

**Western Riverside County  
Multiple Species Habitat Conservation Plan (MSHCP)  
Biological Monitoring Program**

**Los Angeles Pocket Mouse Survey Report 2010**



**21 April 2011**

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**NOTE TO READER:**

This report is an account of survey activities conducted by the Biological Monitoring Program for the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). The MSHCP was permitted in June 2004. The Monitoring Program monitors the distribution and status of the 146 Covered Species within the Conservation Area to provide information to Permittees, land managers, the public, and the Wildlife Agencies (i.e., the California Department of Fish and Game and the U.S. Fish and Wildlife Service). Monitoring Program activities are guided by the MSHCP species objectives for each Covered Species, the information needs identified in MSHCP Section 5.3 or elsewhere in the document, and the information needs of the Permittees.

MSHCP reserve assembly is ongoing and it is expected to take 20 or more years to assemble the final Conservation Area. The Conservation Area includes lands acquired for conservation under the terms of the MSHCP and other lands that have conservation value in the Plan Area (called public or quasi-public lands in the MSHCP). In this report, the term “Conservation Area” refers to the Conservation Area as understood by the Monitoring Program at the time the surveys were planned and conducted.

We would like to thank and acknowledge the land managers in the MSHCP Plan Area, who in the interest of conservation and stewardship facilitate Monitoring Program activities on the lands for which they are responsible. A list of the lands where data collection activities were conducted in 2010 is included in Section 7.0 of the Western Riverside County Regional Conservation Authority (RCA) Annual Report to the Wildlife Agencies. Partnering organizations and individuals contributing data to our projects are acknowledged in the text of appropriate reports.

While we have made every effort to accurately represent our data and results, it should be recognized that data management and analysis are ongoing activities. Any reader wishing to make further use of the information or data provided in this report should contact the Monitoring Program to ensure that they have access to the best available or most current data.

The primary preparer of this report was the 2010 Mammal Program Lead, Jennifer Hoffman. If there are any questions about the information provided in this report, please contact the Monitoring Program Administrator. If you have questions about the MSHCP, please contact the Executive Director of the RCA. Further information on the MSHCP and the RCA can be found at [www.wrc-rca.org](http://www.wrc-rca.org).

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## INTRODUCTION

Los Angeles pocket mouse (*Perognathus longimembris brevinasus*) is a California species of special concern that historically ranged from the San Fernando Valley eastward to the city of San Bernardino and southeast to the Aguanga area of Riverside County (Williams et al. 1993). The species typically occurs on open landscapes associated with alluvial, aeolian, or well-drained upland deposits of sandy soil, and is believed to be in decline due to habitat loss affiliated with agricultural and urban development (Jameson and Peeters 1988, Williams et al. 1993, Dudek & Associates 2003). The current distribution of Los Angeles pocket mouse across the Western Riverside County MSHCP Plan Area is not well understood, partly due to seasonal cycles of activity which make this species difficult to detect.

Los Angeles pocket mouse spends much of its life underground, with ephemeral bouts of surface activity offset by intervals of subterranean aestivation and torpor (French 1976, 1977). Timing and duration of activity cycles can vary across seasons, and appear to be a function of soil temperature, food availability, and ambient air temperature (French 1976, 1977). Detectability of Los Angeles pocket mouse is therefore dependant on conditions suitable for surface activity when the species is available for trapping, and population estimates should account for variation in detectability across and within seasons.

MSHCP species-specific objectives for Los Angeles pocket mouse call for the conservation of 2000 acres (approximately 809 ha) of suitable habitat in each of 7 Core Areas: 1) Davis Unit of San Jacinto Wildlife Area (SJWA) – Lake Perris State Park, 2) The Badlands, 3) San Jacinto River – Bautista Creek, 4) Anza Valley, 5) Lake Skinner – Dominigoni (i.e., Southwestern Riverside County Multi-Species Reserve), 6) Potrero Valley (Potrero), and 7) Temecula Creek. Each Core Area must support a stable or increasing population with at least 30% of suitable habitat occupied, as measured over any 8 consecutive year period (Dudek & Associates 2003).

