

**Riverside Transmission Reliability Project
San Bernardino Kangaroo Rat
Dipodomys merriami parvus
&
Los Angeles Pocket Mouse
Perognathus longimembris brevinasus
Survey**



Prepared for:

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Introduction

On August 24, 2005, Davenport Biological Services (DBS) was hired by TRC Essex to determine the population size and distribution of the San Bernardino kangaroo rat (*Dipodomys merriami parvus*)(SBKR) and the Los Angeles pocket mouse (*Perognathus longimembris brevinasus*)(LAPM) populations within the proposed project area of the Riverside Transmission Reliability Project (RTRP). A preliminary site visit was completed on August 21, 2006, with Roger Overstreet of TRC Essex, and Arthur Davenport, of DBS. During this site visit, the paths of various, alternative, routes were reviewed. Additionally, access to various survey/trapping sites was discussed. Following the initial site visit, the various alignments within the study area were checked and specific areas identified for trapping. Portions of the project located west and north of Interstate 60 were not reviewed.

The survey area is located in San Bernardino and Riverside Counties (Figure 1); the entire project area is depicted in Figure 2. Some of the proposed alignments within the survey area of this study parallel the Santa Ana River whereas other portions lie within developed areas.

Surveys for SBKR and LAPM were initiated on August 30 and concluded on October 14, 2006. Surveys included visual inspection for small mammal sign (e.g., tracks, scat, and/or burrows) and trapping.

Species Information

SBKR

The SBKR is one of 25 subspecies of *Dipodomys merriami* (Hall, 1982). The SBKR is one of two subspecies of *D. merriami* that occur on the coastal plane of southern California (i.e., south of the Transverse Range and west of the Peninsular Ranges). The SBKR is typically associated with alluvial sage scrub and adjacent plant communities where the soils are sandy. The number of SBKR seems to remain highest in areas where shrub cover is low (e.g., less than 60 percent), annual vegetation is sparse, and the ground tends to be predominantly composed of sand. Like other kangaroo rats, the SBKR predominantly collects and consumes seeds (e.g., grass), but will eat green vegetation as well as an occasional insect.

The SBKR was listed as an endangered species under the Federal Endangered Species Act of 1973, as amended (FESA), on September 24, 1998.

The SBKR is identified by the State as a species of special concern (CDFG, 2003). Based on information provided with their list of "Special Animals," the Department of Fish and Game has designated certain vertebrate species as "Species of Special Concern" because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The goal of this designation is to halt or reverse their decline by

calling attention to their plight and addressing the issues of concern early enough to secure their continued existence.

The SBKR is also a covered species under the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). The SBKR is a Group 3 Species in the MSHCP and surveys are required where suitable habitat exists. In order to receive species coverage, the MSHCP must meet the ESA issuance criteria for Habitat Conservation Plans (HCPs). One of the issuance criteria is that the HCP disclose impacts likely to result from the proposed taking, and the measures the applicant shall take to prevent, reduce, and alleviate these impacts. For several species for which coverage was sought under the MSHCP, the available species information was insufficient to make findings to meet the issuance criteria. For those species, survey requirements have been integrated into the MSHCP to provide the information necessary to receive species coverage. Because of this, the Additional Survey Needs & Procedures (Section 6.3.2—MSHCP Final) is required as part of the project review process within the survey areas when suitable habitat is present. Covered species found as a result of survey efforts will need to be conserved as described in Section 6.3.2, MSHCP, Volume 1.

LAPM

The LAPM is one of 19 subspecies of *Perognathus longimembris* (Hall, 1982). The LAPM is one of two *P. longimembris* that occur on the coastal plane of southern California (i.e., south of the Transverse Range and west of the Peninsular Ranges). The marginal records for the distribution of the LAPM are: San Fernando; San Bernardino; Cabazon; Aguanga; 2 1/2 mi. N Oak Grove; Burbank (Hall, 1982).

The LAPM is associated with various sage scrub plant communities. I have observed this subspecies in open grassland, alluvial sage scrub, alluvial fan scrub, and within coastal sage scrub. I have also observed this subspecies in associations of Great Basin sagebrush. Like other pocket mice, the LAPM predominantly collects and consumes seeds (e.g., grass), but will eat green vegetation as well as insects.

The LAPM is identified by the State as a species of special concern (CDFG 2003). Based on information provided with their list of “Special Animals,” the Department of Fish and Game has designated certain vertebrate species as “Species of Special Concern” because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The goal of this designation is to halt or reverse their decline by calling attention to their plight and addressing the issues of concern early enough to secure their continued existence.

