STEPHENS' KANGAROO RAT
Dipodomys stephensi

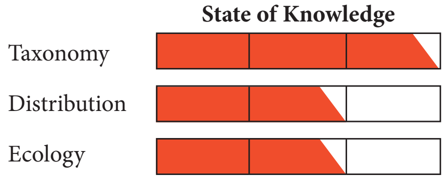

FIGURE 45. Stephens' kangaroo rat from the Ramona Grasslands. Note the round and fleshy ears, broad face with bulging forehead, and indistinct lateral line on tail with scattered white hairs on dark dorsal and ventral surfaces. Photo by M. Peterson.

Overview—Stephens' kangaroo rat is an endangered species of open grasslands or very sparse scrub. Found primarily in the inland valleys of western Riverside County, it is known to occupy a few scattered grasslands in northern San Diego County, particularly on and near Camp Pendleton, the Fallbrook Naval Weapons Station, Lake Henshaw, Rancho Guejito, and Ramona. Stephens' kangaroo rat resembles the Dulzura kangaroo rat closely, differing by averaging larger in certain measurements, in having a broader face and less distinctly striped tail, and other subtle features. It eats seeds primarily, along with some green vegetation and occasional insects.

Description—Stephens' kangaroo rat is a medium-sized (average weight of adults about 67 g), broad-faced kangaroo rat. The head appears large relative to the body, owing in part to the large auditory bullae. The upperparts are dark brown infused with cinnamon buff, the underparts are pure white, and there is an indistinct white stripe on the hip. The tail is bicolored with the dorsal and ventral surfaces dark, nearly black, and indistinct white lateral lines. The dark areas are sprinkled with white hairs, giving them a grizzled appearance. The distal third of the tail bears a long black tuft. The elongated hind feet are white on top, light brown on the bottom, and have five toes, the innermost of which is vestigial (the dew claw).

Dental formula*:* i, 1/1; c, 0/0; p, 1/1; m, 3/3; total = 20

Comparisons—Stephens' is easily distinguished from Merriam's kangaroo rat, which is much smaller (average weight 35 g) and has 4 toes on the hind foot (no dew claw). The ranges of Stephens' and Merriam's overlap in Riverside County but are not known to do so in San Diego County, though overlap is possible in Warner Valley.

Distinguishing Stephens' from the Dulzura kangaroo rat requires experience with its subtle differences in size, coloration, and shape of various body parts. In comparison with the Dulzura kangaroo rat, Stephens' has a broader, rounder face, which gives it a somewhat bulging appearance between the eyes (Figure 47A). With the animal in the hand, a biologist can palpate the skull with his or her fingers, gauging whether the face is as wide as or wider at the zygomatic arch than at the auditory bullae (felt behind the eyes and beneath the ears). In the Dulzura (and other "narrow-faced" kangaroo rats) the zygomatic arch is noticeably narrower than the auditory bullae and the face appears more triangular from the front (Figure 47B). That is, the head of *Dipodomys simulans* appears longer and narrower than that of *D. stephensi*.

The white stripe on the sides of the tail is generally narrower and less sharply defined in Stephens' than in other local kangaroo rats, and the dark hairs on the dorsal

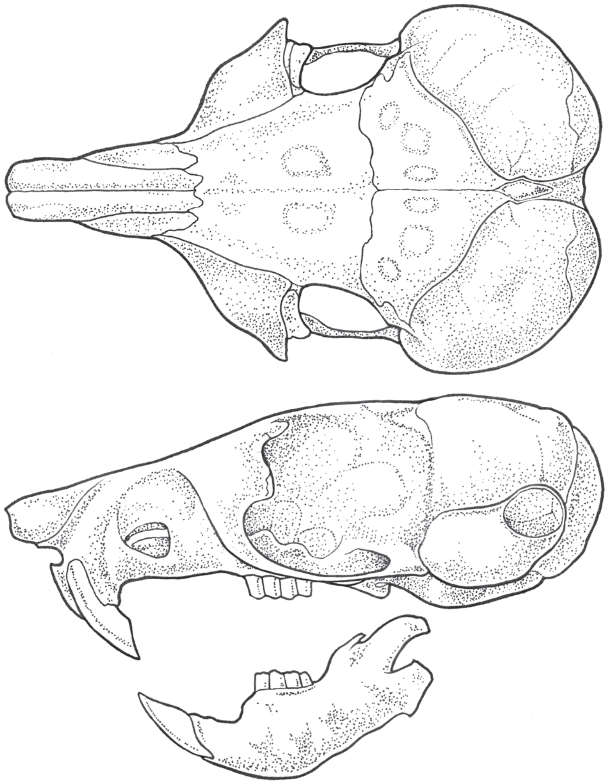

Figure 46. Dorsal and lateral view of cranium and lateral view of mandible of *Dipodomys stephensi*.