Monitoring Program biologists surveyed monthly for Los Angeles pocket mouse at the SJWA from February 2006 to March 2007, and at Silverado Ranch (i.e., Durasno Valley) from October 2006 to March 2007. Our aims were to define a pattern of seasonal surface activity, and to delineate the distribution of Los Angeles pocket mouse across Core Areas where the species was known to occur. We detected Los Angeles pocket mouse year-round, but identified May and June as periods of peak surface activity. We were unable to address distribution because activity at individual trap sites varied across months, and our trapping grid design (i.e., 7 traps x 7 traps, 60 m x 60 m footprint) did not allow for a large enough sample size to estimate occupancy.

We expanded our survey effort in 2010 to include 6 of the 7 Core Areas defined for Los Angeles pocket mouse, excluding Temecula Creek because only a very small parcel of habitat (4.3 ha) is currently conserved there. We targeted modeled habitat in each Core Area with 5x5 trapping grids (28 m x 28 m footprint) following a Percent Area Occupancy (PAO) design (MacKenzie al. 2006). Using a smaller trapping footprint allowed us to survey a greater number of grids than in 2006 – 2007, and to better describe Los Angeles pocket mouse distribution across Core Areas. With a smaller trapping

footprint we are also better able to infer landscape influences on distribution because individual grids will likely contain more homogenous habitat features than captured in 2006 – 2007.

We will address population trend by repeating surveys over 3 years (consecutive or non-consecutive, depending on staff availability) in an 8 year period, and comparing estimates of occupied habitat and relative abundance among grids. We will also examine factors that may drive surface activity of Los Angeles pocket mouse by modeling detection with environmental covariates. Our goals and objectives for surveying Los Angeles pocket mouse are listed below.

### **Goals and Objectives**

- A. Estimate area of suitable habitat occupied by Los Angeles pocket mouse in Core Areas.
  - a. Model suitable habitat based on soil and vegetation characteristics known to be associated with Los Angeles pocket mouse and other closely related subspecies of *Perognathus longimembris*.
  - b. Conduct repeat visit surveys across modeled habitat according to a Percent Area Occupancy (PAO) design, accounting for animals present but not detected.
- B. Determine relative abundance among grids and Core Areas.
  - a. Record number of individuals captured on each grid.
- C. Collect baseline data to compare with future years data to determine if populations are stable or increasing.
  - a. Compare estimates of occupancy over years.
  - b. Compare relative abundance among grids over years.
- D. Examine factors that may influence detectability of Los Angeles pocket mouse.
  - a. Model grid-based detection probability using environmental covariates collected during trap sessions.
- E. Refine model of suitable habitat.
  - a. Compare presence/absence models that include soil and vegetation data collected at trap sites.

## **METHODS**

### **Survey Design**

We estimated area of occupied habitat using a repeat-visit survey design following a Percent Area Occupancy (PAO) framework (MacKenzie et al. 2006). We based this survey design on previous survey efforts for small mammals (see 2008 *Biological Monitoring Program Stephens' Kangaroo Rat Survey Report*). Repeated visits consisted of visiting a trapping grid every night for 4 or 5 nights. During this 4- or 5-night trapping effort, populations are presumed to be 'closed' to changes in occupancy. A closed population is defined as one having no gains through births or immigration and no losses through deaths or emigration. We were able to calculate detection probability and

grid occupancy with data obtained through closed population trapping using Program MARK (White and Burnham 1999). Detection probability is the probability that the species will be detected given that it inhabits the area of interest (MacKenzie et al. 2006). Occupancy is the probability that a randomly selected site in an area of interest is occupied by at least 1 individual of the species of interest (MacKenzie et al. 2006).

## **Training**

Crew members attended an intensive training seminar and participated in mock surveys before being assigned field duty. The 2-day seminar included a slide-show presentation that focused on survey protocol, animal identification, and standard operating procedures for trapping small mammals. Field staff also practiced animal handling and processing techniques on domestic white mice. Following the training seminar, crew members took a quiz covering presented material, and demonstrated proficiency at handling and taking measurements of live animals. Field crew who passed the quiz correctly answered all questions pertaining to identification of Covered Species.