The LAPM is also a covered species under Riverside County’s Multiple Species Habitat Conservation Plan (MSHCP). The LAPM is a Group 3 Species in the MSHCP and surveys are required where suitable habitat exists. In order to receive species coverage, the MSHCP must meet the ESA issuance criteria for Habitat Conservation Plans (HCPs). One of the issuance criteria is that the HCP disclose impacts likely to result from the proposed taking, and the measures the applicant shall take to prevent, reduce, and

alleviate these impacts. For several species for which coverage was sought under the MSHCP, the available species information was insufficient to make findings to meet the issuance criteria. For those species, survey requirements have been integrated into the MSHCP to provide the information necessary to receive species coverage. Because of this, the Additional Survey Needs & Procedures (Section 6.3.2—MSHCP Final) is required as part of the project review process within the survey areas when suitable habitat is present. Covered species found as a result of survey efforts will need to be conserved as described in Section 6.3.2, MSHCP, Volume 1.

Previous Records

SBKR

Sixty-six specimens of SBKR are kept at the Museum of Vertebrate Zoology, Berkeley. Based on review of those specimens, SBKR are known to have occurred at the mouth of Reche Canyon in the early 1900s (Specimen Nos., MVZ Mamm 2600, 2601, 2604, 2605, 2606, 2607, 24462, 24463, 24464, and 24465). There are also a few specimens of SBKR from the Santa Ana River Wash in Redlands (MVZ Mamm 182964, 182965, and 182966). Most of the specimens from Reche Canyon were collected in 1908, while the last four (i.e., MVZ Mamm 24462, 24463, 24464, and 24465), were collected in 1916. Reche Canyon connects with the Santa Ana River and is located approximately three to four miles east of the project area. In the early 1990s, I observed SBKR at Norton AFB, located approximately eight miles to the east of the project area along the Santa Ana River. The Redlands records are located further to the East along the Santa Ana River, and were collected in 1993.

As of May 2, 2005, there were 19 records of SBKR in the Department of Fish and Game's Natural Diversity Data Base. Of these records, four are within 13 miles of the study area; the closest being located between Waterman and Tippecanoe Avenues (approximately five miles upstream). All other records of SBKR in the vicinity of the study area are referring to specimens held at the Museum of Vertebrate Zoology, Berkeley, and already discussed above.

LAPM

Ninety-nine specimens of LAPM are kept at the Museum of Vertebrate Zoology, Berkeley. Based on review of those specimens, LAPM are known to have occurred at the mouth of Reche Canyon in the early 1900s (Specimen Nos., MVZ Mamm 2656 and 24496); these were collected in 1908 and 1916, respectively. There are also three specimens from the vicinity of Slover Mountain (Specimen Nos. MVZ Mamm 16663, 16664, and 16665); all were collected in 1912. In the early 1990s, I observed LAPM at Norton AFB, located approximately eight miles to the east of the project area along the Santa Ana River.

Figure 1. General location of the area surveyed within the eastern portion of the RTRP.