Figure 47. Face shape of Stephens' kangaroo rat (A) and Dulzura kangaroo rat (B). Note the broader, more bulging shape of the face between the eyes in Stephens' and the more sharply triangular face of the Dulzura. Note also the greater contrast in facial coloration and markings of the Dulzura. Both individuals captured at the Ramona Airport. Photos by M. Peterson.

Table 13. External and cranial measurements of *Dipodomys stephensi* from San Diego County (mm).

Character	*n*	Min	Mean	Max	SD
Total length	70	241.0	279.0	308.0	11.5
Tail length	70	133.0	164.6	184.0	8.9
Body length	61	98.0	114.8	134.0	7.3
Hind foot length	70	39.0	41.2	44.0	1.2
Ear length	70	12.0	14.4	17.0	0.9
Skull length	63	34.7	38.1	39.7	1.0
Occipitonasal length	63	32.8	36.5	38.1	1.0
Basilar length of Hensel	59	22.6	24.8	26.3	0.7
Basioccipital length	59	4.6	5.2	6.4	0.3
Interorbital constriction	63	10.3	11.6	12.8	0.6
Spread of maxillary arches	56	19.4	21.7	23.2	0.9
Lacrimal length	58	3.1	3.7	4.3	0.3
Maxillary arch width	63	5.4	6.0	7.0	0.3
Nasal length	63	11.8	13.7	14.8	0.5
Posteriormost projection of premaxillary	63	12.9	14.3	15.4	0.6
Frontonasal length	63	21.4	23.7	24.9	0.7
Nasal width	63	3.4	3.9	4.2	0.2
Interparietal length	63	3.5	4.4	5.4	0.4
Interparietal greatest width	62	0.8	1.4	2.2	0.4
Upper tooth row length	63	4.3	4.9	5.5	0.3
Intermaxillary distance	63	6.8	7.3	7.7	0.2
Projection of maxillary arch	61	5.7	7.4	8.3	0.5
Suborbital distance	63	3.3	4.3	4.9	0.3
Length of diastema	63	7.8	9.1	10.1	0.5
Mastoidal breadth	63	22.7	24.4	25.5	0.6
Zygomatic width	34	16.8	19.8	21.1	0.8
Depth of skull	63	13.0	13.5	14.3	0.3
Upper tooth wear	35	2.5	3.8	4.0	0.4
Bulla length	52	9.9	12.3	14.0	1.5
Lower tooth row length	52	4.0	4.7	5.7	0.4

side of the tail are often intermixed with white hairs that are generally lacking in other species. Some individuals captured at the Ramona Airport almost or completely lack the white lateral tail stripe, nearly the entire tail being dark with a salting of white hairs.

The ears of Stephens' kangaroo rat tend to be rounder, fleshier, and lighter in color (light grayish brown with a pinkish cast) than those of the Dulzura kangaroo rat, which are more elongate and lack the pinkish tint. When a male's penis is extruded by palpation, the baculum of Stephens' kangaroo rat can be seen to be thicker and bent at an angle that averages about 45° and reaches a maximum of about 60°). In contrast, the Dulzura's baculum is thinner and the tip is bent at about 90°. Otherwise, the species are similar with respect to the variably white supraorbital and post-auricular spots, the large and well-furred cheek pouches, the arietiform markings (transverse nose stripes, the same color as the upperparts or slightly darker), and in the scablike sebaceous gland between the shoulders.

