat for *E. kernensis* and other listed species (e.g., San Joaquin kit fox (*Vulpes macrotis mutica*), giant kangaroo rat (*Dipodomys ingens*), and blunt-nosed leopard lizard (*Gambelia sila*). If implemented, the Lokern Natural Area would protect 95 percent of *E. kernensis* habitat in the Lokern area.

Mining: Mining continues on Bureau of Land Management lands; however, mining proponents are required to avoid *Eremalche kernensis* or minimize impacts to populations. On the Carrizo Plain National Monument, only valid leases, claims and other rights that existed as of the date of the Proclamation, January 17, 2001, may be open for mineral development on federal lands within the Monument (BLM 2010).

Oil and Gas Extraction and Conveyance: Adverse effects of oil and gas extraction and conveyance activities on *Eremalche kernensis* include loss of habitat, change in habitat quality, destruction of individuals or populations and their seed bank(s), habitat fragmentation, and increased competition from non-native plant species due to habitat degradation.

On the BLM lands where *Eremalche kernensis* occurs, oil and gas exploration is also a threat to the species' survival and recovery. However, because these are federally owned lands, the land use activities are reviewed under the National Environmental Protection Act (NEPA) as well as the Endangered Species Act. These reviews provide an opportunity to avoid or minimize adverse effects to *E. kernensis*.

Within the Carrizo Plain National Monument, approximately 131,434 acres of mineral rights are privately owned (BLM 2010), including 30,000 acres of privately-held subsurface mineral rights in the center of the monument (BLM 2010). Approximately 53 percent of the mineral estate within the Monument is privately owned; if agency approval is required for mineral development on privately owned minerals, the proposal would be subject to environmental review under the California Environmental Quality Act (CEQA) and/or NEPA, the Act, and applicable state, county, and local laws and ordinances (BLM 2010). The establishment of the Monument was subject to valid existing mineral rights. Accordingly, only those valid leases, claims, and other rights that existed as of the date of the Proclamation, January 17, 2001, may see mineral development on Federal lands within the Monument (BLM 2010).

The Carrizo Plain National Monument is closed to new Federal leases on oil and gas. Exploration and development activities may still occur both on existing Federal leases and on private leases. Seismic exploration, road building, drilling new wells and re-working old wells,

laying pipelines, and other activities may occur. Although there had been no new development for several years, BLM received a request from a private mineral owner in early March 2008 to conduct seismic operations on the Carrizo Plain National Monument valley floor (BLM 2010). Additionally, according to a 2001 programmatic biological opinion for oil and gas extraction on Bureau of Land Management property, *Eremalche kernensis* populations are flagged and fenced as protection against encroachment. No more than 3 percent of a population or occurrence may be destroyed or the amount of habitat lost is cumulatively less than 3 percent of the occupied habitat for the impacted population. However, populations of fewer than 50 individuals that are considered “waifs or an incidental biologically marginal occurrence” may be destroyed (Service 2001). The programmatic biological opinion did not consider that the potential for extreme interannual variation in population numbers makes it difficult to identify a “waif” or “marginal” occurrence as opposed to a population that is experiencing fluctuation due to less than favorable conditions at the time of survey.

Off-road Vehicle Use: Off-road vehicle use has been reported as a minor threat on the Carrizo Plain National Monument where no off-road motorized or mechanical travel is permitted (BLM 2010). Off-road vehicle use is a threat to *E. kernensis* on the Los Padres National Forest where the only documented occurrences of *E. kernensis* are in the Ballinger Canyon OHV Area, one of the largest and most popular OHV areas on the forest (L. Simpson pers. comm. 2012). The threat of off-road vehicle use to *E. kernensis* on private lands is unknown.

Solar Power Developments: Solar power development projects pose potential threats to and may impact large amounts of habitat. These projects can destroy, fragment, or impact *E. kernensis* habitat by: altering landscape topography, vegetation, and drainage patterns; and reducing habitat quality through interception of solar energy normally reaching the ground surface, affecting ambient air temperatures through habitat shading, and altering soil moisture regimes (Smith 1984; Smith et al. 1987 as cited in J.R. Single). Moreover, recently proposed solar projects tend to be large contiguous blocks of disturbance in undeveloped habitat lands, ranging from hundreds to several thousand acres. For example, the biological opinion for the California Valley Solar Ranch states the proposed project will cover 4,781 acres in eastern San Luis Obispo County and western Kern County. However, the proposed project was determined not likely to adversely affect *E. kernensis* (Service 2011).

Summary: The severity and magnitude of each of these threats is difficult to assess. Conversion to agriculture (including grazing) and urbanization near the time of listing were a substantial threat on privately owned lands; the occurrences on public lands are protected from direct effects of urbanization and agricultural land conversion, but in some areas are still subject to other threats including oil and gas exploration and conveyance, solar power developments, off-road vehicle use and mineral exploration and extraction.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial purposes was not known to be a factor in the final listing rule (Service 1990). Overutilization for any purpose does not appear to be a threat at this time.

FACTOR C: Disease or Predation

In the listing rule, the Service identified livestock grazing and competition from non-native plants as threats to *Eremalche kernensis*. Studies into the effects of livestock grazing on *E. kernensis* are inconclusive (Germano et al., 2005), and the effects of precipitation so overwhelming that they cannot be separated from grazing (E. Cypher, pers. comm. 2012). Grazing is used as a habitat management tool throughout the range of *E. kernensis* on Federal lands, and inappropriate grazing levels (either too much or too little) may be a threat to the species (Cypher pers. comm. 2012, De Vries pers. comm. 2012, Germano *et al* 2001). Livestock grazing occurs on the Carrizo Plain National Monument, the Los Padres National Forest, and is being considered for the Bitter Creek National Wildlife Refuge.

Although the arid habitats in which *Eremalche kernensis* occurs were thought to be shaped largely by grazing practices over the last century (or rather by overgrazing) (Holland 1986, Minnich 2008), they were likely influenced to a greater degree by the combined factors of the presence of invasive plant species and the amount and timing of precipitation. Minnich, in his review of historical data described a pattern of native wildflower dominance during the first wet year following several years of drought, a pattern that only emerged in the early 1970's, after populations of invasive non-native grasses such as *Bromus madritensis* ssp. *rubens* had exploded over much of interior southern California (Minnich 2008, page 231). Warrick observed the same pattern for *E. kernensis* over two drought cycles on the Lokern Preserve (Warrick 2012). *Eremalche kernensis* populations tended to decline during years of drought and rebound during the first wet year immediately following several years of drought, while populations of *B. madritensis* ssp. *rubens* and *Schismus arabicus* took longer to recover. It is interesting to note that Warrick also observed that *E. kernensis* populations tended to decline in subsequent wet years and were replaced by taller native forbs such as *Layia pentachaeta* ssp. *albida*, in experimental plots after non-native grasses had been eliminated.

In summary, grazing and competition from non-native plant species continue to be threats, although grazing, when done appropriately, may be an important tool in eliminating competition from both non-native and native competitors of *Eremalche kernensis*.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

In summary, the Endangered Species Act is the primary Federal law that provides protection for this species since its listing as endangered in 1990. Other Federal and State regulatory mechanisms provide discretionary protections for the species based on current management direction, but do not guarantee protection for the species absent its status under the Act. Therefore, we continue to believe other laws and regulations have limited ability to protect the species in absence of the Endangered Species Act.

National Environmental Policy Act (NEPA): NEPA (42 U.S.C. 4371 *et seq.*) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of such projects with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. In cases where that analysis reveals significant environmental

effects, the Federal agency must propose mitigation alternatives that would offset those effects (40 C.F.R. 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public.

Endangered Species Act of 1973, as amended (Act): The Act is the primary Federal law providing protection for this species. The Service's responsibilities include administering the Act, including sections 7, 9, and 10 that address take. Since listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2), which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 CFR 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project.

With regard to federally listed plant species, section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed plant species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the "take" of federally endangered wildlife; however, the take prohibition does not apply to plants. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e., collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation or in the course of any violation of a state criminal trespass law. Federally listed plants may be incidentally protected if they co-occur with federally listed wildlife species.

National Forest Management Act (NFMA): The National Forest Management Act (36 C.F.R. 219.20(b)(i)) has required the USDA Forest Service to incorporate standards and guidelines into Land and Resource Management Plans, including provisions to support and manage plant and animal communities for diversity and for the long-term, range-wide viability of native species. Recent changes to NFMA may affect future management of listed species, particularly rare plant occurrences, on National Forests. On January 5, 2005, the Forest Service revised National Forest land management planning under NFMA (70 FR 1023). The new planning rule changed the nature of Land Management Plans so that plans generally would be strategic in nature and could be categorically excluded from NEPA analysis, and thus not subject to public review. Under this new planning rule, the primary means of sustaining ecological systems, including listed species, would be through guidance for ecosystem diversity. If needed, additional provisions for threatened and endangered species could be provided within the overall multiple-use objectives required by NFMA. The final rule did not include a requirement to provide for viable populations of plant and animal species, which had previously been included in both the 1982 and 2000 planning rules. On March 30, 2007, however, the United States District Court in *Citizens for Better Forestry et al. v. USDA* (N.D. Calif.) enjoined the USDA from implementing and utilizing the 2005 rule until it complies with the court's opinion regarding the Administrative Procedure Act, the Endangered Species Act, and the National Environmental Policy Act. On May 14, 2007, the Forest Service published a Notice of Intent to prepare an environmental

impact statement to analyze and disclose potential environmental consequences associated with a National Forest System land management planning rule. The impact of any revisions of this rule to listed species is unknown at this time.

Federal Land Policy and Management Act of 1976 (FLPMA): The Bureau of Land Management is required to incorporate Federal, State, and local input into their management decisions through Federal law. The FLPMA (Public Law 94-579, 43 U.S.C. 1701) was written “to establish public land policy; to establish guidelines for its administration; to provide for the management, protection, development and enhancement of the public lands; and for other purposes.” Section 102(f) of the FLPMA states that “the Secretary [of the Interior] shall allow an opportunity for public involvement and by regulation shall establish procedures ... to give Federal, State, and local governments and the public, adequate notice and opportunity to comment upon and participate in the formulation of plans and programs relating to the management of the public lands.” Therefore, through management plans, the Bureau of Land Management is responsible for including input from Federal, State, and local governments and the public. Additionally, Section 102(c) of the FLPMA states that the Secretary shall “give priority to the designation and protection of areas of critical environmental concern” in the development of plans for public lands. Although the Bureau of Land Management has a multiple-use mandate under the FLPMA which allows for grazing, mining, and off-road vehicle use, the Bureau of Land Management also has the ability under the FLPMA to establish and implement special management areas such as Areas of Critical Environmental Concern, wilderness, research areas, etc., that can reduce or eliminate actions that adversely affect species of concern (including listed species).

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

Effects of nitrogen deposition, climate change, and loss of pollinators were not considered threats at the time of listing, but could threaten the continued existence of *Eremalche kernensis*.

Nitrogen Deposition: Nitrogen (N) is an essential plant nutrient, and is considered a limiting factor in the soils of many terrestrial ecosystems in the western United States, including the southern San Joaquin Valley, where these ecosystems are vulnerable to anthropogenic nitrogen deposition (Weiss 1999; Fenn et al., 2003; Bobbink et al. 2010). Historically, atmospheric deposition was not a significant source of nitrogen, but now due to industrialization and agriculture, it can be the dominant source (Bobbink, et al. 2010). Nitrogen deposition “hotspots” have been identified downwind of large and expanding metropolitan centers and large agricultural operations in California (Fenn et al. 2003). Increased soil nitrogen from anthropogenic sources such as automobile exhaust, can lead to increased plant productivity in N-limited soils. In areas where non-native nitrophilic (i.e., nitrogen-loving) plants have been introduced (such as *Bromus madritensis* ssp. *rubens* or red brome), this increased productivity can result in competitive exclusion, whereby the faster growing nitrophilic species out-compete the native vegetation. Smaller-statured forbs can be particularly vulnerable (Bobbink et al. 2010).

The increased productivity of non-native annual grasses can also lead to increased fire frequency due to the build-up of fuel. The habitats in which *Eremalche kernensis* occurs are not fire-adapted, and the native vegetation does not recover quickly after burning (E. Cypher, pers.

comm. 2008). An accidental wildfire in the Lokern area in 1997 burned over 44,000 acres; ten years later the normally dominant native shrub *A. polycarpa* had still not colonized the burned areas. Cypher (2005) found that *E. kernensis* in burned areas was less tolerant of disturbance from road corridors or livestock grazing than those in unburned areas. The underlying cause of this reduced tolerance in burned areas was not studied, but Cypher (pers. comm. 2008) suggests that the fire may have been hot enough to destroy much of the *E. kernensis* seed bank.

Climate Change: Current climate change projections for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field et al. 1999; IPCC 2007; Cayan et al. 2008). Projections of climatic conditions for smaller sub-regions such as California remain uncertain, but models show a temperature rise by 1.7° Celsius to 5.8° Celsius (3.0° Fahrenheit to 10.4° Fahrenheit) for years 2000 to 2100 (Cayan et al. 2008). It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to particular species at this time.

Loss of Pollinators: At the time of listing, the loss of pollinators was not considered a threat to the species, but it is discussed in the Recovery Plan, which states that if the number of pollinators is reduced, seed-set of *Eremalche kernensis* would likely be reduced (Mazer et al. 1993; Service 1998). The Recovery Plan further states that the permit conditions for the California Department of Food and Agriculture prohibit Malathion spraying within 1 mile of *E. kernensis* plants. In 2000, the formal section 7 consultation renewing California Department of Agriculture's 5 year pesticide permit for spraying of Malathion (Service 2000) required only a 0.25-mile buffer around known populations of *E. kernensis*. To date no research has been conducted to determine whether or not either of these buffer sizes is adequate to protect pollinators of listed plant species. Furthermore, the reduction in the population of the non-native honeybee (*Apis mellifera*), has been well documented as "colony collapse disorder", although the causes are still under investigation (Ellis et al. 2010). While it is unknown whether honeybees specifically function as pollinators of *E. kernensis*, if the causes of colony collapse disorder result in a decline in any *E. kernensis* pollinators, the species' genetic diversity could be further reduced.

III. RECOVERY CRITERIA

Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, over all, the threats have been minimized sufficiently, and the species is robust enough, to downlist or delist the species. In other cases, new recovery approaches and/or opportunities unknown at the time the recovery plan was finalized may be more appropriate ways to achieve recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery is a dynamic process requiring adaptive management, and assessing a species' degree of recovery is

likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan.

The Endangered Species Act section 4(a)(1) lists factors for re-classification (i.e., downlisting) or delisting that are to be included in recovery plans. These five factors are as follows:

- A. The present or threatened destruction, modification, or curtailment of the species' habitat or range;
- B. Over-utilization for commercial, recreational, scientific or educational purposes;
- C. Disease or predation;
- D. The inadequacy of existing regulatory mechanisms;
- E. Other natural or man-made factors affecting the species' continued existence.

We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species was listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated. Four of the five listing factors are relevant to *Eremalche kernensis*. Factor B “overutilization for commercial, recreational, or educational purposes” was not known to be a factor in the 1990 final rule listing document. Factor B threats do not appear to be adversely affecting the species at this time. The following discussion includes factors A, C, D, and E.

The Recovery Plan addresses the recovery goals for 34 plants and animals that occur in the San Joaquin Valley of California, including *Eremalche kernensis*. The downlisting and delisting criteria in the Recovery Plan are presented in tabular form. Table 4 (page 180) of the Recovery Plan presents the “Generalized Recovery Criteria for Federally-Listed Plants and Animals”. Table 1 below summarizes the information relative to *E. kernensis* from the Recovery Plan and gives the status of each criterion.

Table 1. Generalized recovery criteria for *Eremalche kernensis* and status of those criteria (see page 180 in Recovery Plan)

| Recovery Step | Secure and protect specified recovery areas from incompatible uses | Management plan approved and implemented for recovery areas that include survival of the species as an objective | Population monitoring in specified recovery areas shows: |
|------------------------|---|--|---|
| Downlist to threatened | Ninety-five percent of occupied habitat on public lands; 75 percent of population and 75 percent of occupied habitat in Lokern | For Lokern area | Stable or increasing populations through precipitation cycle |
| | Recovery criterion achieved? | Recovery criterion achieved? | Recovery criterion achieved? |
| | Partially | Partially | No |
| | Recovery criterion still relevant? | Recovery criterion still relevant? | Recovery criterion still relevant? |
| | No | No | Yes |
| Delist | Ninety-five percent or more each of population and occupied habitat in Lokern; two or more distinct populations outside the Lokern Natural Area | For all protected areas identified as important to continued survival | No decline after downlisting, if declining, determine cause and reverse trend |
| | Recovery criteria achieved? | Recovery criteria achieved? | Recovery criteria achieved? |
| | No | No | N/A |
| | Recovery criterion still relevant? | Recovery criterion still relevant? | Recovery criterion still relevant? |
| | No | Yes | Yes |

Table 5 in the Recovery Plan (page 184) presents “Site-specific Protection Requirements to Meet Delisting Criteria for the Six Federally-Listed Plant and Five Federally-Listed Animal Species”.