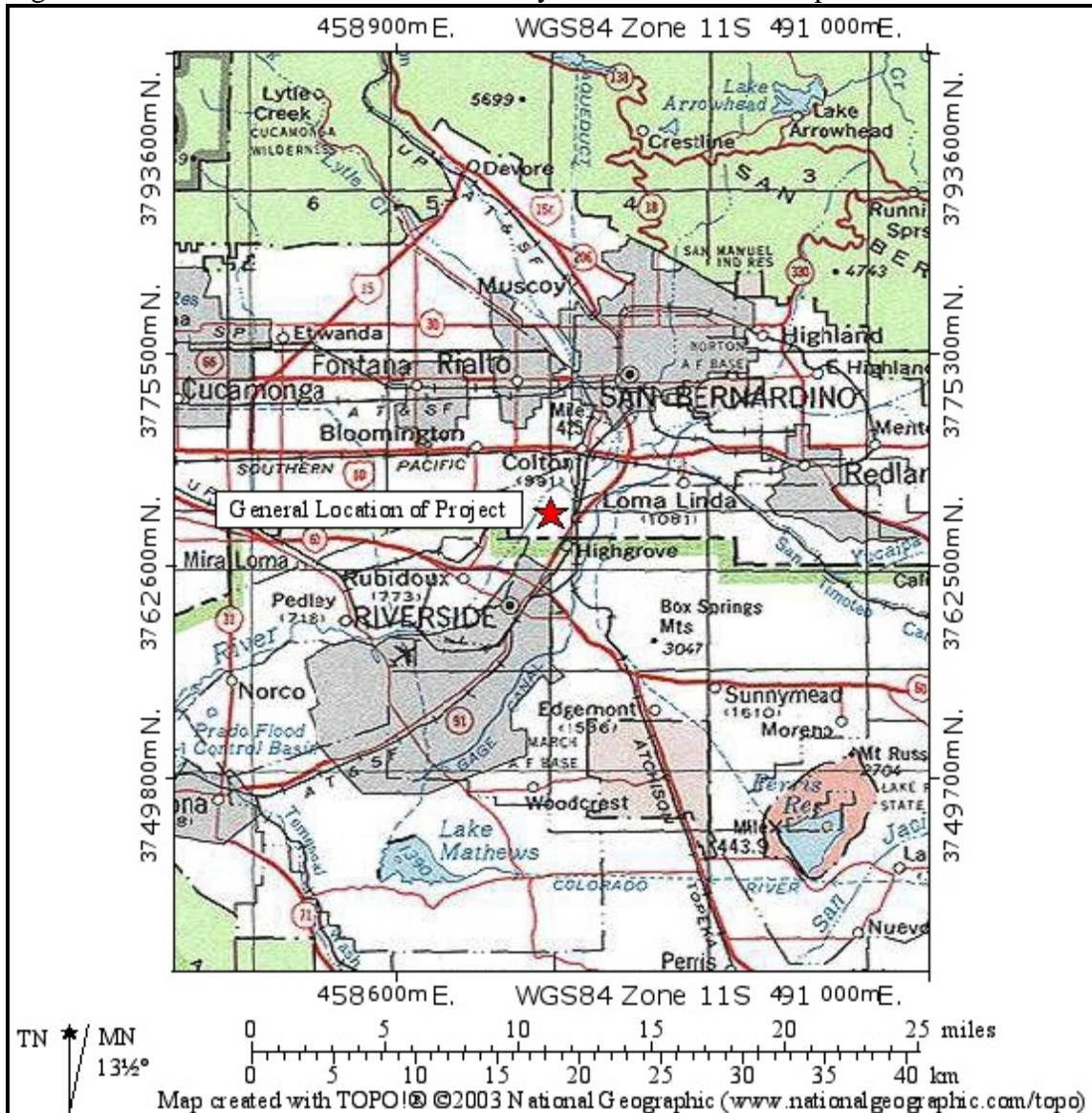
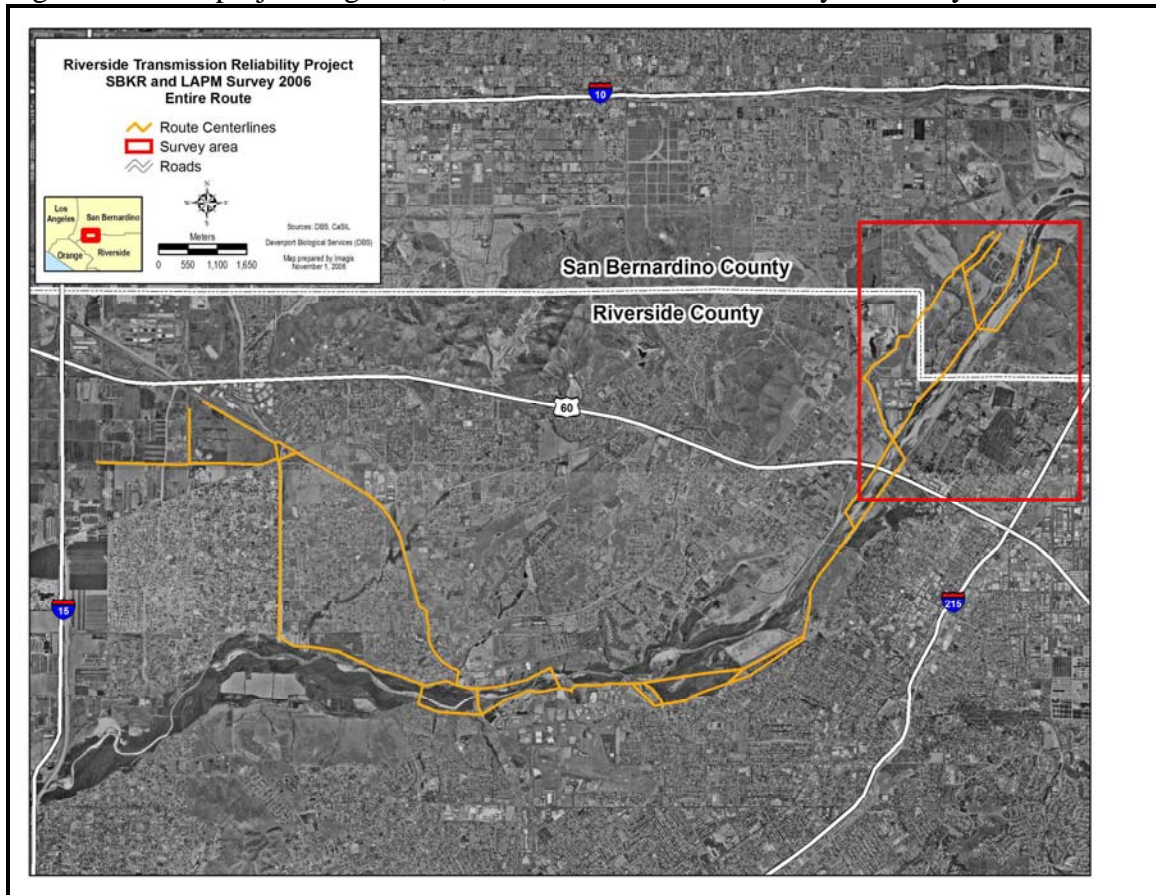


Figure 2. Entire project alignment; includes areas not covered by this study.