Field-based training included 2 nights of demonstrating species identification and processing animals captured on practice grids (5x5) set at the Potrero site. The demonstration period was followed by 2 nights of mock surveys where crew members practiced checking grids and recording data according to protocol. We only checked traps at midnight during the 4 nights of field-based training, while standard protocol surveys included both midnight and dawn trap checks.

After completing the above training, crew members were able to identify 7 covered and 6 non-covered small-mammal species in-hand. Crew members could also safely and proficiently handle live animals and take measurements according to standard operating procedures developed by the Biological Monitoring Program. Moreover, crew members were able to perform surveys for Los Angeles pocket mouse according to established protocol. Only crew members that successfully completed training processed animals. The California Department of Fish and Game and Regional Conservation Authority funded Biological Monitoring Program personnel; volunteers are noted. Biologists conducting Los Angeles pocket mouse surveys in 2010 included:

- Jennifer Hoffman (Project Lead, Biological Monitoring Program)
- Bill Kronland (Biological Monitoring Program)
- Esperanza Sandoval (Biological Monitoring Program)
- Betsy Dionne (Biological Monitoring Program)
- Ashley Ragsdale (Biological Monitoring Program)
- Nicole Housel (Volunteer, Santa Ana Watershed Association)
- Talula Barbee (Volunteer, Santa Ana Watershed Association)
- Lauren Ross (Biological Monitoring Program)
- Joe Sherrock (Biological Monitoring Program)
- John Dvorak (Biological Monitoring Program)
- Julie Golla (Biological Monitoring Program)
- Laura Magee (Biological Monitoring Program)
- Elise Hinger (Biological Monitoring Program)
- Joanna Gibson (Biological Monitoring Program)

- Mike Robinson (Biological Monitoring Program)
- Sloane Seferyn (Biological Monitoring Program)
- Samantha Treu (Biological Monitoring Program)
- Claudia Bauer (Biological Monitoring Program)
- Tara Graham (Biological Monitoring Program)

### Study Site Selection

We stratified Core Areas according to our suitable habitat model based on soil and vegetation characteristics known to be associated with Los Angeles pocket mouse and the closely-related pacific pocket mouse (*P. l. pacificus*). We specifically targeted sand and loam soils found in alluvium and well-drained upland areas (Germano 1997, Bornyasz 2003), including gravelly strata, but not rock, stone, or cobble (M'Closkey 1972, Meserve 1976, Winchell et al. 1999; Appendix A). We included grassland, coastal sage scrub, chaparral, desert scrub, Riversidean alluvial fan scrub, and wet meadow (e.g., playas, vernal pools) vegetation types (Dudek & Associates 2003), but not shrubland or scrub > 60% cover density (Germano 1997). Low-density riparian scrub/woodland (e.g., < 10% cover *Salix*, *Alnus*, *Baccharis*, *Prosopis*) was considered suitable, because these vegetation types are often intermixed on alluvial deposits with habitat more typical of Los Angeles pocket mouse.

We removed from our study sites any areas of minor development (e.g., kiosks, maintenance buildings) identified with digital-aerial photography and those prohibitively difficult to access (e.g., > 600 m from a road or on terrain that exceeded 24 degree slope; USGS 2006). We also placed a 10-m buffer around roads so that survey stations did not overlap transportation corridors. The resulting survey area consisted of 6 locations separated by expanses of non-suitable habitat and/or lands not included in the Conservation Area (Figure 1).

### Survey Locations

We randomly distributed grid center points within Core Areas at 1 of 3 sampling densities, depending on area of accessible habitat, for a minimum of 20 grids per area (Table 1). We placed a 20-m negative buffer on the inference area to prevent placement of grids beyond modeled habitat, and distributed points within this buffer using Hawth's Tools extension (Beyer 2004) for Arc GIS v.9.3.1 (ESRI 2006). Survey stations (grids) consisted of 25 traps arranged in a 5x5 grid with 7-m spacing between traps (28 m x 28 m footprint).