Table 2 below summarizes the relevant information for *Eremalche kernensis* and gives the current status.

Table 2. Site-specific protection requirements to meet delisting criteria for *Eremalche kernensis* and status of those requirements (see page 184 in Recovery Plan)

| Site Name | County | Ownership | Protection Level |
|--|--------|--|--|
| Lokern | Kern | USBLM/Center for Natural Lands Management/CDFG/private | Ninety percent of plants and occupied habitat |
| | | | Requirement met? |
| | | | No |
| Other (if Kern mallow positively identified elsewhere) | Kern | Any | Two populations, each about 260 hectares (640 acres) |
| | | | Requirement met? |
| | | | No? |

Downlisting

Eremalche kernensis may be recommended for downlisting with the completion of the following criteria (Service 1998):

1. *Secure and protect specified recovery areas from incompatible uses on 95 percent of occupied habitat on public lands; 75 percent of the population and 75 percent of the occupied habitat in Lokern.*

Is criterion still relevant: No. The recovery criteria were written when it was believed that *Eremalche kernensis* only occurred in a small portion of Kern County. The taxon is more widespread than was previously understood, and the population dynamics need to be re-evaluated. Limiting protection to the Lokern area does not address the needs of the taxon outside of Lokern.

Listing Factors addressed: A, C, D, E

Has criterion been met: Partially.

2. *Management plan approved and implemented for recovery areas that include survival of the species as an objective, for the Lokern area.*

Is criterion still relevant: No. The recovery criteria were written when it was believed that *Eremalche kernensis* only occurred in a small portion of Kern County. The taxon is more widespread than was previously understood. This criterion is incomplete, as only requiring approved management plans for the Lokern area does not address the needs of the populations outside of Lokern.

Listing Factors addressed: A, C, D, E

Has criterion been met: Partially.

3. *Population monitoring for specified recovery areas shows that the populations are stable or increasing through the normal precipitation cycle.*

Is criterion still relevant: Somewhat. Given the inextricable link between *Eremalche kernensis* “boom and bust” population cycles with the amount of precipitation, the term “precipitation cycle” should be defined to include interannual variation in precipitation, and should incorporate multiple drought/non-drought cycles.

Listing factors addressed: A, E

Has criterion been met: No.

Delisting

Delisting criteria include meeting all of the downlisting criteria (Service 1998). *Eremalche kernensis* may be considered for delisting with the completion of the following criteria:

1. *Secure and protect specified recovery areas from incompatible uses on 95 percent or more each of the population and occupied habitat in Lokern, and two or more distinct populations outside of the Lokern area.*

Is criterion still relevant: No. The recovery criteria were written when it was believed that *Eremalche kernensis* occurred in only a small portion of Kern County. The taxon is more widespread than previously known, and the population dynamics are not completely understood. This criterion should be expanded to make it more relevant to populations outside of Lokern.

Listing factors addressed: A, C, D, E

Has criterion been met: No.

2. *Management plans approved and implemented for recovery areas that include survival of the species as an objective, for all protected areas identified as important for continued survival.*

Is criterion still relevant: Yes.

Listing factors addressed: A, C, D, E

Has criterion been met: No.

3. *Population monitoring for specified recovery areas shows no decline after downlisting, or if declining, determine cause and reverse trend.*

Is criterion still relevant: Yes.

Listing factors addressed: A, E

Has criterion been met: N/A

IV. SYNTHESIS

At the time of listing, *Eremalche kernensis* was thought to be restricted to four extant populations over a 40-square mile area in Kern County, which was then later revised downward to existence along a narrow band along Lokern Road. Confusion over its taxonomic status has not been resolved with genetic studies conducted to date. Recent surveys and verifications of historic herbarium records have documented approximately 209 presumed extant occurrences in five counties, but many of the old records remain unchecked and require updating, and not all field locations have been checked to determine if *E. kernensis* is still present. Fifty-nine percent of these occurrences are on federal land, and are considered protected from direct effects of habitat conversion but all populations are still subject to threats such as grazing, competition from non-native plants, off-highway vehicle use, and mineral exploration and extraction. Since the listing, additional threats have been identified: nitrogen deposition, high speed rail, climate change, loss of pollinators, and solar development. The life history of *E. kernensis* exhibits ephemeral “boom and bust” cycles of germination and growth in the first wet year following a drought, but does not necessarily perform well in the intervening years, as other species out-compete it. Obtaining an accurate assessment of the species’ population status is made difficult, at best, under these conditions. Therefore, we believe that *E. kernensis* still meets the definition of endangered, and recommend no status change at this time.

V. RESULTS

Recommended Listing Action:

- Downlist to Threatened
- Uplist to Endangered
- Delist (indicate reason for delisting according to 50 CFR 424.11):
 - Extinction*
 - Recovery*
 - Original data for classification in error*
- No Change

New Recovery Priority Number and Brief Rationale: No change

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

1. More robust genetic testing should be conducted to determine if *Eremalche kernensis* is a separate lineage from *E. parryi*.
2. Existing records from all sources that have not been confirmed within the last 10 years should be verified and locations field checked to determine if *Eremalche kernensis*, or its habitat, is

still present. Field surveys should be timed for favorable conditions, such as in the first wet year following a drought, if possible.

3. Recovery actions specified in the Recovery Plan should be updated to incorporate populations outside of the Lokern area, and the term “precipitation cycle” should be clarified with regard to the ephemeral nature of *Eremalche kernensis* populations.
4. Known populations of *Eremalche kernensis* should be monitored during multiple precipitation/drought cycles to gain a better understanding of the ecology of the species and how it interacts with grazing and with other species (both native and non-native).

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

Eremalche kernensis (Kern mallow)

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Review Conducted By: Valerie Layne, Sacramento Fish and Wildlife Office

Date Submitted to Region 8: _____

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve Cay C. Monde Date 8/7/2013

Appendix A. *Eremalche kernensis* observations compiled by E. L. Painter, November 2012, revised for 5-yr Review. Observations are alphabetical by county name.

| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|---|-------------------------------|--|-------------|--------|----------------|------------------|--|--|--|
| De Vries 2010 BCNWR report | | De Vries, P. [Gross 3918] | May 19 2009 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | | |
| De Vries 2010 BCNWR report | Population (5/3) 6 | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | old road bed (fire break??) & also at base of nearby junipers | pistillate flowers present |
| De Vries 2010 BCNWR report | Population (5/6) 1 | De Vries, P. | May 6 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | base of a juniper | |
| De Vries 2010 BCNWR report, also CNDDDB | CNDDDB occurrence 56 | De Vries, P. [[Gross & Conway 4530] | May 13 2010 | Kern | 4,130 | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | beautiful black cryptogamic crust over white shale; <i>Juniperus californica</i> , <i>Ericameria linearifolia</i> , <i>Eriogonum fasciculatum polifolium</i> | |
| De Vries 2010 BCNWR report | Population (5/3) 7 | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | | |
| De Vries 2010 BCNWR report | Population (5/6) 5 | De Vries, P. | May 6 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | just north of old road in juniper woodland | |
| De Vries 2010 BCNWR report | Population (5/6) 2 | De Vries, P. | May 6 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | scattered in juniper / grassland | |
| De Vries 2010 BCNWR report | Population (5/3) 5 | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek N [owner / manager: USFWS] | scattered throughout general area, mostly at bases of junipers | |
| De Vries 2010 BCNWR report | Population (5/3) 4 | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | scattered near road (east of road), in open juniper woodland | |
| CNDDDB | CNDDDB occurrence 57 | CNDDDB [De Vries report, Gross report] | May 6 2010 | Kern | 4,250 | Ballinger Canyon | Bitter Creek National Wildlife Refuge, San Emigdio Mtns [owner / manager: USFWS] | <i>Juniperus californica</i> scrub; plants adjacent to junipers, usually downslope; south-facing slopes | occurrence rank: excellent [Gross 3918?]; ~3000+ plants in 2010 |

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| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|----------------------------|-------------------------------|------------------------------------|-------------|--------|----------------|------------------|--|--|--|
| De Vries 2010 BCNWR report | Population (5/6) 4 | De Vries, P. | May 6 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | south side of old road, in silty or gravelly soils, with junipers but also growing in openings in sparsely vegetated areas | pistillate flowers present |
| De Vries CNDDDB report | report 1_5 | De Vries, P. | May 6 2010 | Kern | 3,940 | Santiago Creek | Bitter Creek National Wildlife Refuge, south of locked gate [owner / manager: USFWS] | Juniperus californica scrub, all plants adjacent to junipers | occurrence quality: excellent; well off dirt road used by local residents, no public access; many pistillate plants |
| De Vries 2010 BCNWR report | Population (5/6) 6 | De Vries, P. | May 6 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | east side of old barbed wire fence, among junipers | |
| De Vries 2010 BCNWR report | Population (5/6) 3 | De Vries, P. | May 6 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | north & south side of old road, all on downslope side of junipers in grassland | pistillate flowers present |
| De Vries 2010 BCNWR report | Population (5/3) 8 | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | along road & on an adjacent, steep, south-facing slope | pistillate flowers present |
| De Vries CNDDDB report | report 3 | De Vries, P. | May 3 2010 | Kern | 3,940 | Santiago Creek | Bitter Creek National Wildlife Refuge, steep slope [owner / manager: USFWS] | Juniperus californica scrub | occurrence quality: excellent; pistillate flowers present; near dirt road used by local residents |
| De Vries 2010 BCNWR report | Population (5/3) 3 | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | near switchback in road | pistillate flowers present |
| CNDDDB | CNDDDB occurrence 54 | CNDDDB [De Vries report, 2011 map] | May 3 2010 | Kern | 4,000 | Ballinger Canyon | Bitter Creek National Wildlife Refuge, San Emigdio Mtns [owner / manager: USFWS] | Juniperus californica scrub; steep south-facing slope | occurrence rank: excellent; threat: near dirt road used by local residents; 1,000+ plants in 2010 |
| De Vries 2010 BCNWR report | Population (4/26) 5 | De Vries, P. | Apr 27 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | west of road curve along ridge & on south-facing slope | single pistillate fl |

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|----------------------------|-------------------------------|--------------------------------|-----------------|--------|----------------|------------------|---|--|--|
| De Vries 2010 BCNWR report | | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | | |
| De Vries 2010 BCNWR report | Population (5/3) 2 | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS Bitter Creek NWR] | annual grassland at base of junipers | pistillate flowers present |
| De Vries 2010 BCNWR report | Population (4/26) 1 | De Vries, P. | Apr 26 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | north side of road & up a short slope | |
| CNDDDB | CNDDDB occurrence 55 | CNDDDB [Gross et al. (4453)] | Apr 27 2010 | Kern | 3,900 | Ballinger Canyon | Bitter Creek National Wildlife Refuge, San Emigdio Mtns [owner / manager: USFWS] | flat ridge area; loose white shale; open shrubland, <i>Juniperus californica</i> ; some sites with heavy black cryptogamic crust | 2,000 plants in 2010 |
| De Vries 2010 BCNWR report | Population (4/26) 2 | De Vries, P. [Gross 4453] | Apr 26, 27 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | along road & among junipers | pistillate flowers present |
| De Vries 2010 BCNWR report | Population (5/3) 1 | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | base of 3 junipers, just north of road, west of Cerro Noroeste gate | pistillate flowers present |
| De Vries CNDDDB report | report 2 | De Vries, P. | May 3 2010 | Kern | 4,242 | Santiago Creek | Bitter Creek National Wildlife Refuge [owner / manager: USFWS] | <i>Juniperus californica</i> scrub | occurrence quality: excellent; pistillate flowers present; near dirt road used by local residents |
| De Vries 2012 BCNWR report | | De Vries, P. | Apr 21 2012 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge, Unit 11 [owner / manager: USFWS] | just inside gate | |
| CNDDDB | CNDDDB occurrence 53 | CNDDDB [De Vries report] | May 3 2010 | Kern | 4,242 | Ballinger Canyon | Bitter Creek National Wildlife Refuge, San Emigdio Mtns [owner / manager: USFWS] | <i>Juniperus californica</i> scrub; plants at base of junipers | occurrence rank: excellent; threat: near dirt road used by local residents; 500 plants in 2010 |

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|----------------------------|-------------------------------|--|--------------------|--------|----------------|------------------|---|--|---|
| De Vries 2010 BCNWR report | Population (4/26) 3 | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | north side of road, small patch along road | |
| De Vries 2010 BCNWR report | Population (4/26) 4 | De Vries, P. | May 3 2010 | Kern | | Ballinger Canyon | Bitter Creek National Wildlife Refuge Unit 11 [owner / manager: USFWS] | north side of road, along road & also between junipers | |
| De Vries 2010 BCNWR report | | De Vries, P. [De Vries 7274] | Apr 14 2009 | Kern | | Santiago Creek | Bitter Creek National Wildlife Refuge Unit 2 [owner / manager: USFWS] | | very small population, no plants found in 2010 |
| CNDDDB | CNDDDB occurrence 52 | De Vries, P. [De Vries 7274] | Apr 14 2009 [2010] | Kern | 1,900 | Santiago Creek | Bitter Creek National Wildlife Refuge, Bitter Creek Cyn [owner / manager: USFWS Bitter Creek NWR] | annual grassland | occurrence rank: fair; 10 plants in 2009, none in 2010 |
| CNDDDB | CNDDDB occurrence 59 | CNDDDB [Lawrence field survey form] | Apr 16 1991 | Kern | 1,080 | Pentland | Wind Wolves Preserve [owner / manager: TWC Wind Wolves Preserve] | valley grassland | occurrence rank: fair; threat: moderate cattle grazing 1991, pipeline easement; 45 plants in 1991 |
| CNDDDB | CNDDDB occurrence 60 | CNDDDB [1991 Lewis map] | Mar 5 1991 | Kern | 900 | Maricopa | just south of Maricopa; Maricopa Oil Field [owner / manager: private] | annuals, much bare ground; alluvial soils with small pieces of marine shale mixed with calcareous loam | occurrence rank: poor; 11 plants 1991 ; threat: ORVs, roads, blading of surface, construction, near Maricopa High School |
| CNDDDB | CNDDDB occurrence 30 | CNDDDB | Apr 29 1986 | Kern | 300 | Coal Oil Canyon | Kern Lake Preserve, Kern Lake bed [owner / manager: private] | semi-natural habitat | 1 plant 1986 ; threat: visitor trampling |
| CNDDDB | CNDDDB occurrence 58 | CNDDDB [Shevock et al. (9370), Kramer photos site] | Apr 16 2011 [1982] | Kern | 800 | Arvin | east of Comanche Spring, south of Arvin, Tejon Hills [owner / manager: private] | clay-like soils, rolling hills, annual grasses | Needs fieldwork |
| CNDDDB | CNDDDB occurrence 68 | CNDDDB [1993 Anderson et al. map] | May 4 1993 | Kern | 330 | Mouth of Kern | south of Buena Vista lake bed; south of Buena Vista Hills [owner / manager: BLM] | flat area; north of Atriplex lentiformis 'forest' | 200 plants in 1993 |