Distribution—Stephens' kangaroo rat has a very restricted range for a mammal of its body size, occurring only in San Diego County, western Riverside County, and formerly in extreme southwestern San Bernardino County. Most populations are in the San Jacinto Valley and adjacent areas of western Riverside County, including the Anza area, which at 1250 m represents the highest elevation the species is known to reach. The first suggestion from San Diego County was based on an immature female collected by Laurence M. Huey 5 miles northeast

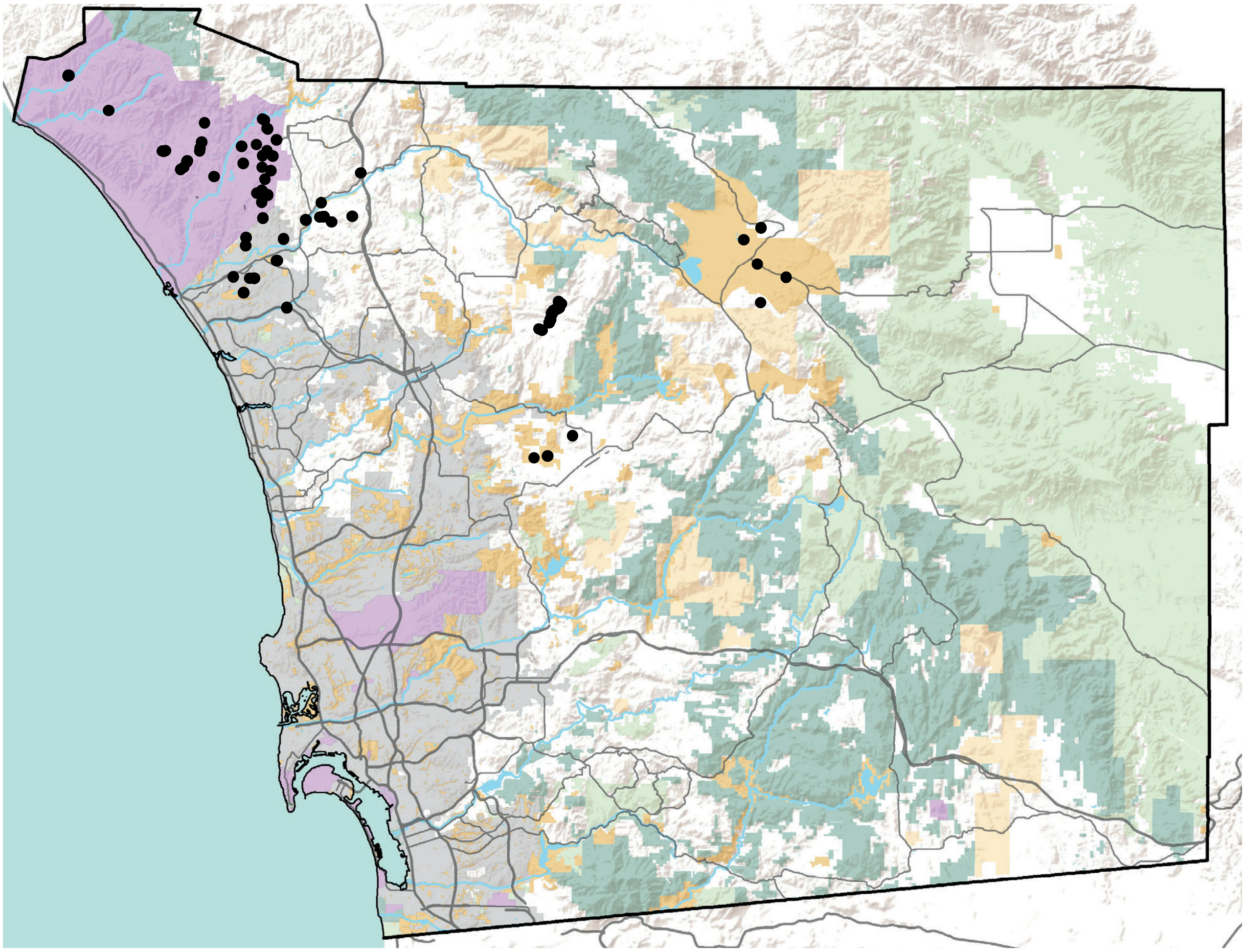

FIGURE 48. Records of *Dipodomys stephensi* in San Diego County. Species believed extirpated from sites now urbanized or cultivated around Oceanside, Vista, Bonsall, and the San Luis Rey River valley.