As of May 2, 2005, there were 30 records of LAPM in the Department of Fish and Game's California Natural Diversity Data Base (CNDDDB). Of these records, one record is from south of the Interstate 10, and north of Agua Mansa Road in West Colton, San Bernardino County (EO Index # 45407). D. Crawford of Impact Sciences captured thirty LAPM at this location on July 21, 2001. This location is located less than one mile north of the area covered in this report. All other records of LAPM in the vicinity of the study area are referring to specimens held at the Museum of Vertebrate Zoology, Berkeley, and already discussed above.

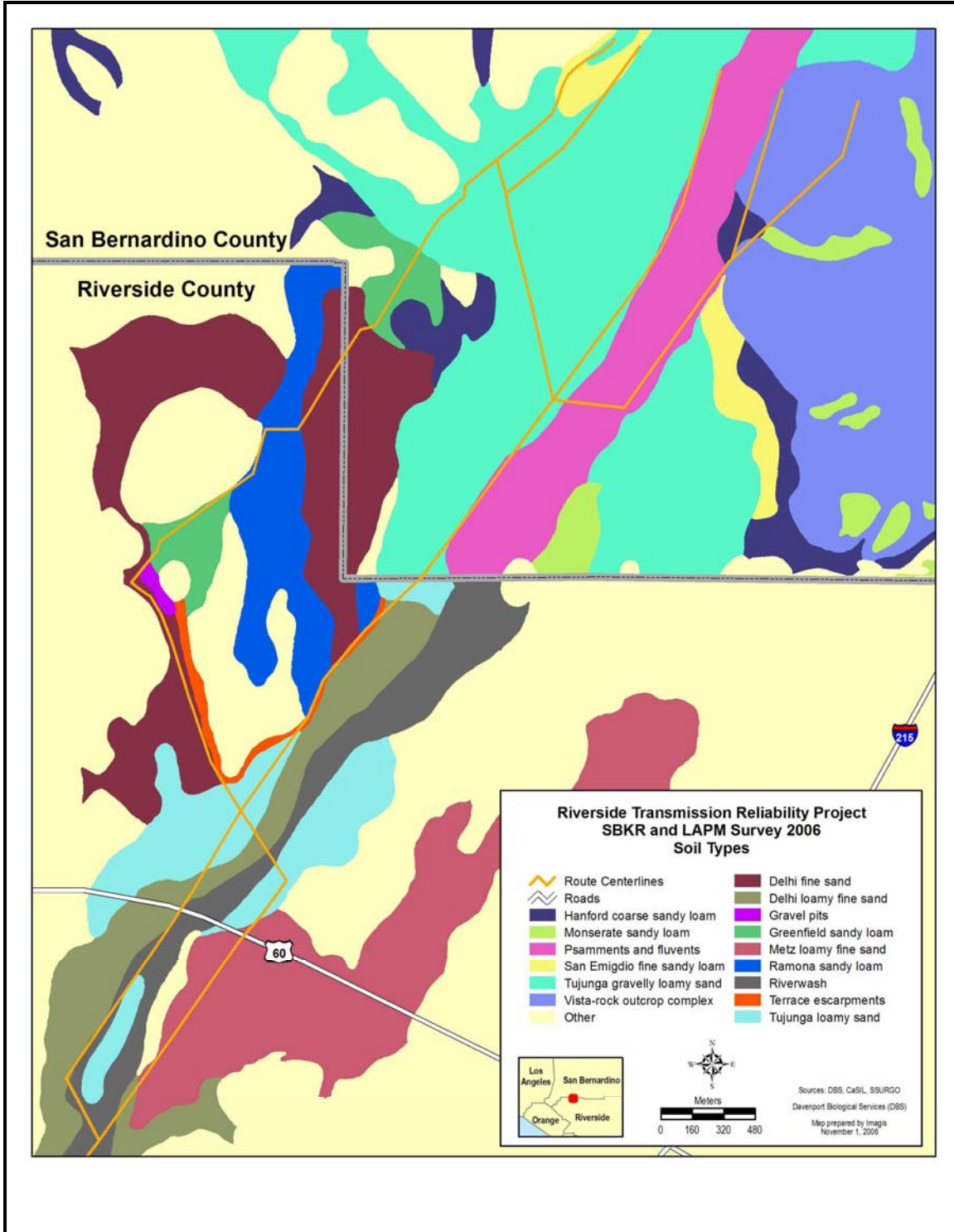
A previous, recent, trapping study documented LAPM along the north side of the Santa Ana River between Riverside Avenue and the Rialto Channel (Kirtland 1998). Based on information from that study, 23 individual LAPM were captured between September 9 and 14, 1998.