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|--------|--|-----------------------------------|--------------------|--------|----------------|-------------------------|---|--|---|
| CNDDDB | CNDDDB occurrence 46 | CNDDDB [Jokerst (3258)] | May 8 1991 | Kern | 950 | Taft | FBOP Prison site along pipeline route [owner / manager: BLM] | | Needs fieldwork |
| CNDDDB | CNDDDB occurrence 44 | CNDDDB [Jokerst (2963)] | Mar 7 1988 | Kern | 275 | Fellows | Elk Hills Prison site north of Buena Vista Hills [owner / manager: unknown] | low flat annual grassland | |
| CNDDDB | CNDDDB occurrence 25 | CNDDDB [1986 CEC map] | Apr 17 1986 | Kern | 1,750 | Fellows, Panorama Hills | Buena Vista Creek, Telephone Hills [owner / manager: private] | grasslands / scrub; base of south-facing slope near mouth of canyon | occurrence rank: poor; 1 plant in 1986 ; threat: transmission line corridor, possibly oil development |
| CNDDDB | CNDDDB occurrence 70 | CNDDDB [1993 Anderson et al. map] | May 9 1993 | Kern | 690 | Taft | west of Naval Petroleum Reserve No 1, Elk Hills [owner / manager: DoD] | alkaline, powdery, whitish soils; south-facing slopes; associated with Atriplex spp. | < 50 plants 1993 |
| CNDDDB | CNDDDB occurrence 69 | CNDDDB [1993 Anderson et al. map] | May 9 1993 | Kern | 500 | Mouth of Kern | north of Buena Vista lake bed; Elk Hills [owner / manager: DoD] | associated with Atriplex spp. | < 10 plants 1993 |
| CNDDDB | CNDDDB occurrence 102 | CNDDDB [Balls, Lenz 14512] | Mar 29 1950 | Kern | 600 | Tupman | west of Kern River Bridge, Hwy 199, between Bakersfield and Taft | hard, gravelly slopes with Monolopia | [in CCH without subsp. identity]; needs fieldwork |
| CNDDDB | CNDDDB occurrence 26 | CNDDDB [1986 CEC map] | Apr 17 1986 | Kern | 1,550 | West Elk Hills, Reward | NW of Derby Acres, Telephone Hills [owner / manager: BLM, private] | grasslands / scrub; south-facing slopes; loose whitish gray loamy soil | occurrence rank: fair; threat: transmission line corridor, possibly oil development; 100's of plants in 1986 |
| CNDDDB | CNDDDB occurrence 45 [including former occ 27] | CNDDDB [Jokerst report] | Mar 27 2009 [1986] | Kern | 1,350 | Reward, West Elk Hills | Hwy 33 south of McKittrick [owner / manager: private, BLM] | saltbush scrub & annual grassland | gynodioecious population; 100's-1,000's of plants in 1986 ; 1,000's in 2009 |
| CNDDDB | CNDDDB occurrence 76 | CNDDDB [1991 Preston map] | Jul 31 1991 | Kern | 1,450 | Reward | west of McKittrick, McKittrick oil field [owner / manager: private] | sw-facing slope; gravelly loam soil; saltbush scrub with Atriplex polycarpa | occurrence rank: fair; threat: relatively undisturbed, dirt road; 2,500 plants in 1991 |

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| CNDDDB | CNDDDB occurrence 81 | CNDDDB [1986 CEC report] | May 30 1986 | Kern | 1,030 | West Elk Hills | NE of McKittrick, north side of Elk Hills [owner / manager: private] | west-facing, gentle slope; Atriplex polycarpa, Bromus | occurrence rank: poor; 1 plant in 1986 ; along transmission line |
| CNDDDB | CNDDDB occurrence 77 | CNDDDB [2 collections] | Apr 28 1991 [1973] | Kern | 2,700 | McKittrick Summit | Hwy 58 west of McKittrick, NE of Soda Lake [owner / manager: unknown] | former pasture; native vegetation unknown, probable alkaline/arid grasslands | location vague; no collector info for 1973 and 1991 collections |
| CNDDDB | CNDDDB occurrence 75 | CNDDDB [1992 Stebbins map] | Mar 28 1992 | Kern | 300 | East Elk Hills | ESE of Elk Hills-Buttonwillow Airfield; north side of California aquaduct, south of Buttonwillow [owner / manager: unknown] | saltbush scrub | threat: aquaduct right-of-way maintenance, overgrazing; 100's of plants in 1992 adjacent to right-of-way |
| CNDDDB | CNDDDB occurrence 37 | CNDDDB [Hrusa (14254)] | Mar 26 2008 [1986, 1998] | Kern | 650 | West Elk Hills | NNE of McKittrick along Hwy 58, along pipeline route [owner / manager: private] | open flat land; grassland / scrub with Atriplex spinifera | occurrence rank: fair; threat: transmission line construction, grazing in past; 1 plant in 1986; ~30 plants in 2008 |
| CNDDDB | CNDDDB occurrence 73 | CNDDDB [1994 Wilson map] | Apr 5 1994 | Kern | 335 | Stevens | ESE of junction of Stockdale Hwy & Hwy 43, south of Calders Corner [owner / manager: private] | grassland & valley saltbush scrub; sandy loam; low relief; south-facing | occurrence rank: fair; threat: oil exploration, agriculture, highway construction; 50 plants in 1994 |
| CNDDDB | CNDDDB occurrence 2 [including former oc 34, 35, 36, 38]; see also below | CNDDDB | Mar 26 2008 [1986, 1989, 1991, 1993] | Kern | 700 | Reward, West Elk Hills | north of McKittrick, west of Elk Hills [owner / manager: BLM, private] | valley saltbush scrub & open grassy areas; Eremalche prefers edges of cryptogamic 'balds' | occurrence rank: good; threat: grazing, petroleum development activity, energy transmission line; 500-1,000 plants in 1986, 1991, 1993; 10,000+ in 1989; 1 plant in 2008 |

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| Status Survey of Three Plants Endemic to San Joaquin Valley | population 02 [CNDDDB 02] | Taylor, D.W. & W.B. Davilla | 1986 | Kern | | Reward | N of McKittrick on Hwy 33, T 29S R 22 E 32 SW 1/4 | alkali scrub codominated by <i>Atriplex spinifera</i> & <i>Atriplex polycarpa</i> | land use: grazing, energy transmission corridor; threats: near highway, area used for gas pipelines, development of energy resources |
| CNDDDB | CNDDDB occurrence 48 | CNDDDB | Mar 31 2004 | Kern | 600 | West Elk Hills | Lokern Natural Area, north of Hwy 58, north of McKittrick [owner / manager: private] | saltbush scrub dominated by <i>Atriplex spinifera</i> & <i>A. polycarpa</i> ; annual grassland between shrubs & where burned; fine sandy loam, sandy loam, clay loam, clay loam saline alkali soils | > 50,000 plants in 2004 (combined with CNDDDB occurrence #'s 1, 28, 47, 82 and 83) |
| CNDDDB | CNDDDB occurrence 39 | CNDDDB [CEC map] | 1986 [2008] | Kern | 350 | West Elk Hills | east of Lokern pumping station, west of California Aqueduct & northeast of McKittrick [owner / manager: private] | | occurrence rank: fiar; no plants 2008 ; very dry year, <2"precipitation |
| CNDDDB | CNDDDB occurrence 47 | CNDDDB | Mar 31 2004 | Kern | 570 | Reward | Lokern Natural Area, east of Hwy 33 [owner / manager: private, BLM] | saltbush scrub dominated by <i>Atriplex spinifera</i> & <i>A. polycarpa</i> ; annual grassland between shrubs & where burned; fine sandy loam, sandy loam, clay loam, clay loam saline alkali soils | > 50,000 plants in 2004 (combined with CNDDDB occurrence #'s 1, 28, 47, 82 and 83) |
| CNDDDB | CNDDDB occurrence 83 | CNDDDB | Mar 31 2004 | Kern | 475 | West Elk Hills, Lokern | SW of point where Lokern Rd crosses California Aquaduct, W of Buttonwillow [owner / manager: private] | saltbush scrub with <i>Atriples polycarpa</i> , <i>A. spinifera</i> ; annual grassland where it has burned | > 50,000 plants in 2004 (combined with CNDDDB occurrence #'s 1, 28, 47, 82 and 83) |

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| CNDDDB | CNDDDB occurrence 74 | CNDDDB [De Vries (806, 807)] | Mar 20 2008 | Kern | 330 | Rosedale, Stevens | near Calders Corner; Rio Bravo spreading basins S of Rosedale Hwy, City of Bakersfield [owner / manager: unknown] | spreading basins; dry; sandy soils | |
| CNDDDB | CNDDDB occurrence 15 | CNDDDB [type locality; holotype, isotypes Wolf 8413; Wolf 9405] | April 1 1938 | Kern | 900 | Reward, Belridge | northwest of McKittrick, Temblor Valley [type locality] [owner / manager: private] | dry sandy loam soils; with Atriplex spinifera | presence: extirpated ; threat: habitat modified by intensive oil & gas development |
| Status Survey of Three Plants Endemic to San Joaquin Valley | population 06 [CNDDDB 06]; also see the three records below | Taylor, D.W. & W.B. Davilla [Wolf 8413 (type), Wolf 8507; Wolf 9405] | 1986 (1937, 1938) | Kern | 900 | Belridge | Temblor Valley, 7 mi. NW of McKittrick on Lost Hills Rd | little native vegetation remaining | extirpated ; habitat modified; intensive oil & gas development |
| Status Survey of Three Plants Endemic to San Joaquin Valley | 6 reported populations | Taylor, D.W. & W.B. Davilla | 1986 | Kern | | Belridge, Lokern, Lost Hills, Reward | San Joaquin Valley | | threats: oil & gas development, construction of transmission facilities, grazing, trampling; fls white to light rose-pink (lavender); gynodioecious population |
| Status Survey of Three Plants Endemic to San Joaquin Valley | population 01 [CNDDDB 01] | Taylor, D.W. & W.B. Davilla [Wolf 9402; Steele BE: 28] | 1986 [1938] | Kern | 500 | Lokern | west of Buttonwillow on road to Belridge oil field | alkali sink vegetation dominated by Atriplex spinifera & Atriplex polycarpa | land use: grazing, threats: electrical near transmission, gas pipeline right-of-ways |

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| Status Survey of Three Plants Endemic to San Joaquin Valley | population 03 [CNDDDB 03] | Taylor, D.W. & W.B. Davilla [Twisselman 4379] | 1986 [1958] | Kern | | Belridge | north of McKittrick (Belridge Plain) | alkali sink scrub dominated by <i>Atriplex polycarpa</i> | land use: grazing, energy transmission corridor; threats: highway maintenance, intensive oil & gas development, near spreading area for waste water |
| report to CA DFG: Demography & Reproductive Biology | population 1 | Mazer, S. et al. | 1994 | Kern | | | north of McKittrick, south of Lokern Rd, east of Hwy 166 | saltbush scrub (<i>Atriplex</i> spp.) & mixed grassland | gynodioecious population; flowers white, pink |
| report to CA DFG: Demography & Reproductive Biology | population 2 | Mazer et al. | 1994 | Kern | | | north of McKittrick, near intersection of Hwy 33 & Lokern Rd | saltbush scrub (<i>Atriplex</i> spp.) & mixed grassland | gynodioecious population; flowers white, pink; ungrazed plants twice size of grazed, length & number of branches less in grazed plants, may reduce amount of seed contributed to seed bank; grazing very detrimental to reproductive success |
| Status Survey of Three Plants Endemic to San Joaquin Valley | population 05 | Taylor, D.W. & W.B. Davilla [Taylor 8759] | 1986 | | | Lokern | along California Aqueduct north of Lokern Rd, west of Buttonwillow | <i>Atriplex polycarpa</i> dominated scrub, light, sandy soils | land use: grazing; threats: near access road & fence paralleling aqueduct |

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| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|--|--|--------------------------------|--------------------------------------|--------|----------------|------------------------|---|--|---|
| CSU Stanislaus Endangered Species Recovery Program | | Cypher, E. | 2005 | Kern | | | Lokern Area; off Lokern Rd near California Aqueduct | arid shrublands & annual grasslands, valley saltbush scrub | intensive grazing severely reduced survival & reproduction in burned areas; road corridors reduced overall survival rate of Kern mallow; pls in burned areas less tolerant of disturbance from corridors or livestock than unburned; photo of pistillate flowers |
| flickr.com/photos | | Laymon, S. | 2009 | Kern | | | Lokern | | photos of both pistillate & perfect flowers posted |
| Nature Alley photos | | Sheehey, A. | Mar 14 2005 | Kern | | | Lokern Rd | | |
| CNDDDB | CNDDDB occurrence 28 [including former occ 49] | CNDDDB [Wolf (9402, 9403)] | Mar 25 2008 [1938, 1986, 1992, 2004] | Kern | 325 | Lokern, West Elk Hills | California Aqueduct, southeast of Hwy 58, Elk Hills [owner / manager: private, BLM] | disturbed saltbush scrub; grassland | occurrence rank: good; threat: activities associated with transmission line; >600 plants on 1986; 100s in 1992 |

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| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|---|--|--|--|--------|----------------|--|--|--|---|
| CNDDDB | CNDDDB occurrence 1 [including former occ 3, 29, 40, 41] | CNDDDB | Mar 29 2010 [1986, 1988, 1989, 1992, 2004] | Kern | 400 | Reward, West Elk Hills, Lokern, Belridge | between West Side Canal & Lost Hills Rd, west of Lokern [owner / manager: private, DFG, CNLM, DWR] | valley saltbush scrub with gravelly-sandy clay loam soils | occurrence rank: excellent; threat: grazing, transmission line corridor, petroleum development, roads, vehicular traffic, herbicides, etc.; 10,000+ plants in 1986; 1,000s in 1988, 1989, and 1992. >50,000 plants in 2004 when combined with occurrences #s 28, 47, 48, 82, and 83. 100,000+ plants along Lokern Rd in 2009. 1,000s in 2010. |
| Status Survey of Three Plants Endemic to San Joaquin Valley | population 01 [CNDDDB 01] | Taylor, D.W. & W.B. Davilla [Wolf 9402; Steele BE: 28] | 1986 [1938] | Kern | 500 | Lokern | West of Buttonwillow on road to Belridge oil field | alkali sink vegetation dominated by Atriplex spinifera & Atriplex polycarpa | land use: grazing, threats: electrical near transmission, gas pipeline rights-of-way |
| CNDDDB | CNDDDB occurrence 42 | CNDDDB | Mar 25 1988 [2008] | Kern | 275 | Lokern | Lokern, near junction of Lokern Rd & Hwy 58 [owner / manager: unknown] | valley sink scrub with Atriplex spinifera, A. polycarpa; <i>Eremalche</i> in sparse annual grasses | threat: annual grasses; 50 plants in 1988; no plants 2008 |
| CNDDDB | CNDDDB occurrence 23 | CNDDDB [1986 map] | 1986 | Kern | 620 | Belridge | South Belridge Oil Field [owner / manager: private] | | threat: in buffer zone of proposed cogeneration project |

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| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|--------|-------------------------------|--------------------------------|-------------|--------|----------------|--------------------|---|---|--|
| CNDDDB | CNDDDB occurrence 24 | CNDDDB | 1986 [2009] | Kern | 550 | Belridge | South Belridge Oil Field; southeast of Missouri Triangle, east side Hwy 33 [owner / manager: private] | | presence: possibly extirpated ; threat: in buffer zone of proposed cogeneration project; heavily disturbed, habitat no longer appears suitable, no Eremalche observed 2009 |
| CNDDDB | CNDDDB occurrence 82 | CNDDDB | Mar 31 2004 | Kern | 300 | Belridge, Lokern | near 7th Standard Rd and California Aquaduct, [owner / manager: private, BLM, Inyo Co., State] | saltbush scrub with <i>Atriples polycarpa</i> , <i>A. spinifera</i> , annuals | occurrence rank: good; threat: grazing, agriculture, development, aquaduct maintenance; ~5,000 plants in 1989; 100s of plants in 1992 |
| CNDDDB | CNDDDB occurrence 43 | CNDDDB | Mar 26 1995 | Kern | 275 | Lokern, Semitropic | north of Lerdo Hwy & west of Interstate 5, south of Kern/Kings county line [owner / manager: unknown] | chenopod scrub; <i>Atriplex polycarpa</i> dominant | flowers pink/lavender; some flowers pistillate [S. White]; threat: annual grasses |
| CNDDDB | CNDDDB occurrence 31 | CNDDDB [1987 Bowen map] | Apr 22 1987 | Kern | 240 | Lost Hills NE | SemiTropic Ridge, north of Hwy 46, east of Lost Hills [owner / manager: CNLM, private] | saltbush scrub; edge of small knolls | occurrence rank: good; 195+ plants in 1987 |
| CNDDDB | CNDDDB occurrence 33 | CNDDDB [1987 Bowen map] | Apr 27 1987 | Kern | 240 | Lost Hills NE | DFG Semitropic Ecological Reserve; west of Corcoran Rd, north of McCombs Rd, E of Lost Hills [owner / manager: DFG Semitropic ER] | scraped land surrounded by <i>Atriplex spinifera</i> | occurrence rank: poor; 1 plant 1987 ; threat: grazing |