We surveyed 6 of the 7 Core Areas listed for Los Angeles pocket mouse. We did not survey the Temecula Creek Core Area because < 5 ha of suitable habitat are currently conserved there. The Lake Perris-SJWA Core Area (Existing Core H) includes lands managed by California State Parks and California Department of Fish and Game west of Gilman Springs Road and north of the Ramona Expressway. The Badlands Core Area (Proposed Core 3) includes San Timoteo Canyon and lands managed by the Regional Conservation Authority, California State Parks, and Riverside County Parks south of I-10 to the Ramona Expressway, west of Gilman Springs Road, and east of CA-79 and Lamb Canyon. The Anza Valley Core Area (Proposed Core 6 and Existing Core L) is defined as



conserved lands east of CA-371 that are managed by the Regional Conservation Authority and Bureau of Land Management. The Lake Skinner – Domenigoni Core Area includes the portions of Existing Core J that comprise the Southwestern Riverside County Multi-Species Reserve (MSR), as managed by the Metropolitan Water District and Riverside County Parks. We surveyed conserved portions of the San Jacinto River-Bautista Creek Core Area (Proposed Core 5) from the bridge at Gilman Springs Road south to the San Bernardino National Forest boundary; these lands are managed by Riverside County Flood Control, Eastern Municipal Water District, and Riverside County Parks. The Potrero Valley Core Area consists of portions of the Potrero Unit of the San Jacinto Wildlife Area (Potrero) managed by the California Department of Fish and Game.

**Table 1.** Area (ha) of modeled habitat and number of grids surveyed in each Core Area.

	Lake Perris- SJWA	Badlands	Anza Valley	Lake Skinner- Domenigoni	San Jacinto River-Bautista Creek	Potrero
Available Habitat <sup>1</sup>	2025.25	802.58	676.53	869.23	210.55	1241.15
Accessible Habitat <sup>2</sup>	1605.72	478.65	468.15	644.45	207.08	304.16
Percent surveyed <sup>3</sup>	79.3	59.6	69.2	74.1	98.4	24.5
Grids	40	24	23	32	20	29
Grids per ha	40	20	20	20	10.5	10.5

<sup>1</sup> From model based on soil and vegetation characteristics.

<sup>2</sup> Represents inference area from which grids will be randomly distributed.

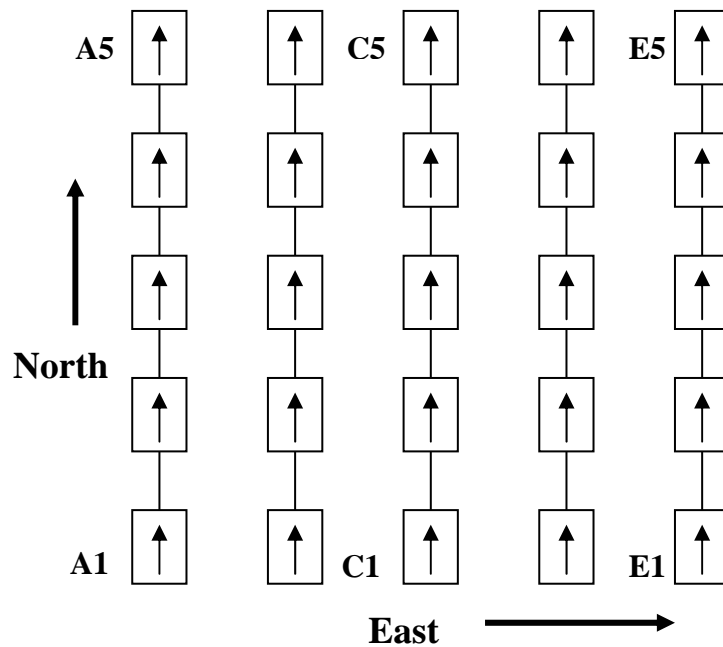
<sup>3</sup> Percent of modeled habitat that is accessible and can be surveyed.

We surveyed each grid over a single 4- or 5-night effort (Monday to Thursday, or Monday to Friday depending on the status of California State mandated furloughs). As a result, we conducted a total of four 2-effort trapping sessions from May to August in 2010, with 16 to 29 grids sampled per effort. We controlled for sampling bias by semi-randomizing the order that grids were checked each night (time bias) and alternating field-crew grid assignments (observer bias) (MacKenzie and Royle 2005). We scheduled sampling efforts to coincide with new-moon cycles in order to control for the effect that lunar brightness can have on small-mammal activity (Daly et al. 1992).