Soils

Soil types were reviewed in an effort to anticipate the potential location of LAPM and SBKR. Both of these species are often found on sandy/gravelly substrates. As indicated by the soil map, most of the area is sandy in nature, and thus suitable for either of these rodents (Figure 3). The soils of the La Loma Hills are identified as Vista rock-outcrop

Complex. Based on site visits during this study, the soils of the La Loma Hills have coarse granitics overlaying clays.

Figure 3. Soil Map (Soil Survey Geographic Data Base from Natural Resource Conservation Service).



Plant Community

SBKR and LAPM typically occur within native plant communities where cover provided by shrubs and trees is low and the ground is largely devoid of vegetation or debris. Thus, in general, except for the dense coastal sage scrub located in the La Loma Hills, the majority of the study site contains suitable habitat for these species. Exceptions to this generalization include the ponds associated with the water treatment plant located adjacent to the Rialto Channel and artificial plantings (e.g., lawns, and other ornamental plantings). In addition, due to heavy off-highway vehicle use, and/or thick annual or perennial vegetation, neither animal is anticipated to occur within the flood control berms lining the Santa Ana River within this study area.

Methods

SBKR and LAPM Population/Distribution Determinations

All habitat thought to be suitable for SBKR and LAPM, within the proposed project area (i.e., along the alignment), was visually inspected in an effort to locate burrows and/or other sign attributable to either of these species. Where small mammal sign was located, or where the potential for their presence was thought to exist, trapping grids or transects were established as appropriate. All traps used were 12 inch, Sherman[®], folding live-traps. In total, five grids and 10 transects were established in an effort to document the distribution and number of SBKR and LAPM within the project area (Table 1 & 2). Eight trap sets were established on the North side of the Santa Ana River and three on the south side of the river (i.e., total of grids and transects).

Table 1. Number of traps per trapping grid or transect located on the North side of the Santa Ana River.

Trap Location Designation	Number of Traps	Number of Trap Nights
G1	75	375
G2	36	180
G3	30	150
G4	60	300
T1	15	75
T2	20	100
T5	20	100
T6	100	500
T7	15	75
T8	10	50
T9	50	250
T10	15	75
Total	446	1,130

Table 2. Number of traps per trapping grid or transect located on the South side of the Santa Ana River.

Trap Location Designation	Number of Traps	Number of Trap Nights
G5	150	750
T3	30	150
T4	30	150
Total	210	1,150

Thus, a total of 606 trap locations were used during this study. Traps within grids and along transects were generally spaced approximately 15 meters apart. Each trap location within each grid was trapped for five consecutive nights. Thus, a total of 3,280 trap nights were used during this study. Traps were checked near midnight and then again in the morning. All traps were closed during the day and reopened and baited each evening. Traps were baited with rolled oats (Quaker[®] Old Fashion).

Unique color combinations were developed using permanent markers (i.e., Sharpie[®]). Both the actual number caught, and the Lincoln-Peterson population estimator, were used in assessing the size of the population of SBKR and LAPM within the footprint of the project in the study area.

Results

SBKR

No SBKR were trapped or otherwise detected during this study.

LAPM

A total of 60 individual LAPM were captured during this study. All of the LAPM were caught East of Riverside Avenue on both the north and south side of the Santa Ana River (Figure 4).

In addition to the LAPM, four other species of rodent, and a bird were trapped, and three carnivores were observed within the project area. The rodents included the California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), San Diego pocket mouse (*Chaetodipus fallax fallax*), and deer mouse (*Peromyscus maniculatus*). Additionally, a western toad (*Bufo boreas halophilus*) was trapped. Regarding the carnivores, striped skunk (*Mephitis mephitis*), coyote (*Canis latrans*), and a bobcat (*Felis rufus*) were observed.

Figure 4. Location of individual LAPM trapped within proposed project area; 2006 data.