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|---|-------------------------------|---|--------------------|--------|----------------|------------------------------|--|---|---|
| CNDDDB | CNDDDB occurrence 32 | CNDDDB [original Paine parcel, (DeBuhr et al. 972, Shevock & Zaninovich 10289, Twisselmann 15073), TNC map] | 1987 | Kern | 240 | Lost Hills NE | Paine Preserve, Semitropic Rdge; east of Lost Hills [owner / manager: CNLM] | valley grassland with <i>Atriplex polycarpa</i> & <i>A. spinifera</i> | |
| CNDDDB | CNDDDB occurrence 4 | CNDDDB [Hoover (11246)]; see also below | Apr 15 1969 [1986] | Kern | 230 | Lost Hills NW | 5 miles north of Lost Hills [owner / manager: private] | no native vegetation left in 1986 | presence: extirpated ; threat: habitat eliminated [label on Hoover 11246 (OBI CCH record) says fl size of <i>E. kernensis</i> , [OBI CCH record says San Luis Obispo Co., UC CCH record says Kern Co.] |
| Status Survey of Three Plants Endemic to San Joaquin Valley | population 04 [CNDDDB 04] | Taylor, D.W. & W.B. Davilla [Hoover 11246] | 1986 [1969] | | | Lost Hills NW | 5 miles north of Lost Hills | | extirpated ; habitat eliminated; land use: agriculture |
| CNDDDB | CNDDDB occurrence 5 | CNDDDB [Twisselmann (10448, ?)] | Mar 17 1965 | Kern | 255 | Lost Hills NW, Lost Hills NE | south end of Kern National Wildlife Refuge [owner / manager: USFWS Kern NWR] | moist, sub-alkaline soil in drying bottom of artificial marsh | [Twisselmann 1954 collection number?]; needs fieldwork |
| Clendenen photo | | Clendenen, D. | 2010 | Kern | | | Wind Wolves Preserve | | pistillate fl photographed |
| CalPhotos | | Fisher, W. | Mar 25 2010 | Kern | | | Lokern area, north of Lokern Road at disposal site | | |
| CalPhotos | | Kramer, N. | Apr 16 2011 | Kern | | | Approx. 1/2 mile east of Comanche Spring | | |

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|-------------------------------------|-------------------------------|--------------------------------|--------------|-----------------|----------------|---------------|--|---|---|
| CalPhotos | | Miller, B | Jun 14 2005 | Kern | | | | | pistillate flowers photographed |
| PLANTS | | Skinner, M. | 1992 | Kern | | | Lokern Rd | | pistillate flowers photographed |
| Flora of Santa Barbara Region | | Smith, C.F. | 1998 | Kern | | | Belridge Plain in San Joaquin Valley | | localized |
| Flora of Santa Barbara Region | | Smith, C.F. | 1998 | Kern | | | Temblor Valley | | localized |
| CalPhotos | | Taylor, D.W. | Mar 21 1989 | Kern | | | N Base Elk Hills, between California Aqueduct & Buena Vista Canal, S of Highway 58 | | flowers appear to be pistillate |
| Flora of Kern County | | Twisselmann, E.C. | 1967 | Kern | | | Belridge Plain | | highly local |
| Flora of Kern County | | Twisselmann, E.C. | 1967 | Kern | | | Northwest of McKittrick on Lost Hills Road (along Salt Creek) | | highly local |
| De Vries surveys for BLM and CNDDDB | CNDDDB occurrence 88 | De Vries, P. | Mar 30 2011 | San Luis Obispo | 2,960 | Cuyama | along pipeline road, east of Quail Canyon, near SE end of Caliente Range [owner / manager: BLM Carrizo Plain NM] | saltbush scrub, gentle south-facing slope, with annuals | occurrence rank: fair; 30 plants |
| CNPS veg surveys | | Harmon, S. | 2008 or 2010 | San Luis Obispo | | | Carrizo Plain | | |
| De Vries surveys for BLM and CNDDDB | CNDDDB occurrence 92 | De Vries, P. | Mar 31 2011 | San Luis Obispo | 3,050 | Elkhorn Hills | East of Hanline Ranch buildings, foothills on NE side of Caliente Range [owner / manager: BLM Carrizo Plain NM] | moderate south-facing slope, with Ephedra, annuals | occurrence rank: fair; vicinity is used for cattle grazing; cattle dung at base of this slope; 20 plants in 2011 |
| De Vries surveys for BLM | | De Vries, P. | Mar 31 2011 | San Luis Obispo | | | Caliente; Padrone Cyn [owner / manager: BLM Carrizo Plain NM] | | |

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| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|-------------------------------------|-------------------------------|--------------------------------|--------------|-----------------|----------------|---------------|--|--|---|
| De Vries surveys for BLM | | De Vries, P. | Mar 31 2011 | San Luis Obispo | | | Caliente; Padrone Cyn [owner / manager: BLM Carrizo Plain NM] | | cattle dung at base of slope |
| De Vries surveys for BLM | | De Vries, P. | Mar 31 2011 | San Luis Obispo | | | Caliente; Padrone Cyn [owner / manager: BLM Carrizo Plain NM] | | major cattle damage to nearby vernal pool |
| CNPS veg surveys | | Harmon, S. | 2008 or 2010 | San Luis Obispo | | | Carrizo Plain | | |
| De Vries surveys for BLM | | De Vries, P. | Apr 7 2011 | San Luis Obispo | | | Caliente; W of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | | |
| De Vries surveys for BLM | | De Vries, P. | Apr 11 2011 | San Luis Obispo | | | Caliente; W of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | | cattle dung at base of slope |
| CNDDDB | CNDDDB occurrence 90 | CNDDDB | Apr 7 2011 | San Luis Obispo | 2,500 | Elkhorn Hills | south of LE Traver Ranch buildings, just above southern portion of Carrizo Plain [owner / manager: BLM Carrizo Plain NM] | gentle to moderate south to SE-facing slopes, with annuals, scattered Ephedra | occurrence rank: good; vicinity used for cattle grazing; ~2,200 plants |
| De Vries surveys for BLM | | De Vries, P. | Apr 11 2011 | San Luis Obispo | | | Caliente; W of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | | cattle dung at base of slope |
| De Vries surveys for BLM and CNDDDB | CNDDDB occurrence 95 | De Vries, P. | Mar 16 2011 | San Luis Obispo | 2,630 | Wells Ranch | Caliente; SW of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | oprn Ephedra/goldenbush shrubland with scattered juniper, annuals; gentle south-facing slope | occurrence rank: good; ~750 plants in 2011 |
| De Vries surveys for BLM and CNDDDB | CNDDDB occurrence 89 | De Vries, P. | Mar 28 2011 | San Luis Obispo | 2,350 | Elkhorn Hills | Caliente; W of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | annuals, scattered Ephedra | occurrence rank: good; 60 plants |
| De Vries surveys for BLM | | De Vries, P. | Mar 28 2011 | San Luis Obispo | | | Caliente; W of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | | |
| De Vries surveys for BLM | | De Vries, P. | Mar 28 2011 | San Luis Obispo | | | Caliente; W of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | | |

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|--|-------------------------------|------------------------------------|--------------|-----------------|----------------|-------------|---|---|--|
| De Vries surveys for BLM | | De Vries, P. | Mar 18 2011 | San Luis Obispo | | | Caliente; W of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | | |
| De Vries surveys for BLM and CNDDDB | CNDDDB occurrence 93 | De Vries, P. | Mar 18 2011 | San Luis Obispo | 2,250 | Wells Ranch | Caliente; W of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | gentle south to west-facing slopes, with Ephedra, annuals; all <i>Eremalche</i> growing at base of Ephedra, on south side | occurrence rank: good; ~100 plants in 2011 |
| De Vries surveys for BLM and CNDDDB report | | De Vries, P. [Wilken et al. 17931] | Mar 16 2011 | San Luis Obispo | 2,274 | Wells Ranch | Caliente; Agave Wash [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; all <i>Eremalche</i> surrounding Ephedra, most on south-facing side | occurrence rank: good; some areas grazed |
| De Vries surveys for BLM | | De Vries, P. | Mar 17 2011 | San Luis Obispo | | | Caliente; Agave Wash [owner / manager: BLM Carrizo Plain NM] | | |
| De Vries surveys for BLM | | De Vries, P. | Mar 17 2011 | San Luis Obispo | | | Caliente; Agave Wash [owner / manager: BLM Carrizo Plain NM] | | |
| De Vries surveys for BLM and CNDDDB report | | De Vries, P. | Mar 16 2011 | San Luis Obispo | 2,205 | Wells Ranch | Caliente; Agave Wash [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; all <i>Eremalche</i> on south side of Ephedra | occurrence rank: good; some areas grazed |
| De Vries surveys for BLM | | De Vries, P. | Mar 18 2011 | San Luis Obispo | | | Caliente; Agave Wash [owner / manager: BLM Carrizo Plain NM] | | |
| De Vries surveys for BLM | | De Vries, P. | Mar 18 2011 | San Luis Obispo | | | Caliente; Agave Wash [owner / manager: BLM Carrizo Plain NM] | | |
| CNPS veg surveys | | Harmon, S. | 2008 or 2010 | San Luis Obispo | | | Carrizo Plain | | |
| De Vries surveys for BLM | | De Vries, P. | Mar 30 2011 | San Luis Obispo | | | Caliente; No of KCL Camp [owner / manager: BLM Carrizo Plain NM] | | |

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|--|-------------------------------|------------------------------------|-------------|-----------------|----------------|----------------|---|---|--|
| De Vries surveys for BLM and CNDDDB report | | De Vries, P. [Wilken et al. 17930] | Mar 16 2011 | San Luis Obispo | 2,087 | Wells Ranch | Caliente; No of KCL [owner / manager: BLM Carrizo Plain NM] | herbaceous veg; s to sw-facing slope | occurrence rank: fair; grazing; many pistillate plants |
| De Vries surveys for BLM | | De Vries, P. | Apr 6 2011 | San Luis Obispo | | | Temblors; Elkhorn Rd S of Crocker [owner / manager: BLM Carrizo Plain NM] | | cattle dung observed |
| De Vries surveys for BLM and CNDDDB report | CNDDDB occurrence 100 | CNDDDB [De Vries report] | Apr 14 2011 | San Luis Obispo | 2,600 | Panorama Hills | Temblors; So of Crocker [owner / manager: BLM Carrizo Plain NM] | gentle south-facing slope, with Ephedra, annuals; most <i>Eremalche</i> plants within 3 ft of Ephedra | occurrence rank: fair; area used for cattle grazing; ~ 50 plants in 2011 |
| De Vries surveys for BLM | | De Vries, P. | Apr 6 2011 | San Luis Obispo | | | Temblors; Elkhorn Rd S of Crocker [owner / manager: BLM Carrizo Plain NM] | | major cattle droppings present |
| De Vries surveys for BLM | | De Vries, P. | Apr 7 2011 | San Luis Obispo | | | Temblors; Elkhorn Rd S of Crocker [owner / manager: BLM Carrizo Plain NM] | | major cattle droppings present |
| De Vries surveys for BLM | | De Vries, P. | Apr 14 2011 | San Luis Obispo | | | Temblors; So of Crocker [owner / manager: BLM Carrizo Plain NM] | | cattle dung present |
| CNDDDB | CNDDDB occurrence 99 | CNDDDB [De Vries report] | Apr 14 2011 | San Luis Obispo | 2,550 | Panorama Hills | about 1 air mile NE of Panorama Point, in foothills on SW side of Temblor Range | gentle north and south-facing slopes, with Ephedra, annuals | occurrence rank: fair; area used for cattle grazing; ~ 460 plants in 2011 |
| De Vries surveys for BLM | | De Vries, P. | Apr 14 2011 | San Luis Obispo | | | Temblors; So of Crocker [owner / manager: BLM Carrizo Plain NM] | | cattle dung present |
| De Vries surveys for BLM | | De Vries, P. | Apr 14 2011 | San Luis Obispo | | | Temblors; So of Crocker [owner / manager: BLM Carrizo Plain NM] | | cattle dung present |
| De Vries surveys for BLM | | De Vries, P. | Apr 11 2011 | San Luis Obispo | | | Temblors; N of Crocker [owner / manager: BLM Carrizo Plain NM] | | cattle present in area |

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|--------------------------|-------------------------------|------------------------------------|-------------|-----------------|----------------|---------------|--|--|--|
| De Vries surveys for BLM | | De Vries, P. | Apr 7 2011 | San Luis Obispo | | | Temblors; Temblor Ridge at Crocker [owner / manager: BLM Carrizo Plain NM] | | cattle dung observed in flat areas |
| De Vries surveys for BLM | | De Vries, P. | Apr 11 2011 | San Luis Obispo | | | Temblors; N of Crocker [owner / manager: BLM Carrizo Plain NM] | | cattle dung throughout area |
| De Vries surveys for BLM | | De Vries, P. | Apr 11 2011 | San Luis Obispo | | | Temblors; N of Crocker [owner / manager: BLM Carrizo Plain NM] | | cattle dung |
| De Vries CNDDDB report | | De Vries, P. | Mar 30 2011 | San Luis Obispo | 2,871 | Cuyama | Carrizo Plain National Monument; foothills of Caliente Mtns, SW end of Pipeline Rd [owner / manager: BLM Carrizo Plain NM] | salbush scrub; gentle south-facing slope; <i>Eremalche</i> in openings between shrubs | occurrence rank: good; some areas grazed; pistillate plants present |
| De Vries CNDDDB report | | De Vries, P. | Mar 31 2011 | San Luis Obispo | 3,031 | Elkhorn Hills | Carrizo Plain National Monument; foothills of Caliente Mtns, Quail Springs Rd | herbaceous veg with widely scattered <i>Ephedra</i> ; moderate to gentle south to southwest-facing slope; <i>Eremalche</i> growing at base of <i>Ephedra</i> | fair; some areas grazed; cattle dung at base of slope; threat: grazing; very small patch |
| De Vries CNDDDB report | | De Vries, P. | Mar 31 2011 | San Luis Obispo | 2,730 | Elkhorn Hills | Carrizo Plain National Monument; foothills of Caliente Mtns, Padrone Canyon [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered <i>Ephedra</i> ; gentle to moderate south to southeast-facing slope | occurrence rank: fair; some areas grazed; threat: grazing; pistillate flowers present |
| De Vries CNDDDB report | | De Vries, P. [Wilken et al. 17933] | Mar 31 2011 | San Luis Obispo | 2,710 | Elkhorn Hills | Carrizo Plain National Monument; foothills of Caliente Mtns, Padrone Canyon [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered <i>Ephedra</i> ; south to southwest-facing moderate to gentle slope; most <i>Eremalche</i> associated with <i>Ephedra</i> (on S to SW side) | occurrence rank: fair; some areas grazed, cattle dung at base of slope; threat: grazing |

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|------------------------|-------------------------------|--------------------------------------|-------------|-----------------|----------------|---------------|--|--|---|
| CNDDDB | CNDDDB occurrence 61 | CNDDDB | Mar 30 2011 | San Luis Obispo | 2,700 | Elkhorn Hills | south end of Carrizo Plain; NE of Padrones Spring, Elkhorn Hills [owner / manager: BLM Carrizo Plain NM] | annuals; gentle slopes with sandy to gravelly soils | occurrence rank: good; threat: area used for cattle grazing; ~2300+ plants in 2011 |
| CNDDDB | CNDDDB occurrence 96 | CNDDDB [Hoover (11038)] | Apr 16 1968 | San Luis Obispo | | Caliente Mtn | Chalk Mountain, north side of Cuyama Valley | | |
| CNDDDB | CNDDDB occurrence 8 | CNDDDB [Robbins & Bacigalupi (3459)] | Apr 20 1952 | San Luis Obispo | 2,850 | Elkhorn Hills | southern most end of Carrizo Plain about 4 miles for Kern County line [owner / manager: BLM Carrizo Plain NM] | | Needs fieldwork |
| De Vries CNDDDB report | | De Vries, P. | Mar 31 2011 | San Luis Obispo | 2,907 | Elkhorn Hills | Carrizo Plain National Monument; foothills of Caliente Mtns, Padrone Canyon [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; gentle south-facing slope | fair; major cattle damage (trampling) to nearby vernal pool; threat: grazing; 1 pistillate plant |
| De Vries CNDDDB report | CNDDDB occurrence 91 | De Vries, P. | Apr 7 2011 | San Luis Obispo | 2,550 | Elkhorn Hills | Carrizo Plain National Monument; Caliente Range foothills, west of Trevor Ranch [owner / manager: BLM Carrizo Plain NM] | open Ephedra-Ericameria-Eriogonum scrub; moderate east to southeast-facing slopes; all plants on east side of Ephedras | occurrence rank: good; some areas grazed; ~60 plants in 2011 |
| De Vries CNDDDB report | | De Vries, P. | Apr 7 2011 | San Luis Obispo | 2,503 | Elkhorn Hills | Carrizo Plain National Monument; Caliente Range foothills, west of Trevor Ranch, NNE of water tank on E side of road [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; gentle to moderate south to southeast-facing slope | occurrence rank: good; some areas grazed; cattle dung at base of slope; threat: grazing |