## Field Methods

### Mammal Trapping

We used 12" x 3" x 3.5" Sherman live traps baited with 1 tablespoon of sterilized large white Proso millet and modified with paper clips to restrict trap doors from potentially damaging animal tails. In general, trap lines were aligned north to south and east to west. Individual trap stations were marked with pin flags labeled with an alphanumeric code (Figure 2). North-south trap lines were identified by an alpha prefix that increases eastward from A to E, and east-west trap lines were distinguished by a numeric suffix that increases northward from 1 to 5 (i.e., A1 to E5). We placed a single trap  $\leq 1$  m from each trap station ( $n = 25$  per grid), and marked their position with an alpha-numerically-labeled pin flag (i.e., A1 to E5). We also marked the southwest corner of each grid with a wooden stake labeled with grid ID and flagged with reflective tape.



**Figure 2.** Grid design (5x5) for trapping small mammals. Boxes represent individual traps and small arrows indicate direction that open doors face. Traps are labeled alphabetically and increasing to the east, numerically and increasing to the north.

We checked traps twice each night in accordance with U.S. Fish and Wildlife Service Section 10(a)(1)(B) permit specifications, because targeted habitat may be occupied by the federally endangered Stephens' kangaroo rat (*Dipodomys stephensi*). At the midpoint of each night we checked all traps and subsequently reset traps with fresh bait added as needed. The second check began 1 hr before dawn, after which we closed traps and removed excess millet to avoid attracting ants which pose a threat to captured animals. We reopened traps 1 to 3 hrs before sunset the following evening and completely removed grids on the final night of each effort by collecting traps, excess bait, and pin flags at the conclusion of the dawn check.

Before checking each grid we recorded moon phase (quarter, half, three-quarter, full, no moon), sky code (0 = clear/few clouds, 1 = 50% clouded, 2 = overcast, 3 = fog, 4 = light drizzle), and ground moisture (wet, dry). We also noted the visit number, trap check (midnight, dawn), grid ID, recorder (3-letter initial), and start and end times (24 hr) of each grid check. Two-member teams checked grids, and the status of individual trap stations was recorded on a quality-control form as either occupied, open, closed-empty, robbed, or missing. Status of traps with animals was recorded as the 4-letter species code of the animal captured. After checking the entire grid, crew members examined the quality-control form to ensure that no traps were missed. Before leaving the grid crew members recorded ambient air and soil temperature (C).

We processed captured animals according to standard operating procedures developed by the Biological Monitoring Program for animal handling and data collection

of small mammals (*Small Mammal Trapping Standard operating Procedures v.2, 31 March 2010*; Appendix B). In general, we recorded weight (g; 100-g Pesola spring scale), ear length (mm; tip to notch), hind foot length (mm; *Chaetodipus* species only), sex, age class (adult, juvenile), reproductive condition (non-reproductive, scrotal, pregnant, lactating, perforate, plugged), capture history (new, recapture), and trap location of each initial capture of a Covered Species per survey effort. We marked the ventral surface of all Covered Species (RediSharp non-toxic permanent marker) with a color unique to individual trapping efforts to indicate the repeated capture of an animal. For recaptured animals, we only recorded species, trap location, and capture history. For non-covered species (e.g., *Peromyscus maniculatus*), we just recorded presence and trap location; we did not mark the ventral surface of non-covered species. Processing times ranged between 30 s and 3 min, depending on the species and capture history.

### Vegetation and Soil

We revisited each grid within 45 days of trapping to record habitat characteristics following a modified version of the Biological Monitoring Program pilot protocol for monitoring vegetation community and wildlife habitat condition. In general, we collected point-intercept data along a single 40-m transect that spanned the distance between the southwest and northeast corners of each grid (i.e., 45° bearing from A1). We collected point intercept data every meter starting at 1 m and recorded hits within 14 height classes (Table 2). We recorded multiple hits within the first 2 height classes and the tallest hit at each point along the transect. We focused our effort on the first 2 height classes to decrease the time commitment per transect and because we assume Los Angeles pocket mouse are more influenced by vegetation close to soil.