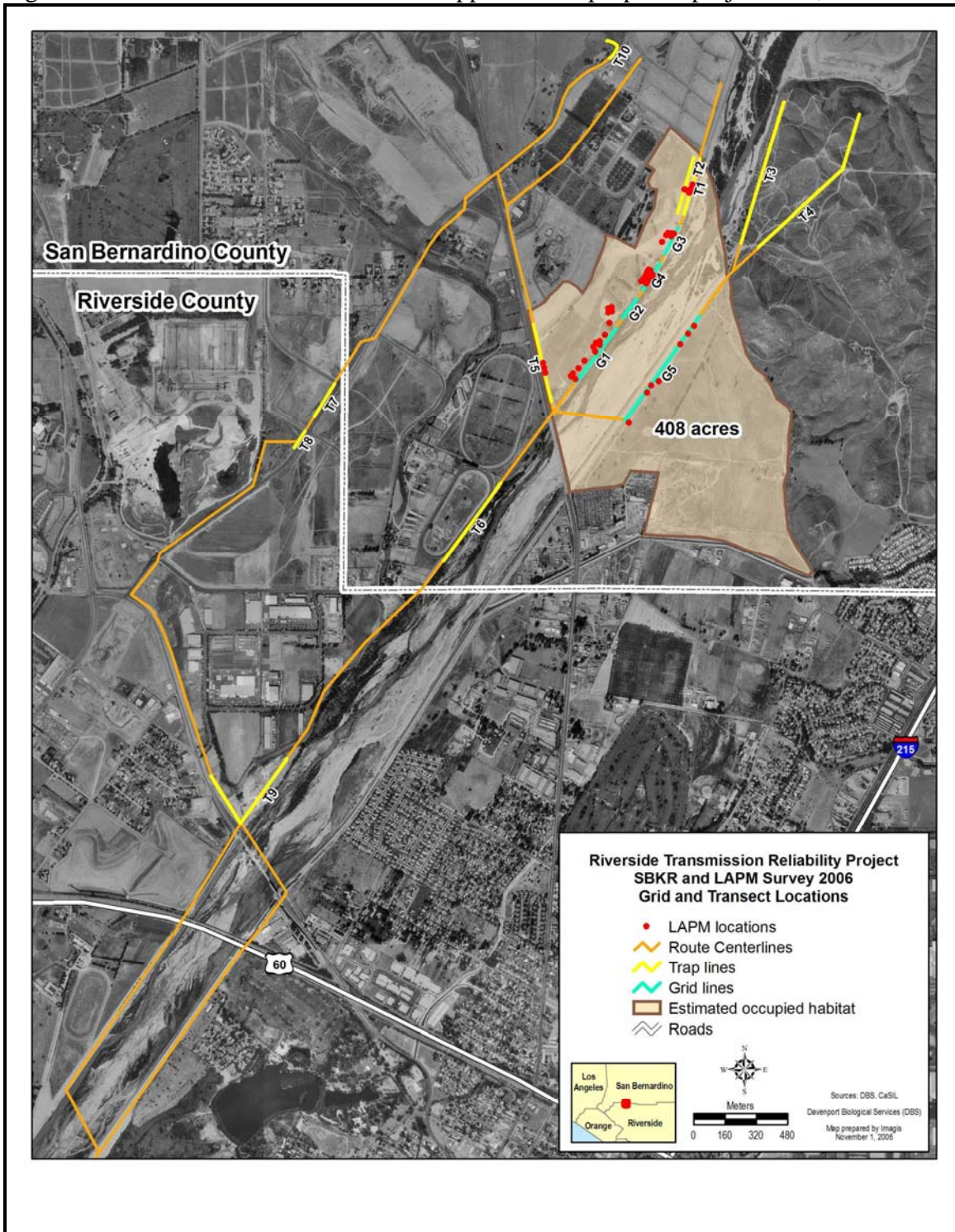


Table 3. Capture history of individual LAPM during this study (n = 60).

LAPM #	1 st Night	2 nd Night	3 rd Night	4 th Night	5 th Night
1	1	0	0	0	0
2	1	0	0	0	1
3	1	0	0	1	0
4	1	1	1	0	0
5	1	1	1	1	0
6	1	0	0	0	0
7	1	0	0	0	0
8	1	0	0	0	0
9	1	0	0	0	0
10	1	0	0	0	1
11	1	1	0	0	1
12	1	0	0	1	1
13	1	0	1	0	1
14	1	0	0	0	1
15	1	0	1	0	0
16	0	1	0	0	0
17	0	1	0	0	0
18	0	1	1	0	0
19	0	1	0	0	0
20	0	1	0	0	1
21	0	1	0	1	1
22	0	1	0	0	0
23	0	1	0	0	0
24	0	1	0	0	0
25	0	0	1	0	1
26	0	0	1	0	0
27	0	0	1	0	0
28	0	0	1	1	0
29	0	0	1	0	0
30	0	0	1	0	0
31	0	0	1	0	1
32	0	0	1	0	0
33	0	0	1	0	1
34	0	0	1	0	0
35	0	0	1	0	0
36	0	0	1	0	0
37	0	0	0	1	0
38	0	0	0	1	0
39	0	0	0	1	0
40	0	0	0	1	0
41	0	0	0	1	0
42	0	0	0	1	0
43	0	0	0	1	0
44	0	0	0	1	1
45	0	0	0	1	0
46	0	0	0	1	0
47	0	0	0	1	1
48	0	0	0	0	1
49	0	0	0	0	1
50	0	0	0	0	1
51	0	0	0	0	1
52	0	0	0	0	1
53	0	0	0	0	1
54 (S #1)	1	0	1	1	0
55 (S #2)	1	0	0	0	0
56 (S #3)	0	0	1	0	0
57 (S #4)	0	0	1	1	0
58 (S #5)	0	0	0	1	1
59 (S #6)	0	0	0	1	0
60 (S #7)	0	0	0	1	1

Population Size

Based on five nights of trapping, per trap set, the initial probability of capture for LAPM during this study was 0.53 (StDev = 0.32; N = 53). The average probability of recapture was 0.27 (StDev = 0.35; N = 36). Based on a Mann-Whitney Rank Sum Test, there is a significant difference between initial capture and recapture probabilities (T = 1754.500, n(small) = 47, n(big) = 53; P = <0.001 @ alpha = 0.05)(SigmaStat 3.1). Thus, LAPM appear to avoid recapture.