of Bonsall on 30 October 1920 (UCLA H850). Grinnell (1922) wrote that it "resembles *stephensi* most nearly" but hesitated to identify it as such because of its black tail (later revealed to have been discolored with spilled ink, Huey 1962) and insufficient width across the zygomatic arches (though the specimen was not fully grown and Grinnell lacked other specimens of *stephensi* of similar age for comparison). Forty-one years later, Huey (1962) himself rediscovered the species in San Diego County 1 mile east of Bonsall on 17 August 1961, collecting two specimens (SDNHM 18961, 18962) to which he gave a new name, *Dipodomys cascus*. Then Lackey (1967) studied the species intensively, locating it at five sites in and near the San Luis Rey River valley from near the current site of Rancho del Oro Community Park up to 2.0 km northeast of Bonsall. Having collected an adequate sample of specimens (93 from San Diego County), he concluded that the characters Huey proposed for *cascus* represented minor variation within *stephensi*. Lackey identified the difference in habitat between *stephensi* and *simulans*. Thomas (1973) reported that Stephens' kangaroo rat had already been extirpated from Bonsall just six years after Lackey published his study. Urban development and agriculture have now consumed this area almost totally, leaving only small patches of possibly suitable habitat.

Bleich and Schwartz (1974) discovered Stephens' kangaroo rat at the Fallbrook Naval Weapons Station, mapping it at seven localities and collecting seven specimens on 1 and 2 July 1972, two on 19 September 1972, and one on 16 February 1974 (LACM). The area occupied there decreased from a reported 1117 hectares in 1992 to less than 162 hectares in 2001. The population in adjacent Camp Pendleton is scattered across active military training areas and is also small and vulnerable to extirpation. Montgomery estimated the area occupied at about 324 hectares in 1996, it but may have dropped to less than half of that by 2002.

In 1983 O'Farrell and Uptain (1987) documented the Warner Valley/Lake Henshaw population, following a report from Warner Springs (APEC unpubl. data 1981). They preserved two specimens from 2.3 km west of Warner Springs (20 August 1983, MVZ 165802, 165803) and reported densities of active burrows ranging from 0.8 to 9.4 per hectare. This may be the largest contiguous population remaining in the species' range. Frank Stephens had collected one specimen at "Warner's" on 7 February 1922 (MVZ 32853), but it remained unpublished until 1987. During the 1980s this population was distributed over more than 4600 hectares (O'Farrell and Uptain 1987). Its current size and distribution are not well documented, and presumably vary with the level of cattle grazing and rainfall, but have probably declined since that time.

Montgomery discovered the population on the private Rancho Guejito in 1991 and surveyed its distribution in 2004, finding the population to occupy about 1219 hectares (Montgomery 1991, 2005). He also postulated the existence of the Ramona population, and Spencer confirmed it in October 1997. The Ramona population appears to be relatively limited in distribution, even though the habitat looks suitable in many parts of the grasslands around the Ramona airport. It numbers up to perhaps a few thousand individuals on loamy soils centered in the grasslands west of the town of Ramona.

FIGURE 49. Stephens' kangaroo rat habitat in the Ramona Grasslands showing effects of grazing. Ungrazed grasslands left of the fence are too dense to support the species, which is abundant in the more open, grazed habitat to the right. Photo by W. Spencer.

Habitat—Stephens' kangaroo rat is a habitat specialist, occupying open grassland dominated by annual forbs or sparse coastal sage scrub with a shrub cover of less than 30% and extensive bare ground. Typical habitat is vegetated with both native and non-native forbs, such as filaree, dove weed, tarplant, and goldfields. Dense grass or shrub cover can exclude Stephens' kangaroo rat from otherwise suitable habitat, presumably by interfering with its natural bounding movements and ability to forage efficiently. Moister conditions that favor denser perennial vegetation may set its upper elevational limit. The soil is usually friable and loamy, facilitating burrowing. Rarely is it high in clay or rock content, which makes burrowing difficult, or very sandy, in which burrows tend to collapse. The species sometimes uses clayey soils near more suitable habitat if other rodents (especially ground squirrels or pocket gophers) have dug sufficient burrows for kangaroo rats to exploit, perhaps only when populations are high and better habitat is fully occupied. Stephens' kangaroo rats tend to avoid steep slopes (greater than about 40%) and seem most abundant on gentle slopes (about 7 to 11%).