**Table 2.** Summary of height ranges assigned to height classes.

Height class	Height range (m)	Height class	Height range (m)
1	< 0.1	8	0.7 – 0.8
2	0.1 - 0.2	9	0.8 – 0.9
3	0.2 - 0.3	10	0.9 – 1.0
4	0.3 - 0.4	11	1.0 – 1.5
5	0.4 - 0.5	12	1.5 – 2.0
6	0.5 - 0.6	13	2.0 – 3.0
7	0.6 – 0.7	14	> 3.0

For all unique hits on the point-intercept pole, we assigned non-woody species to functional groups (native or non-native grass or forb); identified woody shrubs, trees, and cacti to species; and assigned branches of woody species that died because of fire, to the group “burned-standing dead”. We also identified the ground layer at the base of the intercept pole at each meter as bare soil, rock, basal stem, litter (i.e., dead or detached organic matter), or thatch. Rock is defined as anything that would inhibit the germination of a seedling, for example, a rock embedded in the ground or >7.5 cm. We used a modified version of Ledebor’s (1967) definition to differentiate thatch as a tightly

intermingled layer of living and dead stems, leaves, and roots (> 0.5 cm in depth and occurring between the soil surface and the near-vertical vegetation above). We recorded thatch and litter depth that was > 0.5 cm.

We compared habitat characteristic variables for differences among the 6 study areas using a non-parametric ANOVA, Kruskal Wallis test (kruskal test;  $p = 0.05$ ) using package 'coin' in Program R v. 2.12.1 (R Development Core Team). If there were differences among habitat variables in the 6 study areas we performed a post hoc permutation test ( $p = 0.05$ ) using package 'coin' in Program R v. 2.12.1 (R Development Core Team) to determine where those differences lie.

We collected soil at grids where Los Angeles pocket mouse were caught. One soil core was collected at the center trap station (i.e., C3) of each grid using a 2-in bucket auger drilled to a depth of 1 m. Alternatively, we collected soil at the southwest grid corner (i.e., trap station A1) if substrate (e.g., excessive rock) at the center station impeded us from drilling to 1 m. We attached a sand-bucket extension to collect loose soils that would otherwise pass through a normal auger. Soil cores were transferred to cloth bags and allowed to dry for a minimum of 1 week before analysis.

We sifted dried cores from each grid through 6 Hubbard soil sieves (#5, #10, #35, #60, #120, #230) for 10 min, or until samples were completely segregated. We weighed the contents in each sieve using a digital hand-held scale (Salter Brecknell Weighing Products, Fairmont, MN), and determined the percent composition of gravel, sand, silt, and clay in each sample according to the relative weight of each sieve (gravel: sieve #5; sand: sieve #10 and #35; silt: sieve #60 and #120; clay: sieve #230 and bottom pan). Samples were classified according to a standard US Department of Agriculture soil-texture triangle (USGS 2006).

### **Data Analysis**

We estimated grid occupancy ( $\Psi$ ) and nightly detection probability ( $p$ ) at the Lake Perris-SJWA, Anza Valley, and San Jacinto River-Bautista Creek Core Areas, where Los Angeles pocket mouse were present, using a closed-capture occupancy model that derived estimates based on grid-level presence/absence data (MacKenzie et al. 2002). The output from these models was a percent estimate of occupied grids that accounted for animals present but undetected. Accuracy and precision of grid occupancy was generally a function of the number of sampling occasions and grids trapped (and to some extent nightly detection probability) rather than the absolute number of animals detected, thus allowing us to design surveys that would maximize the reliability of estimates given the availability of resources and project timeframes (MacKenzie and Royle 2005, MacKenzie et al. 2006).