The Lincoln-Peterson method of population estimation was chosen for estimating the size of the population. Lincoln-Peterson has been shown to be a good estimator of population size, even with violation of some of the assumptions (e.g., small changes in probability of capture). The assumptions of the Lincoln-Peterson method are: the population is closed; no marks fall off the population; the researcher correctly records all marks; and the probability of capture remains the same (Krebs 1999).

Lincoln-Peterson (unbiased estimator)

$$N = \frac{(M + 1)(C + 1) - 1}{(R + 1)}$$

N = Estimate of total population size

M = Total number of animals captured on the first visit

C = Total number of animals captured on the second visit

R = Number of animals captured on the first visit that were then recaptured on the second visit

$$N = \frac{(15+1)(12+1) - 1}{(3+1)}$$

$$N = \frac{(16)(13) - 1}{(4)}$$

$$N = 52$$

Confidence Interval

Binomial Confidence Interval

(Binomial 95% Confidence limits determined using graph from Krebs (1999))

$$R/C = 3/12$$

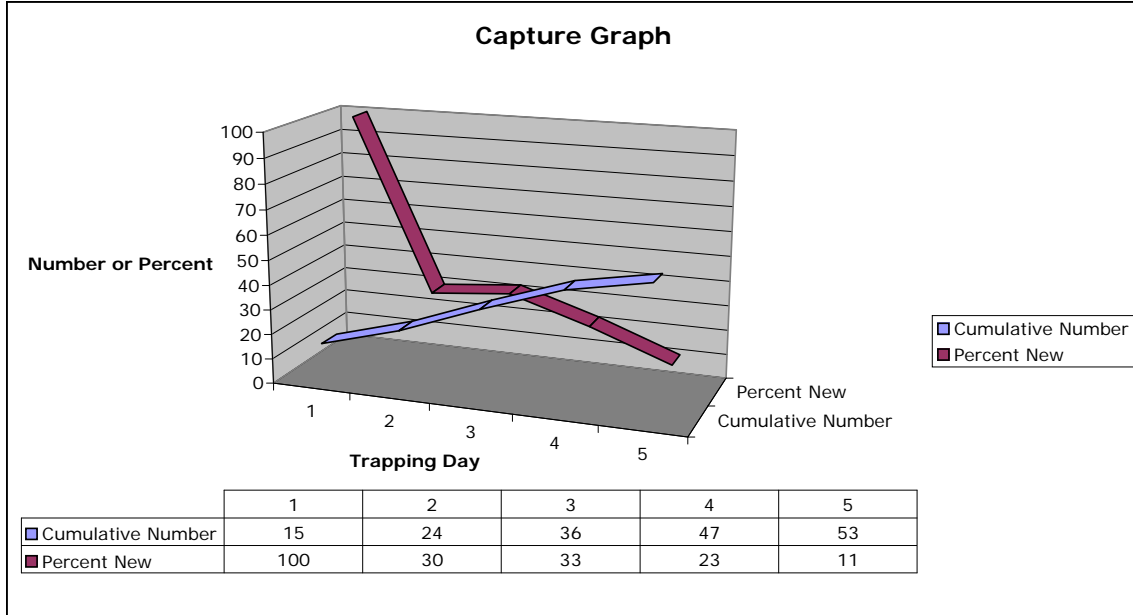
$$R/C = 0.25$$

$$1/0.6 (53) = 88 \text{ (Lower limit)}$$

$$1/0.061 (53) = 868 \text{ (Upper Limit)}$$

Thus, based on the modified Lincoln-Peterson method, the LAPM population lies between 88 and 868 animals along the project alignment.

Figure 5. Cumulative capture graph; also shows percentage of new animals caught per trap day (n = 53).



Distribution

Based on the number of animals captured during this study, a large population of LAPM is located on the north side of the Santa Ana River between Riverside Avenue and the Rialto Channel. LAPM were also trapped on the south side of the Santa Ana River between Riverside Avenue and the base of the La Loma Hills (Figure 4). However, the southern population appears to have been much smaller than that found on the north side of the river. It is important to note that animals on the north and south side of the Santa Ana River are probably not isolated from each other. That is, on occasion, animals are expected to move across the Santa Ana River. Therefore, animals on the north and south side of the river should be considered part of the same population. However, a more detailed study would be necessary to assess movement between these two areas. Based on the location of trapped LAPM and the distribution of suitable habitat, approximately 408 acres of occupied habitat occur within and immediately adjacent to the project area (Figure 4).