Stephens' kangaroo rat is sometimes described as a pioneer species, because it often colonizes an area after a disturbance that opens up the vegetation, such as fire or grazing. It also readily colonizes fallow agricultural fields. Such disturbances create the open conditions the species needs, and they encourage growth of the weedy forbs that serve as its favored food. Moderate grazing, especially by sheep or cattle, can help maintain habitat value for Stephens' kangaroo rat by thinning vegetation, creating areas of bare ground, and promoting growth of weedy forbs (Figure 49). Overgrazing, especially by horses, can degrade habitat by reducing food sources, compacting soil, and crushing burrows.

The value of habitat for Stephens' kangaroo rat can fluctuate from year to year in response to weather cycles, although patterns are not fully understood. In general, the population increases through the summer in proportion to the previous winter's rainfall. Winter rains stimulate the growth of food plants and increase Stephens' kangaroo rat's reproductive output. Prolonged or very heavy rains (as in El Niño years), however, may make vegetation so dense that it interferes with the kangaroo rat's ability to move and forage, especially on soils that hold moisture well. Drier periods allow the habitat to open up but do not produce as much food in the form of seeds and tender vegetation. Stephens' kangaroo rat populations probably respond in complex ways to this interplay between rains, soils, and vegetation.

Diet—Stephens' kangaroo rat is a granivore that feeds mostly on the seeds and young shoots of filaree and other forbs, annual grasses (oat, brome, Mediterranean grass), and some shrubs (including sagebrush, buckwheat, and Russian thistle). It also ingests the occasional insect. It forages for seeds by smell whether on or below the soil surface, and readily clips seed heads off of low-growing plants. At the Ramona airport, Spencer has observed that when seeds are abundant, Stephens' kangaroo rat stores food within the burrow or buries it in shallow caches scattered around the home range.

Reproduction—Although this species' breeding behavior is not well studied, Stephens' kangaroo rat is probably similar to most kangaroo rats in being generally promiscuous. Like other kangaroo rats, Stephens' reproductive output is relatively low for a rodent of its size. This output, however, may be somewhat higher than in most kangaroo rats, because the moister conditions in its habitat can prolong the breeding season beyond that possible in the deserts. Stephens' kangaroo rats typically produce two litters per year, with an average litter of two or three pups. The peak of the breeding season is in the late winter and spring, but males may be reproductive throughout the year. Reproduction is positively related to rainfall, but the pattern is not straightforward. Breeding is stimulated by young, green vegetation. In years with higher than average rainfall, Stephens' kangaroo rats may have a longer breeding season, bearing more litters, and females may breed in their first year rather than waiting until they are one year old.

Stephens' kangaroo rats are born altricial but in captivity stop nursing by about day 18. Juveniles are philopatric, remaining near their natal burrow for an extended period (Shier 2009). They typically establish a home range centering only 30 m from their site of initial capture (Shier 2009). However, they are capable of moving more than 400 m.

Space-use patterns—Even in suitable habitat, Stephens' kangaroo rats may be patchily distributed, with clusters of burrows often separated by unoccupied areas. The species is a good disperser and probably capable of colonizing habitat patches hundreds of meters or more from other occupied habitats, so long as the terrain is open and gentle enough to facilitate travel. It often disperses along dirt roads, trails, or the edges of agricultural fields, and readily takes advantage of off-road vehicle tracks or trails made by large mammals through dense grasses it otherwise avoids. Typically, however, Stephens' kangaroo rats are sedentary (individuals remain in one general locale all their life) and maintain stable home ranges, averaging about 0.2 hectares for males and 0.1 hectares for females. Males' home ranges are irregular in shape and tend to overlap one another as well as those of females. In contrast, females' home ranges tend to be more circular with less intrasexual overlap (Kelly and Price 1992). Population densities can vary dramatically by habitat, season, and annual reproductive output (e.g., Bleich 1973, McClenaghan and Taylor 1993). Rangewide, densities in suitable habitat typically are about one to ten individuals per hectare (O'Farrell and Uptain 1989) but can exceed 50 per hectare in some areas during the spring and summer when juveniles are present (McClenaghan and Taylor 1993). O'Farrell and Uptain (1989) characterized low density as less than 4 per hectare, medium density as 4–8 per hectare, and high density as greater than 8 per hectare.