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|------------------------|-------------------------------|------------------------------------|-------------|-----------------|----------------|---------------|---|---|---|
| De Vries CNDDDB report | | De Vries, P. | Apr 7 2011 | San Luis Obispo | 2,536 | Elkhorn Hills | Carrizo Plain National Monument; Caliente Range foothills, west of Trevor Ranch [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; gentle to moderate south to southeast-facing slope, most <i>Eremalche</i> with Ephedra at tops of hills | occurrence rank: good; some areas grazed; cattle dung at base of slope; threat: grazing |
| De Vries CNDDDB report | | De Vries, P. | Mar 16 2011 | San Luis Obispo | 2,625 | Wells Ranch | Carrizo Plain National Monument; foothills of Caliente Mtns, southwest of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | open Ephedra / goldenbush shrubland with scattered juniper; gentle south-facing slope | occurrence rank: good; some areas grazed; 1 pistillate plant found |
| De Vries CNDDDB report | | De Vries, P. | Mar 28 2011 | San Luis Obispo | 2,359 | Wells Ranch | Carrizo Plain National Monument; foothills of Caliente Mtns, west of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; no slope | occurrence rank: good; some areas grazed; flowers perfect |
| De Vries CNDDDB report | | De Vries, P. | Mar 28 2011 | San Luis Obispo | 2,329 | Wells Ranch | Carrizo Plain National Monument; foothills of Caliente Mtns, west of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; gentle E-facing slope; most <i>Eremalche</i> on south side of Ephedra | good; some areas grazed; pistillate plants present |
| CNDDDB | CNDDDB occurrence 62 | CNDDDB | Mar 30 2011 | San Luis Obispo | 2,360 | Wells Ranch | south end of Carrizo Plain; SW of Le Travers Ranch, between Temblor Range & Caliente Range [owner / manager: BLM Carrizo Plain NM, private] | gentle slopes; annuals | occurrence rank: good |
| De Vries CNDDDB report | | De Vries, P. [Wilken et al. 17932] | Mar 28 2011 | San Luis Obispo | 2,329 | Wells Ranch | Carrizo Plain National Monument; foothills of Caliente Mtns, west of Traver Ranch | herbaceous veg with widely scattered Ephedra; gentle southeast-facing slope; all <i>Eremalche</i> on SE side of Ephedra | occurrence rank: good; some areas grazed; pistillate plants present; 1 very light colored flower |

Appendix A. *Eremalche kernensis* observations compiled by E. L. Painter, November 2012, revised for 5-yr Review. Observations are alphabetical by county name.

| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|---------------------------|--|--------------------------------|-------------|--------------------|----------------|------------------|---|---|--|
| De Vries CNDDDB report | CNDDDB occurrence 94 | De Vries, P. CNDDDB report | Mar 18 2011 | San Luis Obispo | 2,300 | Wells Ranch | West of LE Traver Ranch Buildings, southern Carrizo Plain [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered <i>Ephedra</i> ; gentle north-facing slope; <i>Eremalche</i> at base of <i>Ephedra</i> , on south side | occurrence rank: good; some areas grazed; pistillate pls present; ~400 plants in 2011 |
| De Vries CNDDDB report | | De Vries, P. | Mar 28 2011 | San Luis Obispo | 2,247 | Wells Ranch | Carrizo Plain National Monument; foothills of Caliente Mtns, west of Traver Ranch [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered <i>Ephedra</i> ; gentle south to west-facing slopes; all <i>Eremalche</i> at base of <i>Ephedra</i> ; excellent crust between shrubs | occurrence rank: good; some areas grazed |
| CNDDDB | CNDDDB occurrence 9 | CNDDDB [Keil (?)] | May 6 1978 | San Luis Obispo | 2,250 | Elkhorn Hills | North of junction of Hwy 166 along Soda Lake Rd, Carrizo Plain [owner / manager: unknown] | | [Keil 1978 collection number?]; needs fieldwork |
| CNDDDB | CNDDDB occurrence 97 [Butterworth report] | CNDDDB | May 18 2012 | San Luis Obispo | 1,990 | Taylor Canyon | along Taylor Rd and ridgeline SE of Taylor Rd, NE of Cuyama Valley [owner / manager: DFG Carrizo Plain ER] | open, shaly sites, with <i>Atriplex canescens</i> , annuals | occurrence rank: fair; possibly threatened by fire; ~78 plants in 2012 |
| CNDDDB | CNDDDB occurrence 63 | CNDDDB | Mar 30 2011 | San Luis Obispo | 2,260 | Wells Ranch | Carrizo Plain; ENE of Wells Ranch SW of BM 2037 [owner / manager: private] | <i>Ephedra californica</i> , annuals | ~300 plants in 2011 |
| De Vries CNDDDB report | | De Vries, P. | Mar 17 2011 | San Luis Obispo | 2,201 | Wells Ranch | Carrizo Plain National Monument; foothills of Caliente Mtns, near Agave Wash [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered <i>Ephedra</i> ; gentle south to southeast- facing slopes; all <i>Eremalche</i> associated with <i>Ephedra</i> | occurrence rank: good; some areas grazed; pistillate plants present |
| CNDDDB | CNDDDB occurrence 64 | CNDDDB | May 20 2011 | San Luis Obispo | 2,200 | Wells Ranch | Carrizo Plain; NW of LE Traver Ranch, near Agave Wash and Soda Lake Road [owner / manager: private, BLM Carrizo Plain NM] | <i>Ephedra</i> , annuals | occurrence rank: good; threat: vicinity used for cattle grazing; ~940 plants in 2011 |

Appendix A. *Eremalche kernensis* observations compiled by E. L. Painter, November 2012, revised for 5-yr Review. Observations are alphabetical by county name.

| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|------------------------|-------------------------------|--------------------------------|--------------|-----------------|----------------|-------------|--|--|--|
| De Vries CNDDDB report | | De Vries, P. | Mar 18 2011 | San Luis Obispo | 2,198 | Wells Ranch | Carrizo Plain National Monument; foothills of Caliente Mtns, near Agave Wash [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered <i>Ephedra</i> ; gentle west-facing slope; <i>Eremalche</i> at base of <i>Ephedra</i> | occurrence rank: good; some areas grazed; pistillate plants present |
| De Vries CNDDDB report | | De Vries, P. | Mar 18 2011 | San Luis Obispo | 2,146 | Wells Ranch | Carrizo Plain National Monument; foothills of Caliente Mtns, near Agave Wash [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered <i>Ephedra</i> | occurrence rank: good; some areas grazed |
| CNPS veg surveys | | Harmon, S. | 2008 or 2010 | San Luis Obispo | | | Carrizo Plain | | |
| CNDDDB | CNDDDB occurrence 65 | CNDDDB [vegcamp site] | Apr 5 2010 | San Luis Obispo | 2,425 | Wells Ranch | Carrizo Plain; north of Kern County Land Co Ranch, east of Caliente Range [owner / manager: BLM Carrizo Plain NM] | saltbush scrub, with annual grasses | occurrence rank: good; threat: may be threatened by competition from exotics; ~300 plants in 2011 |
| De Vries CNDDDB report | | De Vries, P. | Mar 30 2011 | San Luis Obispo | 2,441 | Wells Ranch | Carrizo Plain National Monument; foothills of Caliente Mtns, southwest end of KCL Campground [owner / manager: BLM Carrizo Plain NM] | saltbush scrub; moderate south-facing slope; <i>Eremalche</i> in openings between shrubs | occurrence rank: good; some areas grazed; pistillate plants present |
| CNDDDB | CNDDDB occurrence 66 | CNDDDB [Begley map] | Apr 4 2008 | San Luis Obispo | 2,450 | Wells Ranch | Carrizo Plain; WNW of Kern County Land Co Ranch, east of Caliente Range [owner / manager: BLM Carrizo Plain NM] | desert chaparral; <i>Eremalche</i> under & around shrubs; gentle south-facing slope | occurrence rank: excellent; threat: close to informal hiking/bicycle trail; 500+ plants in 2008 |
| CNDDDB | CNDDDB occurrence 67 | CNDDDB | May 20 2011 | San Luis Obispo | 2,100 | Wells Ranch | Carrizo Plain; East of Washburn Ranch, east of Caliente Range [owner / manager: BLM Carrizo Plain NM] | south-side volcanic dome; steep south-facing slope of dacitic outcrop; annuals | occurrence rank: fair; threat: site used for cattle grazing; ~500 plants in 2011 |

Appendix A. *Eremalche kernensis* observations compiled by E. L. Painter, November 2012, revised for 5-yr Review. Observations are alphabetical by county name.

| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|------------------------|-------------------------------|---|-------------------|-----------------|----------------|------------------------------|--|---|--|
| CNDDDB | CNDDDB occurrence 10 | CNDDDB [McMillan (155)] | July 19 1952 | San Luis Obispo | 2,000 | Panorama Hills, Painted Rock | south of Soda Lake, Carrizo Plain [owner / manager: BLM Carrizo Plain NM] | sand blown soil on valley floor | Needs fieldwork |
| De Vries CNDDDB report | CNDDDB occurrence 71 | CNDDDB [Keil et al. (19284), De Vries report] | Apr 6 2011 [1986] | San Luis Obispo | 2,355 | Panorama Hills | WSW of Midway Peak, at NW end of Elkhorn Plain, SW side of Temblor Range [owner / manager: BLM Carrizo Plain NM] | saltbush scrub and annual grassland | occurrence rank: poor; threat: vicinity is used for cattle grazing; 10 plants in 2011; 1 plant white-flowered |
| De Vries CNDDDB report | | De Vries, P. | Apr 14 2011 | San Luis Obispo | 2,566 | Panorama Hills | Carrizo Plain National Monument; Temblor Range foothills, south of Crocker Rd [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; gentle south-facing slope; majority of <i>Eremalche</i> within 3 ft of Ephedra, on south side | occurrence rank: fair; some areas grazed; cattle dung present; threat: grazing; plants mostly pistillate |
| De Vries CNDDDB report | | De Vries, P. | Apr 6 2011 | San Luis Obispo | 2,461 | Panorama Hills | Carrizo Plain National Monument; foothills of Temblor Range, off Elkhorn Rd south of Crocker [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; gentle south-facing slope; all <i>Eremalche</i> on south side of Ephedra, none in openings | occurrence rank: fair; some areas grazed: large quantity of cattle dung present; threat: grazing; flowers very pale, none pure white |
| CNDDDB | CNDDDB occurrence 80 | CNDDDB | Apr 6 2011 | San Luis Obispo | 2,435 | Panorama Hills | Elkhorn Plain, east of Panarama Point and south of Crocker Grade, SW side of Temblor Range [owner / manager: private] | Ephedra, annuals | occurrence rank: fair; vicinity is used for cattle grazing; ~200 plants in 2011 |
| De Vries CNDDDB report | | De Vries, P. | Apr 6 2011 | San Luis Obispo | 2,428 | Panorama Hills | Carrizo Plain National Monument; foothills of Temblor Range, off Elkhorn Rd south of Crocker [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with scattered Ephedra, <i>Eremalche</i> mostly growing on south side of Ephedra | occurrence rank: fair; some areas grazed: large quantity of cattle dung present; threat: grazing; flowers very pale color |

Appendix A. *Eremalche kernensis* observations compiled by E. L. Painter, November 2012, revised for 5-yr Review. Observations are alphabetical by county name.

| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|------------------------|-------------------------------|--|-------------|-----------------|----------------|------------------------------|--|---|--|
| De Vries CNDDDB report | | De Vries, P. | Apr 14 2011 | San Luis Obispo | 2,585 | Panorama Hills | Carrizo Plain National Monument; Temblor Range foothills, south of Crocker Rd [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; gentle south-facing slope; plants associated with 3 Ephedra shrubs | occurrence rank: fair; some areas grazed; cattle dung present; threat: grazing; flowers pink |
| De Vries CNDDDB report | | De Vries, P. | Apr 14 2011 | San Luis Obispo | 2,566 | Panorama Hills | Carrizo Plain National Monument; Temblor Range foothills, south of Crocker Rd [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; gentle south-facing slope; all <i>Eremalche</i> on south side of Ephedras | occurrence rank: fair; some areas grazed; cattle dung present; threat: grazing |
| De Vries CNDDDB report | | De Vries, P. | Apr 14 2011 | San Luis Obispo | 2,516 | Panorama Hills | Carrizo Plain National Monument; Temblor Range foothills, south of Crocker Rd [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with widely scattered Ephedra; gentle north & south-facing slopes; <i>Eremalche</i> scattered in Ephedra on lower slopes | occurrence rank: fair; some areas grazed; cattle dung present; threat: grazing |
| CNDDDB | CNDDDB occurrence 101 | CNDDDB | May 2 2012 | San Luis Obispo | 2,950 | Chimineas Ranch | SW of Saucito Ranch buildings, northern Caliente Range [DFG Carrizo Plain ER] | steep south-facing slope of shaly clay, with <i>Peritoma arborea</i> , annuals | occurrence rank: fair; area used for cattle grazing; 40 plants in 2012 |
| CNDDDB | CNDDDB occurrence 18 | CNDDDB [Woods (?)] | May 27 1978 | San Luis Obispo | 2,050 | Painted Rock, Panorama Hills | NW of Hurricane Rd along Soda Lake Rd / San Diego Creek Rd, Carrizo Plain [owner / manager: DFG Carrizo Plains ER] | | [Woods collection number?]; needs fieldwork |
| CNDDDB | CNDDDB occurrence 84 | CNDDDB [Simpson & Simpson 3062, Keil et al. 19268] | Mar 30 2009 | San Luis Obispo | 2,650 | Panorama Hills | along Hurricane/Crocker Rd, halfway between Elkhorn Plain and road summit, Temblor Range [owner / manager: BLM Carrizo Plain NM] | desert scrub with <i>Atriplex polycarpa</i> , <i>Eriogonum fasciculatum</i> , <i>Ericameria linearifolia</i> , <i>Eastwoodia elegans</i> , <i>Ephedra californica</i> | |

Appendix A. *Eremalche kernensis* observations compiled by E. L. Painter, November 2012, revised for 5-yr Review. Observations are alphabetical by county name.

| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|---------------------------------------|--|---|--|-----------------|----------------|----------------|---|--|---|
| CNDDDB | CNDDDB occurrence 11 | CNDDDB [Bower map] | May 26 1983 | San Luis Obispo | 3,250 | Panorama Hills | Crocker Grade; along unnamed road heading SE off Hurricane / Crocker Springs Rd, Temblor Range [owner / manager: BLM Carrizo Plain NM] | annual grassland, under shrubs [<i>Ephedra californica</i>] & in open; fine gray, brown soil with clay & scattered volcanic rocks | threat: old gypsum pit nearby; < 10 plants [1983] [could this be Bowen, collection from the same area?] |
| De Vries CNDDDB report | | De Vries, P. | Apr 6 2011 | San Luis Obispo | 2,904 | Panorama Hills | Carrizo Plain National Monument; Temblor Range, along ridge top & west-facing side of ridge at Crocker Rd [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with scattered <i>Ephedra</i> or <i>Atriplex</i> ; | occurrence rank: good; some areas grazed: cattle dung present in flat areas; threat: grazing; many pistillate plants, 1 white-flowered plant |
| De Vries and others, CNDDDB report(s) | CNDDDB occurrence 13 [including former occ 17] | De Vries; CNDDDB (Hoover 9793, 10258, Smith 12181)] | April 11 2011 [1966, 1967, 1978, 1991] | San Luis Obispo | 2,430 | Panorama Hills | along Elkhorn Hills Rd near Crocker Grade, foothills above Carrizo Plain, Temblor Range [several collection sites [owner / manager: BLM Carrizo Plain NM] | rocky draw with desert-like scrub; herbaceous veg with widely scattered <i>Ephedra</i> ; flat topography; only 2-3 <i>Eremalche</i> at base of each <i>Ephedra</i> | occurrence rank: fair; area used for cattle grazing; ~ 20 plants in 2011 |
| CNDDDB | CNDDDB occurrence 72 | CNDDDB [vegcamp site, De Vries report] | Apr 4 2011 [2008] | San Luis Obispo | 2,000 | Panorama Hills | Crocker Grade Rd, NE of junction with Elkhorn Rd, Temblor Range [owner / manager: BLM Carrizo Plain NM] | roadside and steep south-facing slopes, with <i>Eastwoodia elegans</i> , <i>Atriplex polycarpa</i> , <i>Ephedra</i> , annuals | occurrence rank: good; vicinity is used for cattle grazing |
| CNPS veg surveys | | Harmon, S. | 2008 or 2010 | San Luis Obispo | | | Carrizo Plain | | |
| CNPS veg surveys | | Harmon, S. | 2008 or 2010 | San Luis Obispo | | | Carrizo Plain | | |
| De Vries CNDDDB report | | De Vries, P. | Apr 11 2011 | San Luis Obispo | 2,644 | Panorama Hills | Carrizo Plain National Monument; Temblor Range foothills, north of Crocker Rd [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with scattered <i>Atriplex canescens</i> ; gentle south-facing slope | occurrence rank: good; some areas grazed; abundant cattle dung in area; threat: grazing; many pistillate plants |

Appendix A. *Eremalche kernensis* observations compiled by E. L. Painter, November 2012, revised for 5-yr Review. Observations are alphabetical by county name.

| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|------------------------|-------------------------------|---------------------------------|--------------|-----------------------|----------------|-------------------|--|---|--|
| CNDDDB | CNDDDB occurrence 98 | CNDDDB [De Vries report] | Apr 11 2011 | San Luis Obispo | 2,650 | Panorama Hills | NW of Crocker Grade, foothills on SW side of Temblor Range, NE of Elkhorn Plain [owner / manager: BLM Carrizo Plain NM] | gentle south-facing slope, with <i>Atriplex canescens</i> , annuals | occurrence rank: good; area used for cattle grazing; ~1000 plants in 2011 |
| De Vries CNDDDB report | | De Vries, P. | Apr 11 2011 | San Luis Obispo | 2,694 | Panorama Hills | Carrizo Plain National Monument; Temblor Range foothills, north of Crocker Rd [owner / manager: BLM Carrizo Plain NM] | herbaceous veg with scattered <i>Atriplex canescens</i> ; gentle to moderate south-facing slope | occurrence rank: good; some areas grazed; abundant cattle dung in area; threat: grazing; most plants pistillate |
| CNPS veg surveys | | Harmon, S. | 2008 or 2010 | San Luis Obispo | | | Carrizo Plain | | |
| CNPS veg surveys | | Harmon, S. | 2008 or 2010 | San Luis Obispo | | | Carrizo Plain | | |
| CNPS veg surveys | | Harmon, S. | 2008 or 2010 | San Luis Obispo | | | Carrizo Plain | | |
| CNDDDB | CNDDDB occurrence 79 | CNDDDB [2005 Morse observation] | Apr 3 2005 | San Luis Obispo, Kern | 2,500 | McKittrick Summit | Wallace Creek, Carrizo Plain [owner / manager: unknown] | | > 1 plant 2005 |
| www.keiriosity.com | | Morse, K. | Apr 3 2005 | San Luis Obispo | | | Carrizo Plain National Monument | | pistillate & perfect flowers photographed |
| CNDDDB | CNDDDB occurrence 19 | CNDDDB [Twisselmann (?)] | May 12 1958 | San Luis Obispo | 2,000 | Simmler | North of Soda Lake, Carrizo Plain [owner / manager: private] | alkaline sink | [Twisselmann collection number?]; needs fieldwork |
| De Vries CNDDDB report | | De Vries, P. | Apr 11 2011 | San Luis Obispo | 2,260 | Panorama Hills | Carrizo Plain National Monument; Temblor Range foothills, north of Wallace Creek [owner / manager: BLM Carrizo Plain NM] | roadside grassland; flat topography | occurrence rank: fair; some areas grazed; dirt road; threat: grazing; all plants observed pistillate or functionally pistillate , perfect flowers ca. 100 ft north |
| CNDDDB | CNDDDB occurrence 104 | CNDDDB | Apr 11 2011 | San Luis Obispo | 2,300 | McKittrick Summit | along Elkhorn Rd, south of Hwy 58, NE side of Carrizo Plain [owner / manager: private] | annual grassland, with <i>Atriplex canescens</i> | occurrence rank: fair; area used for cattle grazing; ~60 plants in 2011 |

Appendix A. *Eremalche kernensis* observations compiled by E. L. Painter, November 2012, revised for 5-yr Review. Observations are alphabetical by county name.

| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|--------------------------|--|--------------------------------------|--------------------------|-----------------|----------------|----------------------------|--|---|--|
| De Vries surveys for BLM | | De Vries, P. | Apr 14 2011 | San Luis Obispo | | | Temblors; N of Wallace Creek [owner / manager: BLM Carrizo Plain NM] | | |
| De Vries CNDDDB report | | De Vries, P. | Apr 11 2011 | San Luis Obispo | 2,643 | McKittrick Summit | Carrizo Plain National Monument; Temblor Range foothills, south of Wallace Creek [owner / manager: BLM Carrizo Plain NM] | annual grass | occurrence rank: fair; some areas grazed; dirt roadside; threat: grazing |
| De Vries surveys for BLM | | De Vries, P. | Apr 5 2011 | San Luis Obispo | | | Temblors; Elkhorn Rd S of 7 Mile Rd [owner / manager: BLM Carrizo Plain NM] | | |
| CNDDDB | CNDDDB occurrence 103 | CNDDDB | Apr 5 2011 | San Luis Obispo | 2,250 | McKittrick Summit | along Elkhorn Rd, south of Hwy 58, NE side of Carrizo Plain [owner / manager: private] | annual grassland, with annuals | occurrence rank: fair; ~500 plants in 2011 |
| De Vries CNDDDB report | | De Vries, P. | Apr 5 2011 | San Luis Obispo | 2,730 | McKittrick Summit | Carrizo Plain National Monument; foothills of Temblor Range, off Elkhorn Rd south of 7 Mile Rd [owner / manager: BLM Carrizo Plain NM] | annual grassland; flat topography | occurrence rank: fair; some areas grazed: some plants at edge of well travelled dirt road; several plants pistillate , several functionally female |
| CNDDDB | CNDDDB occurrence 78 | CNDDDB [Schreiber (s.n.)] | Apr 1 1934 | San Luis Obispo | 2,700 | California Valley, Simmler | near Simmler, Carrizo Plain [owner / manager: unknown] | sandy flat | Needs fieldwork |
| CNDDDB | CNDDDB occurrence 20 [including former occ 21] | CNDDDB [Keil 29294-2, Hoover (9349)] | Apr 13 2001 [1936, 1965] | San Luis Obispo | 1,700 | La Panza Ranch | Hwy 58, east of San Juan Creek Bridge, east of La Panza [owner / manager: private] | semi-desert scrub and scattered California junipers | [Eastwood 1936 collection number?] |
| CNPS veg surveys | | Harmon, S. | 2008 or 2010 | San Luis Obispo | | | Carrizo Plain | | |
| CNDDDB | CNDDDB occurrence 105 | CNDDDB [Riggins 1518] | Apr 13 1985 | San Luis Obispo | 1,350 | Camatta Ranch | adjacent to Shell Creek Rd, north of junction with CA Hwy 58, northern La Panza Range [owner / manager: unknown] | grassland | |

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| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|-------------------------------|-------------------------------|--------------------------------|-------------|-----------------|----------------|------------------|---|--|--|
| CNDDDB | CNDDDB occurrence 106 | CNDDDB [Keil & Keil (29356)] | Apr 20 2001 | San Luis Obispo | 2,200 | Packwood Creek | along Bitterwater Rd, circa 10 miles north of junction with Hwy 58, Bitterwater Canyon, Temblor Range | Amsinckia-covered hillside; crumbling alkali clay soil; rolling hills; steep eroding west-facing slope | |
| Flora of Santa Barbara Region | | Smith, C.F. | 1998 | San Luis Obispo | | | Elkhorn Plain | | localized |
| Flora of Kern County | | Twisselmann, E.C. | 1967 | San Luis Obispo | | | Soda Lake region | | highly local |
| Flora of Kern County | | Twisselmann, E.C. | 1967 | San Luis Obispo | | | Panorama Hills | | highly local |
| De Vries CNDDDB report | CNDDDB occurrence 86 | De Vries, P. | May 3 2012 | Ventura | 3,700 | Cuyama Peak | Ballinger Canyon OHV Recreational Area, western San Emigdio Mtns [owner / manager: Los Padres National Forest] | scattered among Juniperus californica in open juniper scrub | occurrence quality: fair; threat: OHVs; pistillate & perfect flowers present; ~30 plants in 2012 |
| CNDDDB | CNDDDB occurrence 85 | De Vries, P. | Apr 24 2012 | Ventura | 3,550 | Cuyama Peak | Ballinger Canyon OHV Recreational Area, in Ballinger Canyon, western San Emigdio Mtns [owner / manager: Los Padres National Forest] | south side of Juniperus californica in open juniper scrub, just east & north of shallow wash | occurrence quality: fair; threat: OHVs; pistillate & perfect flowers present; ~70 plants in 2012 |
| De Vries CNDDDB report | report 2 Ballinger | De Vries, P. | Apr 24 2012 | Ventura | 3,422 | Ballinger Canyon | Ballinger Canyon OHV Recreational Area, east of Ballinger Campground [owner / manager: Los Padres National Forest] | south side of Juniperus californica in open juniper scrub; also growing in open, dry drainage just NE of point | occurrence quality: fair; pistillate & perfect flowers present; threat: off road vehicle use; disturbed motorcycle trail |
| De Vries CNDDDB report | report 6 Ballinger | De Vries, P. | May 3 2012 | Ventura | 3,396 | Ballinger Canyon | Ballinger Canyon OHV Recreational Area, east of Ballinger Campground [owner / manager: Los Padres National Forest] | at base of single juniper on south-facing slope | occurrence quality: fair; very small population; all perfect flowers; threat: off road vehicle use |

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| Source | Record Number (if applicable) | Reporter [information sources] | Date | County | Elevation (ft) | USGS Quad | Locality | Ecological / habitat information | Notes, location quality, or population information |
|------------------------|-------------------------------|--------------------------------|-------------|---------|----------------|------------------|--|--|--|
| CNDDDB | CNDDDB occurrence 87 | CNDDDB | May 3 2012 | Ventura | 3,400 | Ballinger Canyon | ESE of Ballinger Campground, in Ballinger Canyon, western San Emigdio Mtns [owner / manager: Los Padres National Forest] | open juniper scrub, with <i>Juniperus californica</i> , annuals | occurrence quality: fair; threat: OHVs; ~140 plants in 2012, in 4 polygons |
| De Vries CNDDDB report | report 1 Ballinger | De Vries, P. | Apr 24 2012 | Ventura | 3,396 | Ballinger Canyon | Ballinger Canyon OHV Recreational Area, east of Ballinger Campground [owner / manager: Los Padres National Forest] | south side of <i>Juniperus californica</i> & along base of south-facing slope in open juniper scrub | occurrence quality: fair; pistillate flowers present; threat: off road vehicle use |
| De Vries CNDDDB report | report 3 Ballinger | De Vries, P. | Apr 24 2012 | Ventura | 3,478 | Ballinger Canyon | Ballinger Canyon OHV Recreational Area, east of Ballinger Campground [owner / manager: Los Padres National Forest] | adjacent to & in opening between <i>Juniperus californica</i> in open juniper scrub on east-facing slope | occurrence quality: fair; pistillate & perfect flowers present; threat: off road vehicle use |
| CalPhotos | | Miller, B | Apr 19 2003 | Ventura | | | Ballinger Canyon | | pistillate flowers photographed |
| USFS | | Simpson, L. | Apr 20 2012 | Ventura | | | Ballinger Canyon, Los Padres National Forest | | |

Abbreviations:

- BCNWR: Bitter Creek National Wildlife Refuge indicates observation was made within the last ten years, as of December 2012.
- BLM: Bureau of Land Management
- CA DFG: California Department of Fish and Game indicates observation was made more than ten years ago, as of December 2012.
- CCH: California Consortium of Herbaria
- CNDDDB: California Natural Diversity Data Base
- CNPS: California Native Plant Society
- CSU: California State University
- De Vries: Pam De Vries, botanist
- PLANTS: U.S. Department of Agriculture Data Base
- USFS: U.S. Forest Service
- USGS Quad: United States Geological Survey 7.5 minute quadrangle map

Appendix B. *Eremalche kernensis* herbarium records compiled by E. L. Painter, 2012; revised for 5 year review. Records are alphabetical by county name.

| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|---|-------------------|--------------------------------|--------------------------|--------|-----------|------------------|--|---|
| RSA734958 | Anonymous [pupil Santa Ana Jr. College Herbarium] | s.n. | E.L. Painter & P. DeVries 2012 | Mar 27 1947 | Kern | | | | with illustration of pistillate fls; no stamens [CCH records don't match label info] |
| CHSC1039 | Anthony, M. | s.n. | | Apr 13 1954 | Kern | | | | |
| RSA59381 | Balls, E.K. & L. Lenz | 14512 | | Mar 29 1950 | Kern | | | | in CCH without subsp. identity |
| DS493441 | Breedlove, D.E. | 2392 | | Apr 18 1962 | Kern | | | in flat valley with Atriplex sp. | fls pink |
| VVC2610 | Clendenen, D. | s.n. | | Mar 11 2011 | Kern | | | grassland; chalky white soil | |
| JEPS89568 | Cypher, E. & R. McCormick | 1104 | | May 7 1991 | Kern | | | valley saltbush scrub | corollas white |
| RSA749987 | De Vries, P. | 0806 | Pam De Vries 2011 | Mar 20 2008 | Kern | 101 m | Rosedale | spreading basins; disturbed, sandy soils | pistillate & perfect fls present, dark lavender or pink-purple (none white) |
| RSA749873 | De Vries, P. | 0807 | Pam De Vries 2011 | Mar 20 2008 | Kern | 101 m | Rosedale | spreading basins, disturbed sandy soils | pistillate & perfect fls present; fls dark lavender or pink-purple (none white) |
| RSA245519 | DeBuhr, L.E. et al. | 972 | E.L. Painter 2009 | Apr 12 1973 | Kern | | | Wildflower Preserve | |
| CAS242612 | Dudley, C. | s.n. | | Apr 1937 | Kern | | | | |
| RSA749596 | Gross, L. | 3918 | E.L. Painter 2009 | May 19 2009 | Kern | 1170 m | Ballinger Canyon | Juniperus californica, Yucca whipplei, Eriogonum fasciculatum polifolium, Eriophyllum confertiflorum, Ericameria linearifolia | purple fls |
| RSA761531 | Gross, L. & P. Conway | 4530 | | May 13 2010 | Kern | 1196 m | Ballinger Canyon | Juniperus californica, Ericameria linearifolia, Eriogonum fasciculatum polifolium, Yucca whipplei; beautiful black cryptogamic crust | some pls pistillate ; lavender fls |

Appendix B. *Eremalche kernensis* herbarium records compiled by E. L. Painter, 2012; revised for 5 year review. Records are alphabetical by county name.

| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|---------------------------|-------------------|---------------------|--------------------------|--------------------------|-----------------|----------------------|---|---|
| RSA761768 | Gross, L. et al. | 4453 | | Apr 27 2010 | Kern | 1177 m | Ballinger Canyon | Juniperus californica, Ericameria linearifolia, Eriogonum fasciculatum polifolium; heavy black cryptogamic soil | some smaller fls all pistillate ; lavender fls |
| RSA747485 | De Vries, P. | 7274 | | Apr 14 2009 | Kern | | Santiago Canyon | annual grasslands | |
| OBI12397 | Hoover, R.F. | 11246 | | Apr 15 1969 | Kern [San Luis Obispo?] | | | | fl size of E. kernensis [label] |
| UC1392682 | Hoover, R.F. | 11246 | | Apr 15 1969 | Kern | | | | to species |
| CAS537521 | Hoover, R.F. | 11246 | | Apr 15 1969 | Kern | | | | fl size of E. kernensis [label] |
| CDA15149 | Hrusa, G.F. | 14254 | | Apr 26 1998 | Kern | 100 m | West Elk Hills [OBI] | recently burned flats | corolla pink |
| OBI65623 | Hrusa, G.F. | 14254 | David J. Keil 2001 | Apr 26 1998 | Kern | 100 m | West Elk Hills | recently burned flats | corolla pink |
| RSA121087 | Johannsen, P.L. | 1423 | E.L. Painter 2009 | Mar 23 1937 | Kern | 91 m | | | |
| UC572470 | Johannsen, P.L. | 1423 | | Mar 23 1937 | Kern | 300 ft | McKittrick Quad | | to species |
| CHSC67565 | Jokerst, J.D. | 3221 | | 1989 | Kern | 411 m [1350 ft] | | lowhill side | |
| UCD116246 | Jokerst, J.D. | 3221 | | 1989 | Kern | 1350 ft | | lowhill side | |
| CHSC67564 | Jokerst, J.D. | 3222 | | 1989 | Kern | | | | |
| CHSC67563 | Jokerst, J.D. | 3223 | | 1989 | Kern | | | | |
| CHSC67568 | Jokerst, J.D. | 3258 | | May 8 1991 | Kern | 289 m [950 ft] | | | |
| UCD116248 | Jokerst, J.D. | 3258 | | May 8 1991 | Kern | 950 ft | | on lowhill side | |
| CHSC67566 | Jokerst, J.D. & M. Foster | 2957 | | Mar 7 1988 | Kern | | | Atriplex scrub | |
| CHSC67567 | Jokerst, J.D. & M. Foster | 2963 | | Mar 7 1988 | Kern | | | annual grassland | |
| UCR51070 | LaPre, L.F. | s.n. | Steven R. Hill 2001 | Mar 11 1988 | Kern | | | saltbush scrub | fls white to purplish |
| RSA489393 | LaPre, L.F. | s.n. | | Mar 11 1988 | Kern | | | saltbush scrub | fls white to purplish |

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| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|--------------------------------|-------------------|----------------------|--------------------------|--------|----------------|----------------|---|-------------------------------------|
| SD125983 | LaPre, L.F. | s.n. | | Mar 11 1988 | Kern | | | saltbush scrub | |
| RSA758905 | Shevock, J. R. & J. Zaninovich | 10289 | Chelsea Dickson 2009 | Apr 8 1983 | Kern | 75 m | | small vernal pool in a valley grassland; in a valley grassland with <i>Atriplex polycarpa</i> & <i>Atriplex spinifera</i> | |
| CAS1102346 | Shevock, J. R. & J. Zaninovich | 10289 | | Apr 8 1983 | Kern | 75 m | | in a valley grassland with <i>Atriplex polycarpa</i> and <i>Atriplex spinifera</i> . | |
| RSA761390 | Shevock, J. R. et al. | 9370 | | Apr 27 1982 | Kern | | | clay-like soils on rolling hills; annual grassland | |
| CAS1102347 | Shevock, J. R. et al. | 9370 | | Apr 27 1982 | Kern | 1100 ft | | clay-like soils on rolling hills dominated by annual grasses | |
| JEPS89565 | Taylor, D.W. | 8902 | | Apr 17 1987 | Kern | 112 m [370 ft] | | open, grassy field (recently burned, without much cover); in or about old shrub mounds | |
| JEPS89566 | Taylor, D.W. | 10171 | | Mar 21 1989 | Kern | 134 m [440 ft] | West Elk Hills | sub-alkaline clay to sandy soils | |
| UC1584614 | Taylor, D.W. | 10171 | | Mar 21 1989 | Kern | 97 m [320 ft] | West Elk Hills | sub-alkaline sandy soils | fls lavender |
| RSA529981 | Taylor, D.W. | 10173 | | Mar 21 1989 | Kern | 155 m | Belridge | sub-alkaline sandy soils; <i>Atriplex polycarpa</i> | |
| JEPS89564 | Taylor, D.W. & R.E. Palmer | 8890 | | Mar 21 1987 | Kern | 152 m [500 ft] | | open patches of cryptogamic soil crust | |
| DS459076 | Twisselmann, E.C. | | | Aor 6 1954 | Kern | 106 m [350 ft] | | alkali sink; wet alkaline mud under <i>Atriplex spinifera</i> | corolla blue-violet; anthers violet |
| CAS482511 | Twisselmann, E.C. | 4378 | | Apr 26 1958 | Kern | 243 m [800 ft] | | <i>Atriplex polycarpa</i> association; alluvial soil on the sandy flood plain of a dry wash | corollas white |
| CAS601700 | Twisselmann, E.C. | 4378 | | Apr 26 1958 | Kern | 243 m [800 ft] | | <i>Atriplex polycarpa</i> association; alluvial soil on the sandy flood plain of a dry wash | corollas white |

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| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|-------------------|-------------------|---|--------------------------|--------|-----------------|------------|---|--|
| RSA217958 | Twisselmann, E.C. | 4378 | | Apr 26 1958 | Kern | 244 m | | alluvial soil on sandy flood plain of a dry wash; <i>Atriplex polycarpa</i> | corollas white |
| CAS482510 | Twisselmann, E.C. | 4379 | | Apr 26 1958 | Kern | 243 m [800 ft] | | <i>Atriplex polycarpa</i> association; alluvial soil on the sandy flood plain of a dry wash | lavender-flowered plants occasional in a large colony of white-flowered plants |
| CAS601704 | Twisselmann, E.C. | 4379 | | Apr 26 1958 | Kern | 243 m [800 ft] | | <i>Atriplex polycarpa</i> association; alluvial soil on the sandy flood plain of a dry wash | lavender-flowered plants occasional in a large colony of white-flowered plants |
| CAS482528 | Twisselmann, E.C. | 10448 | | Mar 17 1965 | Kern | 225 ft | | along a recently dried canal | petals very pale lavender; to species |
| CAS602660 | Twisselmann, E.C. | 10448 | | Mar 17 1965 | Kern | 225 ft | | along a recently dried canal | petals very pale lavender; to species |
| RSA179964 | Twisselmann, E.C. | 10448 | E.L. Painter 2009 | Mar 17 1965 | Kern | 69 m | | moist subalkaline light soil in drying bottom of artificial marsh | |
| RSA212031 | Twisselmann, E.C. | 15073 | | Apr 5 1969 | Kern | 91 m | | alkali sink | |
| CAS490788 | Twisselmann, E.C. | 15073 | | Apr 5 1969 | Kern | 300 ft | | in loamy soil on low ridges between small alkali playas; Alkali sink association | to species |
| CAS602663 | Twisselmann, E.C. | 15073 | | Apr 5 1969 | Kern | 300 ft | | in loamy soil on low ridges between small alkali playas; Alkali sink association | to species |
| DS459073 | Twisselmann, E.C. | s.n. | | Jul 1954 | Kern | | | alkali sink | |
| CHSC14066 | Walker, J.R. | 7 | | Apr 21 1973 | Kern | 396 m [1300 ft] | | open flat area | fls lavender |
| UCR91383 | White, S.D. | 2620 | Steven R. Hill 2001 [some fls pistillate] | Mar 25 1995 | Kern | 152 m | Semitropic | chenopod scrub | fls pink; some fls pistillate only |
| RSA77202 | Woglum, R.S. | 993 | | Apr 5 1935 | Kern | | | | |
| RSA18629 [holotype] | Wolf, C.B. | 8413 | | Apr 1 1937 | Kern | 274 m [900 ft] | | <i>Atriplex spinifera</i> , sun, dry open flats, clay | |

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| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|------------|-------------------|-----------------|--------------------------|--------|-------------------|-----------|--|-----------------------------|
| POM244240 [isotype] | Wolf, C.B. | 8413 | | Apr 1 1937 | Kern | 274 m [900 ft] | | Atriplex spinifera, sun, dry open flats, clay | |
| CAS264757 [isotype] | Wolf, C.B. | 8413 | T. Kearney 1955 | Apr 1 1937 | Kern | 274 m [900 ft] | | Atriplex spinifera, sun, dry open flats, clay | fls pure white |
| DS258307 [isotype] | Wolf, C.B. | 8413 | T. Kearney 1955 | Apr 1 1937 | Kern | 274 m [900 ft] | | Atriplex spinifera, sun, dry open flats, clay | fls pure white |
| RSA18628 | Wolf, C.B. | 8507 | | Apr 27 1937 | Kern | 274 m | | dry open flats, clay, sun; Atriplex spinifera | |
| DS258308 | Wolf, C.B. | 8507 | | Apr 27 1937 | Kern | 274 m [900 ft] | | Atriplex spinifera; dry open flats, clay; Lower Sonoran | 'Belridge Oil Field' strain |
| POM244281 | Wolf, C.B. | 9402 | | May 1 1938 | Kern | 121 m [400 ft] | | open valley, dry sandy loam | |
| CAS263907 | Wolf, C.B. | 9402 | | May 1 1938 | Kern | 121 m [400 ft] | | salt bushes; open valley, dry sandy loam | fls white |
| CAS601699 | Wolf, C.B. | 9402 | | May 1 1938 | Kern | 121 m [400 ft] | | salt bushes; open valley, dry sandy loam | fls white, but see 9403 |
| DS282138 | Wolf, C.B. | 9402 | | May 1 1938 | Kern | 121 m [400 ft] | | salt bushes; open valley, dry sandy loam | fls white, but see 9403 |
| RSA20366 | Wolf, C.B. | 9403 | | May 1 1938 | Kern | 121 m [400 ft] | | open valley, dry sandy loam | fls pale lavender |
| DS282137 | Wolf, C.B. | 9403 | | May 1 1938 | Kern | 121 m [400 ft] | | saltbushes; open valley, dry sandy loam; Lower Sonoran | fls pale lavender |
| POM244279 | Wolf, C.B. | 9404 | | May 1 1938 | Kern | 500 ft ? | | open flats & edges of depression, dry sandy loam | |
| CAS263807 | Wolf, C.B. | 9404 | | May 1 1938 | Kern | 152 m [500 ft] | | saltbushes; edges of depressions & open flats, dry sandy loam; Lower Sonoran | all white fls |
| CAS601698 | Wolf, C.B. | 9404 | | May 1 1938 | Kern | 152 m [500 ft] | | saltbushes; edges of depressions & open flats, dry sandy loam; Lower Sonoran | all white fls |

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| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|-----------------------------|-------------------|--------------------------------|--------------------------|-----------------|-----------------|----------------|---|--|
| DS282136 | Wolf, C.B. | 9404 | | May 1 1938 | Kern | 152 m [500 ft] | | saltbushes; edges of depressions & open flats, dry sandy loam; Lower Sonoran | all white fls |
| GH420358 | Wolf, C.B. | 9404 | | May 1 1938 | Kern | | | | |
| POM244943 | Wolf, C.B. | 9405 | | May 1 1938 | Kern | 274 m [900 ft] | | edges of brush in grass, dry sandy loam | fls white faintly tinged with purple |
| RSA600862 | Wolf, C.B. | 9405 | | May 1 1938 | Kern | 274 m [900 ft] | | edges of brush in grass, dry sandy loam | fls white, faintly tinged with purple |
| CAS263905 | Wolf, C.B. | 9405 | | May 1 1938 | Kern | 274 m [900 ft] | | saltbushes; in grass at edges of brush, dry sandy loam | fls white faintly tinged with purple; no typical <i>E. parryi</i> seen |
| CAS601701 | Wolf, C.B. | 9405 | | May 1 1938 | Kern | 274 m [900 ft] | | saltbushes; in grass at edges of brush, dry sandy loam | fls white faintly tinged with purple; no typical <i>E. parryi</i> seen |
| DS282135 | Wolf, C.B. | 9405 | | May 1 1938 | Kern | 274 m [900 ft] | | saltbushes; in grass at edges of brush, dry sandy loam | fls white faintly tinged with purple; no typical <i>E. parryi</i> seen |
| JEPS32556 | Wolf, C.B. | 9405 | | May 1 1938 | Kern | 274 m [900 ft] | | saltbushes; edges of brush in grass; dry sandy loam | |
| SD22844 | Wolf, C.B. | 9405 | | May 1 1938 | Kern | 274 m [899 ft] | | saltbushes | |
| GH420356 | Wolf, C.B. | 9405 | | May 1 1938 | Kern | | | | |
| GH420357 | Wolf, C.B. | 9405 | | May 1 1938 | Kern | | | | |
| POM282885 | Benson, L. | 8102 | E.L. Painter & P. DeVries 2012 | Apr 4 1937 | San Luis Obispo | 457 m [1500 ft] | | clay soil, S slope | |
| OBI36481 | Bowen, C.L. | 743 | C.L. Bowen [label] | May 25 1983 | San Luis Obispo | 990 m [3250 ft] | Panorama Hills | annual grassland with few scattered shrubs; upper crest of very steep ravines of fine solid with shale & volcanic rocks | fls rose-lavender |
| RSA562189 | Charlton, D. & R. McCormick | 5039 | E.L. Painter 2009 | Apr 28 1991 | San Luis Obispo | 823 m | | former pasture native vegetation unknown; probable alkaline/arid grasslands | |

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| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|---------------------------|-------------------|--------------------------------|--------------------------|-----------------|-----------|-----------|-------------------|------------------------|
| CAS235708 | Eastwood, A & J.T. Howell | 2336 | | May 8 1936 | San Luis Obispo | | | | |
| UCD116245 | Esau, K. | s.n. | Robert Preston 1993 | May 13 1935 | San Luis Obispo | | | | |
| OBI75644 | Hoover, R.F. | 7797 | R.F. Hoover [label] | Apr 2 1950 | San Luis Obispo | | | coarse sandy soil | |
| CAS458452 | Hoover, R.F. | 7797 | | Apr 2 1950 | San Luis Obispo | | | coarse sandy soil | |
| OBI12403 | Hoover, R.F. | 7830 | R.F. Hoover [label] | Apr 14 1950 | San Luis Obispo | | | sandy wash | |
| CAS399071 | Hoover, R.F. | 7830 | | Apr 14 1950 | San Luis Obispo | | | sandy wash | fls white to rose-pink |
| DS562751 | Hoover, R.F. | 7830 | | Apr 14 1950 | San Luis Obispo | | | sandy wash | fls white to rose-pink |
| OBI12394 | Hoover, R.F. | 8067 | | Apr 1 1952 | San Luis Obispo | | | clay soil | |
| RSA217357 | Hoover, R.F. | 8067 | E.L. Painter & P. DeVries 2012 | Apr 1 1952 | San Luis Obispo | | | clay soil | |
| CAS482529 | Hoover, R.F. | 8067 | | Apr 1 1952 | San Luis Obispo | | | clay soil | to species |
| OBI12398 | Hoover, R.F. | 8134 | R.F. Hoover [label] | Apr 20 1952 | San Luis Obispo | | | sandy soil | |
| CAS399070 | Hoover, R.F. | 8134 | | Apr 20 1952 | San Luis Obispo | | | sandy soil | |

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| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|-------------------------|-------------------|---------------------|--------------------------|-----------------|-----------|-----------|-----------------------|---------------------------------|
| DS562749 | Hoover, R.F. | 8134 | | Apr 20 1952 | San Luis Obispo | | | sandy soil | |
| OBI12400 | Hoover, R.F. | 9349 | R.F. Hoover [label] | Apr 24 1965 | San Luis Obispo | | | sandy calcareous soil | |
| CAS458260 | Hoover, R.F. | 9349 | | Apr 24 1965 | San Luis Obispo | | | sandy calcareous soil | |
| OBI12401 | Hoover, R.F. | 9793 | R.F. Hoover [label] | Apr 2 1966 | San Luis Obispo | | | sandy wash | |
| CAS482543 | Hoover, R.F. | 9793 | | Apr 2 1966 | San Luis Obispo | | | sandy wash | |
| OBI12392 | Hoover, R.F. | 10258 | R.F. Hoover [label] | Mar 22 1967 | San Luis Obispo | | | | |
| CAS482509 | Hoover, R.F. | 10258 | | Mar 22 1967 | San Luis Obispo | | | | |
| OBI12389 | Hoover, R.F. | 10470 | | Apr 16 1967 | San Luis Obispo | | | | cf. <i>E. kernensis</i> [label] |
| CAS482526 | Hoover, R.F. | 10470 | | Apr 16 1967 | San Luis Obispo | | | | cf. <i>E. kernensis</i> [label] |
| OBI12396 | Hoover, R.F. | 11038 | | Apr 16 1968 | San Luis Obispo | | | | |
| UC1392660 | Hoover, R.F. | 11038 | | Apr 16 1968 | San Luis Obispo | | | | to species |
| CDA16837 | Hrusa, G.F. & L. Saslaw | 15774 | | Apr 12 2001 | San Luis Obispo | 760 m | | disturbed | mostly pistillate |