Discussion

SBKR

During this study, no SBKR were detected. The reason for their absence may be due to the small size of patches of remaining undisturbed habitat. Much of the area on the north and south side of the river had been under some type of agriculture in the past. In addition, much of the area is either urban or industrial development. Thus, the remaining patches of relatively undisturbed habitat do not appear to have been large enough to sustain a viable population of the kangaroo rat. Additionally, the nearest known patch of occupied habitat occurs approximately eight miles upstream of the eastern edge of the study area (i.e., at the San Bernardino International Airport). Thus, re-colonization of the site seems limited. The process of extinction events, within small isolated patches, has been well documented (Gilpin and Soule 1986).

LAPM

In contrast to the results for SBKR, LAPM was found to occur on the north and south side of the river between Riverside Avenue and the Rialto Channel, and Riverside Ave. and the base of the La Loma Hills, respectively. Within the project area, the southern sub-population appears to be smaller based on the relatively low number of animals caught during this study. The sub-population of LAPM on the south side of the river appears to coincide with an area that was under agriculture in the past. This assertion is based on the presence of hedgerows of trees and the absence of shrubs commonly found in the flood plane of the Santa Ana River (e.g., scale broom). Thus, LAPM located on the south side of the river appear to be re-colonizing the area.

The number of LAPM actually known to have been on site during the study is 60 (animals from the north and south combined). For the north side of the river, the population estimate of 52 animals from the Lincoln-Peterson model is close to the total caught for that area. However, the 95% confidence intervals are too large to determine, with any degree of confidence, the actual population size. The reason for the extremely wide confidence interval is the low recapture probability of this species (i.e., 0.27; $StDev = 0.35$; $n = 36$). In short, the significant difference in initial and recapture probabilities is a major violation of the assumptions of the Lincoln Peterson model. That is, the probability of capture did not remain approximately the same during the study, as required by the model.

Reviewing the capture graph (Figure 5), suggests that the catchable population lies near the 53 animals that were caught. In addition, on average, the initial capture probability of this animal for this study (i.e., 0.52), suggests that approximately 96 percent of the catchable population within the area trapped should, on average, be caught by the fifth night. It is important to note that an unknown percentage of LAPM, with a lower initial capture probability, were not caught. Thus, the average initial capture probability is likely lower than indicated by this study. A longer trapping session would result in a more accurate estimate of initial and recapture probability for this species, and a more precise

estimate of the population. Based on the presence of adjacent suitable habitat (i.e., approximately 408 acres), a much larger population of LAPM is anticipated in this general area.

LAPM were not found in recently disked fields located along the proposed project route (i.e., at T7 and T8). Their absence is likely due to the shallow structure of their burrows. That is, the disking destroys burrows and likely killed and/or displaced the animals. In addition, LAPM were not found to remain in areas close to human habitation, despite the presence of suitable soils and native plants (e.g., croton). All of the LAPM were caught away from human habitation and where disturbance was lacking or had not occurred in some time. It is important to note, however, that LAPM were found adjacent to Riverside Avenue; a very busy street.

Significance

The population of LAPM within the study area is significant and important to the long-term conservation of the species. The basis for this assertion is the large number of animals caught within a relatively small area, during a relatively short sampling period, with relatively few traps. Additionally, the area of contiguous suitable habitat is approximately 408 acres in size and appears connected to suitable habitat located upstream of the site. In addition, it may be possible to connect, or maintain a connection between this group of LAPM, and those documented to occur approximately one mile north of this site (NDBB EO # 45407). Without this population, the northern population will definitely become isolated from the remainder of this species and will be at high risk of extirpation. The population of LAPM located along the Santa Ana River within the study area is likely a component of the population of this species that occurs east of the project site and along the flood plane of the Santa Ana River.

Other Sensitive Species

Northwestern San Diego Pocket Mouse

The Northwestern San Diego pocket mouse (*Chaetodipus fallax fallax*)(NSDPM) was also caught during this survey. The NSDPM is a sensitive species (CDFG, 2003). Based on this survey, this subspecies is common within the *Encelia farinosa* (brittle bush) dominated coastal sage scrub of the La Loma Hills. A few NSDPM were also trapped along G5.

San Diego Black-tailed Jackrabbit

The San Diego black-tailed jackrabbit (*Lepus californicus bennettii*) was observed during this study. The San Diego jackrabbit is a sensitive subspecies (CDFG, 2003). The distribution of the San Diego black-tailed jackrabbit includes cismontane southern California and northern Baja California, Mexico (Hall, 1981). Within California, this subspecies occurs as far north as Mount Pinos (Ventura County).

Conclusion

No San Bernardino kangaroo rats were trapped or otherwise detected during this study. However, a large, regionally significant population of LAPM occurs within the study area, within San Bernardino County. No LAPM were found during this study within Riverside County.

Recommendations

Avoid disturbance within remnant, representative patches of alluvial fan scrub and other natural communities

Reduce area of disturbance due to project activities to the smallest area practicable

Protect occupied habitat from further off-highway-vehicle use and other disturbance factors

Control exotic vegetation

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