Activity patterns—Stephens' kangaroo rat is primarily nocturnal. Individuals generally emerge shortly after dusk to forage, explore, sandbathe, and interact. Most activity is concentrated in the early evening, but the animals may be active at any hour of the night. Stephens' kangaroo rat is active above ground year round, but time spent outside the burrow may be reduced on cold or wet nights. Like other kangaroo rats, it seems to limit movement above ground on bright moonlit nights, which make it more vulnerable to predators. Observations at the Ramona airport suggest that the animals are more active on cloudy nights than on clear nights around the full moon. Artificial lighting reduces the species' aboveground foraging activity up to 35 m from the light source, likely because the additional light makes the animals more conspicuous to predators (Shier et al. unpubl. data).

Predators—Common predators of kangaroo rats include snakes (e.g., gopher snakes, rattlesnakes, and coachwhips), owls (e.g., the barn and great horned), the long-tailed weasel, and coyote. House cats also may be serious predators where residential development encroaches on Stephens' kangaroo rat habitat.

There is little direct information on the anti-predator behavior of Stephens' kangaroo rat, but other kangaroo rats reduce predation by switching activity from open areas to shrubby habitat as well as limiting their activity in bright moonlight. At the Ramona airport, Spencer has observed decreased activity by Stephens' kangaroo rats on moonlit nights and after seeing a barn owl foraging over their habitat. Upon detecting low-frequency sounds made by predators (such as air movement created by owl wings) or smelling snake odor, kangaroo rats escape predators by explosive hops like ricochets. They may also confront snakes by foot drumming or kicking sand at the predator. When they feel threatened, they also rapidly plug their burrows from the inside.

Behavior—Stephens' kangaroo rat is generally solitary, with each individual (or mother with young) occupying its own burrow complex. Adult males and females probably come together only for reproduction. Like other medium to large kangaroo rats, they drum with their feet as a form of long-distance communication. Stephens' drums at the fastest rate documented to date, averaging 24.44 beats per second (Shier et al. 2012). Sand bathing, a mode of short-distance communication, is important in many species of rodents, especially those adapted to arid conditions (Randall 1993). Rubbing the body through fine, powdery sands and then grooming removes excess oils from the pelage. Sandbathing also marks the location with the animal's scent, which is probably important to social communication and helps maintain social spacing. In Stephens' kangaroo rat sandbathing appears also to be a means by which females communicate to males whether they are in estrus (Shier, unpubl. data).

Detection in the field—Sign of Stephens' kangaroo rat is fairly obvious and diagnostic where populations are dense, but can be very difficult to discern when populations are sparse or ground cover is thick. Sign surveys (searching for burrows, trails, and scat) are best done in summer or early fall, when vegetation is driest and most open. To the trained eye, the burrow and trail systems are somewhat different from those of other local species of kangaroo rat, although sign alone does not identify the species definitively. Each Stephens' kangaroo rat generally occupies a burrow system having as many as four to six entrance holes connected by trails (Figure 50). These trails often mirror underground tunnels that connect the surface entrances. The entrance holes tend to be quite round, about 5 to 7 cm in diameter. Entrances may be larger where the kangaroo rat took over an existing ground squirrel burrow, or where gradual erosion of the entrance enlarged it. The species often clears vegetation and other obstructions from around the entrance, out to a radius of about 15 to 30 cm. Aprons of soil may be pushed out from the mouth of the burrow. To deter predators or to maintain a suitable microclimate within their burrows, kangaroo rats sometimes plug burrow entrances from the inside by pushing dirt up from below. Stephens' kangaroo rat occasionally cleans old seed chaff, loose soil, and other debris from its burrows, pushing them into small piles outside the entrance holes. One may often find evidence of such "house cleaning" after rain. Other local species of kangaroo rats may conceal burrow entrances beneath shrubs, use trails less habitually, and may not groom the surrounding area as meticulously as Stephens' kangaroo rat does.