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|----------------------------|--------------------|-------------------|--|--------------------------|-----------------|-----------------|-----------|--|---------------------|
| OBI63020 | Keil, D. | 29294-2 | David J. Keil 2001 | Apr 13 2001 | San Luis Obispo | | | arid slopes with semidesert scrub & scattered California junipers; In partial shade of juniper | fls pink-purple |
| OBI63020 | Keil, D.J. | 29294-2 | David J. Keil 2011 | Apr 13 2001 | San Luis Obispo | | | arid slopes with semidesert scrub and scattered California junipers | fls pink-purple |
| OBI66955 | Keil, D. & K. Keil | 29356 | David J. Keil 2001 | Apr 20 2001 | San Luis Obispo | 670 m [2200 ft] | | Amsinckia-covered hillside; crumbling alkali clay soil; rolling hills; steep eroding west-facing slope | corolla pink-purple |
| OBI66955 | Keil, D. & K. Keil | 29356 | David J. Keil 2011 | Apr 20 2001 | San Luis Obispo | 2200 ft | | Amsinckia-covered hillside; crumbling alkali clay soil; rolling hills; steep eroding west-facing slope | corolla pink-purple |
| RSA659230 | Keil, D. & K. Keil | 22788-2 | E.L. Painter & P. DeVries 2012 | Apr 11 1992 | San Luis Obispo | | | flat area with scattered vernal pools;alkaline soil underlain by claypan | |
| SBBG112555 | Keil, D. & K. Keil | 22788-2 | E.L. Painter 2012 [pistillate fls present] | Apr 11 1992 | San Luis Obispo | | | flat area w/ scattered vernal pools; alkaline soil underlain by claypan; dense growth of wildfls | |
| UC1576174 | Keil, D. et al. | 19268 | M. Wetherwax 2009 | Apr 26 1986 | San Luis Obispo | 838 m [2750 ft] | | desert scrub; very fine loose clay soil | fls pink |
| SBBG95284 | Keil, D. et al. | 19268 | M. Wetherwax 2009 | Apr 26 1986 | San Luis Obispo | 2750 ft | | very fine loose clay soil | |
| SBBG95310 | Keil, D. et al. | 19284 | M. Wetherwax 2009 | Apr 26 1986 | San Luis Obispo | | | damp site at roadside; flat areas & low barren hills; scrub | |

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| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|-------------------------------|-------------------|---------------------|--------------------------|-----------------|-----------------|-----------|--|---|
| OBI45905 | Keil, D. et al. | 19284 | D. Keil [label] | Apr 26 1986 | San Luis Obispo | | | Flat areas & low barren hills with desert scrub dominated by <i>Ephedra californica</i> ; near damp site at roadside | fls lavender or white with red markings at base of petals |
| OBI47616 | Keil, D. et al. | 19284 | D. Keil [label] | Apr 26 1986 | San Luis Obispo | | | Flat areas & low barren hills with desert scrub dominated by <i>Ephedra californica</i> ; near damp site at roadside | fls lavender or white with red markings at base of petals |
| CAS454900 | McMillan, E. | 155 | | Jun 19 1952 | San Luis Obispo | | | sand blown soil on valley floor | |
| OBI12399 | McMillan, E. | 155 | E. McMillan [label] | Jun 19 1952 | San Luis Obispo | | | sand blown soil on valley floor | |
| OBI37644 | Riggins, R. | 1518 | | Apr 13 1985 | San Luis Obispo | | | roadside grasslands | |
| JEPS7480 | Robbins, G.T. & R. Bacigalupi | 3459 | M. Wetherwax 2009 | Apr 20 1952 | San Luis Obispo | 868 m [2850 ft] | | | fls pale pink to white |
| OBI12402 | Robbins, G.T. & R. Bacigalupi | 3459 | | Apr 20 1952 | San Luis Obispo | 868 m [2850 ft] | | | fls pale pink to white |
| UC614873 | Schreiber, B.O. | s.n. | M. Wetherwax 2009 | Apr 1 1934 | San Luis Obispo | | | sandy flat | fls rose purple |
| SJSU3378 | Sharsmith, C.W. | 6852A | | Apr 21 1962 | San Luis Obispo | | | dry bench | plants intimately intermixed among staminate individuals in same dense colony |
| SJSU3378 | Sharsmith, C.W. | 6852B | | Apr 21 1962 | San Luis Obispo | | | dry bench | plants intimately intermixed among pistillate individuals in same dense colony |

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| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|----------------------------|-------------------|----------------------------------|--------------------------|-----------------|-----------------|----------------|--|--|
| SD208197 | Simpson, M.G. & L. Simpson | 3062 | | Mar 30 2009 | San Luis Obispo | 807 m [2651 ft] | | open Atriplex-Ephedra, mixed herb scrub | |
| SDSU18461 | Simpson, M.G. & L. Simpson | 3062 | | Mar 30 2009 | San Luis Obispo | 808 m | | tan, silty soil; open Atriplex - Ephedra, mixed herb scrub | corolla purplish; one pl with pistillate fls only |
| SBBG80407 | Smith, C.F. | 2709 | E.L. Painter 2012 | Apr 30 1950 | San Luis Obispo | | | flat | kernensis? [label] |
| RSA535234 | Smith, C.F. | 12181 | E.L. Painter 2009 | Apr 9 1991 | San Luis Obispo | | | rocky draw with desert-like scrub | fls white to purple |
| RSA535235 | Smith, C.F. | 12181 | E.L. Painter 2009 | Apr 9 1991 | San Luis Obispo | | | | |
| SBBG97413 | Smith, C.F. | 12181 | M. Wetherwax 2009 | Apr 9 1991 | San Luis Obispo | | | rocky draw; scrub | |
| UC1586834 | Smith, C.F. | 12181 | M. Wetherwax 2009 | Apr 9 1991 | San Luis Obispo | | | rocky draw with desert-like scrub | fls white to purple |
| UCR73096 | Smith, C.F. | 12181 | Steven R. Hill 2001 [to species] | Apr 9 1991 | San Luis Obispo | | Panorama Hills | rocky draw with desert-like scrub | fls white to purple |
| CAS908028 | Smith, C.F. | 12181 | | Apr 9 1991 | San Luis Obispo | | | in rocky draw with desert-like scrub | fls white to purple; to species |
| SBBG120318 | Smith, C.F. | 12292 | D.H. Wilken 2007 | Apr 10 1992 | San Luis Obispo | | | alluvial flat; rangeland | |
| SBBG105441 | Smith, C.F. | s.n. | E.L. Painter 2012 | Apr 3 1993 | San Luis Obispo | 5000 ft | | calcareous formation | |
| CAS394500 | Twisselmann, E.C. | 1807 | | Apr 6 1955 | San Luis Obispo | 792 m [2600 ft] | | Ephedra californica association; very light loose dry soil | corollas very light lavender |

Appendix B. *Eremalche kernensis* herbarium records compiled by E. L. Painter, 2012; revised for 5 year review. Records are alphabetical by county name.

| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|-------------------------|-------------------|--|--------------------------|-----------------|-----------------|-----------|--|---|
| CAS601702 | Twisselmann, E.C. | 1807 | | Apr 6 1955 | San Luis Obispo | 792 m [2600 ft] | | Ephedra californica association; very light loose dry soil | corollas very light lavender |
| CAS601705 | Twisselmann, E.C. | 4451 | | May 12 1985 | San Luis Obispo | 624 m [2050 ft] | | alkali sink association; in light alkaline soil | corollas lavender; dense colony |
| CAS601706 | Twisselmann, E.C. | 4462 | | May 12 1958 | San Luis Obispo | 731 m [2400 ft] | | gravelly shale soil; Lower Sonoran grassland | petals white, vivid violet spot at the base |
| CAS482544 | Twisselmann, E.C. | 4462 | | May 12 1958 | San Luis Obispo | 731 m [2400 ft] | | gravelly shale soil; Lower Sonoran grassland | petals white, vivid violet spot at the base |
| SBBG124116 | Wilken, D. & E. Painter | 17940 | | Apr 20 2011 | San Luis Obispo | 201 m [660 ft] | | W-facing slope | |
| SBBG124120 | Wilken, D. et al. | 17930 | | Mar 30 2011 | San Luis Obispo | 192 m | | steep S-facing slope of dacitic outcrop | |
| SBBG124119 | Wilken, D. et al. | 17931 | | Mar 30 2011 | San Luis Obispo | 207 m | | gentle S-facing slope | |
| SBBG124118 | Wilken, D. et al. | 17932 | | Mar 30 2011 | San Luis Obispo | 219 m | | gentle NE-facing slope | |
| SBBG124117 | Wilken, D. et al. | 17933 | | Mar 30 2011 | San Luis Obispo | 249 m | | S-facing slope | |
| SBBG16462 | Chandler, E.R. | 556 | E.L. Painter 2012 [pistillate fls present] | Apr 16 1962 | Santa Barbara | 3000 ft | | sandy flats & washes; desert environment | |
| SBBG24055 | Chandler, E.R. | 2826 | E.L. Painter 2012 [pistillate fls present] | Mar 29 1966 | Santa Barbara | 2800 ft | | sandy flat | |
| SBBG43715 | Chandler, E.R. | 3366 | E.L. Painter 2012 [pistillate fls present] | Apr 30 1967 | Santa Barbara | | | sandy flat | |

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| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|----------------|-------------------|---|--------------------------|---------------|-----------|-----------|---|------------------------------|
| SBBG22578 | Chandler, E.R. | 2165 I | E.L. Painter 2012 | May 7 1965 | Santa Barbara | 3000 ft | | flat sandy area | |
| SBBG71532 | Hoffmann, R | s.n. | E.L. Painter 2012 [pistillate fls present] | Apr 5 1928 | Santa Barbara | | | open gravelly floor | |
| SBBG71527 | Hoffmann, R | s.n. | E.L. Painter 2012 | Apr 6 1928 | Santa Barbara | | | | |
| SBBG71528 | Hoffmann, R | s.n. | E.L. Painter 2012 | Apr 3 1932 | Santa Barbara | | | | |
| POM117876 | Jones, M.E. | s.n. | E.L. Painter & P. DeVries 2012 | Apr 28 1926 | Santa Barbara | | | | |
| CAS452786 | Shockley, R. | s.n. | | Apr 1965 | Santa Barbara | | | | |
| POM216208 | Keck, D.D. | 2242 | E.L. Painter & P. DeVries 2012 | May 6 1933 | Santa Barbara | | | light soil | fls light violet |
| DS214307 | Keck, D.D. | 2242 | | May 6 1933 | Santa Barbara | | | light soil | fls light violet; to species |
| DS694353 | Keck, D.D. | 2242 | | May 6 1933 | Santa Barbara | | | light soil | fls light violet; to species |
| UC518965 | Keck, D.D. | 2242 | | May 6 1933 | Santa Barbara | | | light soil | fls light violet; to species |
| SBBG71530 | Muller, K.K. | 823 | E.L. Painter 2012 | Apr 29 1957 | Santa Barbara | | | under shrubs & on open valley floor; light sandy soil | |
| SBBG4740 | Muller, K.K. | 823 | E.L. Painter 2012 | Apr 29 1957 | Santa Barbara | | | under shrubs & on open valley floor; light sandy soil | |

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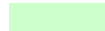
| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|-----------------------|-------------------|--|--------------------------|---------------|---------------|-------------|---|--------------------------------------|
| RSA354523 | Smith, C.F. | 5157 | E.L. Painter & P. DeVries 2012 | Apr 21 1957 | Santa Barbara | | | | |
| SBBG81365 | Smith, C.F. | 5157 | E.L. Painter 2012 | Apr 21 1957 | Santa Barbara | | | field | |
| SBBG81354 | Smith, C.F. | 5195 | Holly C. Forbes 1986 [as <i>E. kernensis</i>]; E.L. Painter 2012 [pistillate fls present] | Apr 24 1957 | Santa Barbara | | | crevices of concrete | |
| SBBG81353 | Smith, C.F. | 6738 | E.L. Painter 2012 | Apr 20 1962 | Santa Barbara | | | sandy bank | <i>E. kernensis</i> [label] |
| UCR1667 | Bowen, W.R. | 124 | Steven R. Hill 2001 | May 1 1962 | Tulare | 98 m | Delano West | saline flats in valley grassland; hard soil. | fls lavender |
| DS318801 | Wiggins, I.L. | 11577A | | Mar 28 1947 | Tulare | | | | |
| SBBG120668 | Burgess, R., P. Munro | 1878 | E.L. Painter 2012 [pistillate fls present] | Apr 14 1996 | Ventura | 3700 ft | | arid clay loam; full sun; E-facing slope; pinyon juniper woodland | some pls with pistillate fls |
| SBBG120669 | Burgess, R., P. Munro | 2739 | E.L. Painter 2012 | Apr 19 1998 | Ventura | 3200 ft | | sandy loam; full sun; pinyon juniper woodland | |
| RSA772449 | Gross, L. & P. Conway | 5441 | E.L. Painter & P. DeVries 2012 | May 4 2011 | Ventura | 1024 - 1036 m | Cuyama Peak | near edges of large junipers, on upper sandy benches | perfect fls, lavender color |
| RSA423691 | Menke, A. | s.n. | E.L. Painter & P. DeVries 2012 | May 15 1955 | Ventura | | | | [CCH records don't match label info] |
| SBBG33115 | Muller, K.K. | 823 | E.L. Painter 2012 [pistillate fls present] | Apr 29 1957 | Ventura | | | under shrubs over side area on open valley floor | |
| | Muller, K.K. | 823 | David J. Keil 2012 | Apr 29 1957 | Ventura | | | | |
| SBBG81377 | Secrest, T.L. | s.n. | E.L. Painter 2012 | May 6 1958 | Ventura | | | | |


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| Herbarium Accession Number | Collector | Collection Number | Determination | Specimen Collection Date | County | Elevation | USGS Quad | Habitat | Notes |
|----------------------------|-------------------|-------------------|---|--------------------------|---------|-----------|------------------|--|--|
| SBBG81378 | Secrest, T.L. | s.n. | Holly C. Forbes 1986 [as <i>E. kernensis</i>]; E.L. Painter 2012 | Apr 24 1957 | Ventura | | | | |
| SBBG | Wilken, D. et al. | 17978 | | May 3 2012 | Ventura | 1025 m | Ballinger Canyon | at base of <i>Juniperus californica</i> ; sandy to gravelly soil, S-facing slope | pistillate & bisexual pls present; corollas light lavender to pink-lavender |
| SBBG | Wilken, D. et al. | 17979 | | May 3 2012 | Ventura | 1050 m | Ballinger Canyon | at base of <i>Juniperus californica</i> ; sandy to gravelly soil; S-facing slope | pistillate & bisexual pls present; corollas light lavender to pink-lavender |
| SBBG | Wilken, D. et al. | 27980 | | May 3 2012 | Ventura | 1080 m | Ballinger Canyon | at base of <i>Juniperus californica</i> ; sandy to gravelly soil; S-facing slope | pistillate & bisexual pls present; corollas light lavender to pink-lavender |

Abbreviations:

CAS California Academy of Sciences
 CCH Consortium of California Herbaria
 CDA California Department of Food and Agriculture
 CHSC Chico State Herbarium, CSU Chico
 DS Dudley Herbarium (Stanford University) in CAS
 GH Gray Herbarium, Harvard University
 JEPS Jepson Herbarium, UC Berkeley
 OBI California Polytechnic State University, SLO
 POM Pomona Herbarium in RSA
 RSA Rancho Santa Ana Botanic Garden Herbarium
 SBBG Santa Barbara Botanic Garden
 SD San Diego Natural History Museum
 SJSU Carl W. Sharsmith Herbarium
 s.n. *sine numero*, or "without a number"
 UC University Herbarium, UC Berkeley
 UCD UC Davis
 UCR UC Riverside
 VV Victor Valley College

 indicates record is within the last 10 years, as of December 2012

 indicates record is older than 10 years, as of December 2012