Conservation status—Even in 1962, Huey recognized "that this struggling relict population of kangaroo rats is still to be found in the tiny known range, where it has had to contend with poisoning campaigns and human agricultural invasion, is almost a miracle." The California Department of Fish and Game listed Stephens' kangaroo rat as rare in 1971 and threatened in 1984. The U.S. Fish and Wildlife Service listed it as endangered in 1988 and prepared a draft recovery plan in 1997.

The IUCN's Red List classifies Stephens' kangaroo rat as "lower risk, conservation dependent," under the assumption that its risk of extinction in the near future is relatively low so long as Riverside County's plan for conservation of the species' habitat provides sufficient preserves and is fully implemented. Adequate management and monitoring have not yet been systematically instituted over the species' range, making attainment of these goals uncertain. Many remaining populations are outside of habitat reserves.

In San Diego County most Stephens' kangaroo rats live in areas not yet conserved or managed as biological reserves. Camp Pendleton's integrated natural-resources-management plan established guidelines for managing and monitoring Stephens' kangaroo rat beginning in 2002, and as of 2017 an updated version was under review. The Warner Valley/Lake Henshaw population is primarily on land managed by the Vista Irrigation District. The Rancho Guejito population is on private ranch land. The Ramona population is partially protected at the Ramona Airport under an integrated habitat-management plan and on some adjacent lands conserved in 2004 and 2005 by the county of San Diego and The Nature Conservancy. The county of San Diego has emphasized conservation of Stephens' kangaroo rat habitat as a priority of its North County Multiple Species Conservation Program.

The species is threatened by habitat removal and fragmentation throughout its range. In addition, many human actions or anthropogenic factors kill kangaroo rats or destroy or degrade their habitat: disking for weed abatement, pasture improvement, or farming; irrigation or spraying of sewage effluent on pastures (which saturates soils and makes them unsuitable for burrowing); application of rodenticides and perhaps other poisons; predation by domestic pets, especially house cats; road kill; and soil compaction by off-road vehicles, horses, and other livestock.

Human development and agriculture have removed an estimated 85% of suitable habitat throughout the species' range. Many historical locations no longer support Stephens' kangaroo rat, and much of the remaining habitat consists of thin strips along roadways or field edges, at the bases of hills, or around rocky areas where disking and farming are difficult. Consequently, Stephens' kangaroo rat populations are scattered, with few large, core populations and many small, isolated populations.

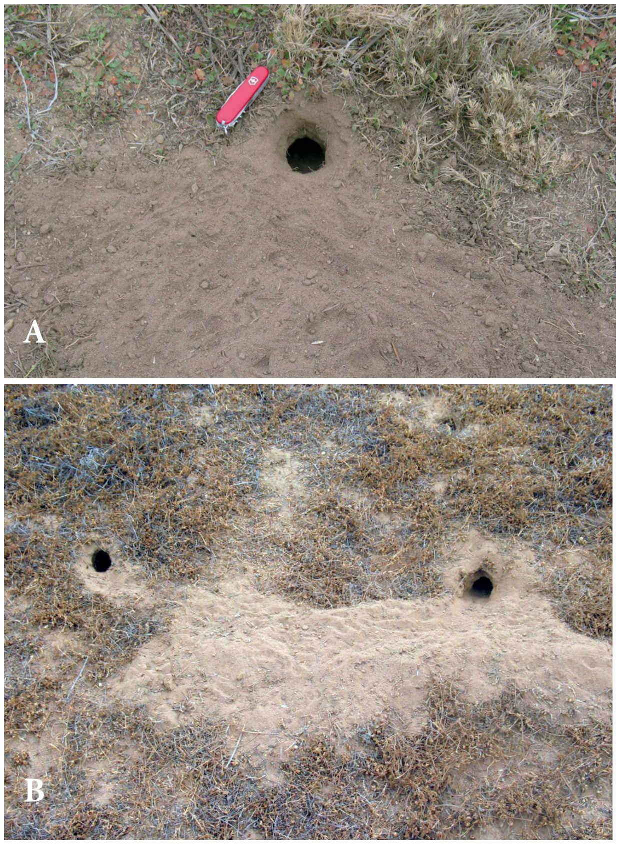

Figure 50. (A) Typical Stephens' kangaroo rat burrow, showing round, clean entrance and a portion of the dirt apron. Swiss knife, length 8 cm, for scale. (B) Two burrow entrances joined by a trail and probably connected under ground. Both photos from Ramona Grasslands. Photos by W. Spencer.

Isolation increases the risk of extirpation, especially of smaller populations. Fragmentation prevents movement between patches of suitable habitat and threatens genetic vigor by promoting inbreeding.

Of the three studies of the genetics of Stephens' kangaroo rat, the first assessed genetic variability within and between populations on the basis of allozymes (proteins) (McClenaghan and Truesdale 1991, 2002). It found that genetic divergence at various loci was not significantly correlated with geographic distances between populations, suggesting that habitat fragmentation has influenced the populations' genetic structure. In a second study Metcalf et al. (2001) used mitochondrial DNA to assess the patterns of genetic diversity across 16 scattered sites. Their results suggested the separation of three geographic populations in the north, middle, and south of the range. Yet small sample sizes and grouping of samples from multiple locations limited the study's precision, and the USFWS (2010) considered the results preliminary.

The San Diego Zoo developed a set of microsatellite loci specific to Stephens' kangaroo rat (Shier 2010, 2011) and genotyped 371 individuals from 21 sites across the species range. This study found genetic variation in terms of number of alleles greater in northern populations (northwestern Riverside County) and the lowest in the southernmost populations (i.e., Ramona Grasslands, Rancho Guejito, and Camp Pendleton), suggesting that the species may have expanded southward from an ancestral population in the north of the current range. The results of this study imply that in the past there was no geographic genetic structuring across the species' range but that the current genetic structuring is likely due to connectivity between populations being cut by recent urbanization (Shier 2016). Thus populations across the range are becoming increasingly isolated by restriction of dispersal and gene flow. Should this trend of fragmentation continue, isolated populations may be at risk of extirpation.

Stephens' kangaroo rat populations fluctuate in distribution and abundance under the influence of climate, fire, and other factors. After the Tomahawk Fire of 2014, Stephens' kangaroo rats expanded from long-occupied grasslands into adjacent burned shrublands at Fallbrook Naval Weapons Station (Montgomery, pers. obs.). Price et al. (1992) reported a similar response after fire at Lake Perris in Riverside County. Near Lake Henshaw, M. J. O'Farrell and Montgomery have observed population extensions into areas where the density of grass has been reduced by cattle grazing. Similar effects of reduced grass density resulting from sheep grazing have been observed at March Air Force Base and at Lake Mathews in Riverside County. Thus habitat management can allow populations to expand. Shier (2011, 2012) studied the effects of various habitat treatments on the success of relocation of Stephens' kangaroo rat, finding that more survived translocation when sites had been burned to reduce invasive grasses than at sites that had been grazed or mowed.

Conversely, after extended rains, the ensuing growth of vegetation can result in conditions generally unsuitable for Stephens' kangaroo rat, leading to contraction of its distribution and decrease of its population density. In such cases isolated populations are more susceptible to extirpation, as they may lack habitat sufficient to allow for natural population expansions and contractions in response to these cycles. In spite of the degree of protection accorded an endangered species, conservation of Stephens' kangaroo rat is not so secure as to preclude the fate predicted by Huey (1962): "Its future seems extremely doubtful, and before many years this species probably will pass into extinction."

RESEARCH NEEDS

- Basic natural history and behavior
- Population trends and cycles in response to management

Wayne Spencer, Stephen J. Montgomery, Philip R. Behrends, and Debra M. Shier

CALIFORNIA POCKET MOUSE

Chaetodipus californicus

Subspecies: *Chaetodipus californicus femoralis* (Dulzura pocket mouse; in the following account, when possible, the subspecies name is used to minimize confusion with the California mouse, *Peromyscus californicus*)

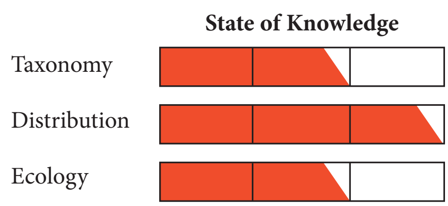

FIGURE 51. California pocket mouse from Descanso. Note the white spines on the rump and flanks, long ears with nearly parallel sides, and tufted tail. Photo by J. C. Mitchell.