Occupancy estimates based on the method described above relied on 4 critical assumptions: occupancy status of sites did not change over the survey period; probability of occupancy was constant among sites, or differences were modeled; probability of detections was constant among sites, or differences were modeled; and capture histories were independent among trap locations (MacKenzie et al. 2006). We kept the survey period short (4 or 5 trap nights per grid) to maximize the probability of population closure during the sampling period. We also used Program MARK to construct separate

sets of candidate models that accounted for differences in grid occupancy and nightly detection probability across survey periods (White and Burnham 1999). We maintained independence among grid locations by spacing them at a minimum of 80-m intervals. We constructed 2 candidate models that examined the effect of trap night on nightly detection probability while assuming grid occupancy to be constant across occasions. We ranked candidate models in each set according to differences in Akaike's Information Criterion for small samples ( $\Delta AIC_c$ ), and calculated an Akaike weight ( $w_i$ ) for each. We then derived weighted-average estimates across the entire candidate set unless there was clear support (e.g.,  $w_i > 0.9$ ) for a single model (Burnham and Anderson 2002). Finally, we calculated the acreage of occupied suitable habitat at the Lake Perris-SJWA, Anza Valley and San Jacinto River-Bautista Creek Core Areas by extrapolating occupied-grid estimates to the area of modeled moderate- to high-suitability habitat in this Core Area.

We attempted to refine our understanding of Los Angeles pocket mouse habitat by using the R statistical package v. 2.12.1 (R Development Core Team 2007) to create generalized linear models (GLMs) of Los Angeles pocket mouse presence based on a binomial error structure. We included 7 explanatory variables in the global model: percent grass, percent forb, percent bare ground, percent thatch, percent litter, average litter depth, and average thatch depth. We included type of ground cover (i.e., bare ground, litter, thatch), litter depth and thatch depth as close relatives of Los Angeles pocket mouse are limited to areas with sparse ground vegetation (Dudek & Associates 2003). We combined native and non-native grasses into a single grass covariate, as there were not enough native grass data to be analyzed alone. Similarly, we combined native, non-native and unidentified forbs into a single forb covariate. Percent cover for bare ground, thatch, litter, and percent grass and forb were arcsine transformed for normality before being included in the analysis.

We applied the above described global model to Los Angeles pocket mouse presence/absence data, and examined model fit against a null model (i.e., containing no variables) with a Pearson chi-square goodness-of-fit test. We also calculated a variance-inflation factor ( $\hat{c}$ ) for the global model, and considered overdispersion to be present if  $\hat{c}$  greatly exceeded 1 (e.g.,  $\hat{c} > 2$ ) (Burnham and Anderson 2002). We then examined Los Angeles pocket mouse presence/absence by considering candidate model sets ( $n = 127$ ) that included all combinations of the 7 explanatory variables. We ranked each model according to Akaike's Information Criterion (AIC), and calculated AIC weights ( $w_i$ ) across the entire candidate set. We then calculated weighted-average estimates ( $\hat{\beta}$ ) of modeled parameters (i.e., explanatory variables) across the entire candidate set and considered the summed weights from all models that included individual variables (Burnham and Anderson 2002).

## RESULTS

### Occupied Habitat

We captured Los Angeles pocket mouse on 29 grids at 3 of the 6 Core Areas surveyed (SJWA – Lake Perris State Park:  $n = 5$ , Anza Valley:  $n = 7$ , San Jacinto River – Bautista Creek:  $n = 17$ ; Figure 3). We also captured other covered mammal species which included San Diego pocket mouse (*Chaetodipus fallax fallax*), Dulzura kangaroo rat

(*Dipodomys simulans*), Stephens' kangaroo rat, San Diego desert woodrat (*Neotoma lepida intermedia*), and San Bernardino kangaroo rat (*Dipodomys merriami parvus*) (Appendix C). Non-covered animals caught included California pocket mouse (*Chaetodipus californicus*), dusky footed woodrat (*Neotoma fuscipes*), cactus mouse (*Peromyscus eremicus*), brush mouse (*Peromyscus boylii*), western harvest mouse (*Reithrodontomys megalotis*), Botta's pocket gopher (*Thomomys bottae*), California vole (*Microtus californicus*), house mouse (*Mus musculus*), deer mouse (*Peromyscus maniculatus*), desert cottontail (*Sylvilagus audubonii*), western fence lizard (*Sceloporus occidentalis*), southern pacific rattlesnake (*Crotalus oreganus helleri*), western skink (*Eumeces skiltonianus*), northern red diamond rattlesnake (*Crotalus ruber*), and unidentified whiptail lizard (*Cnemidophorus* spp.).

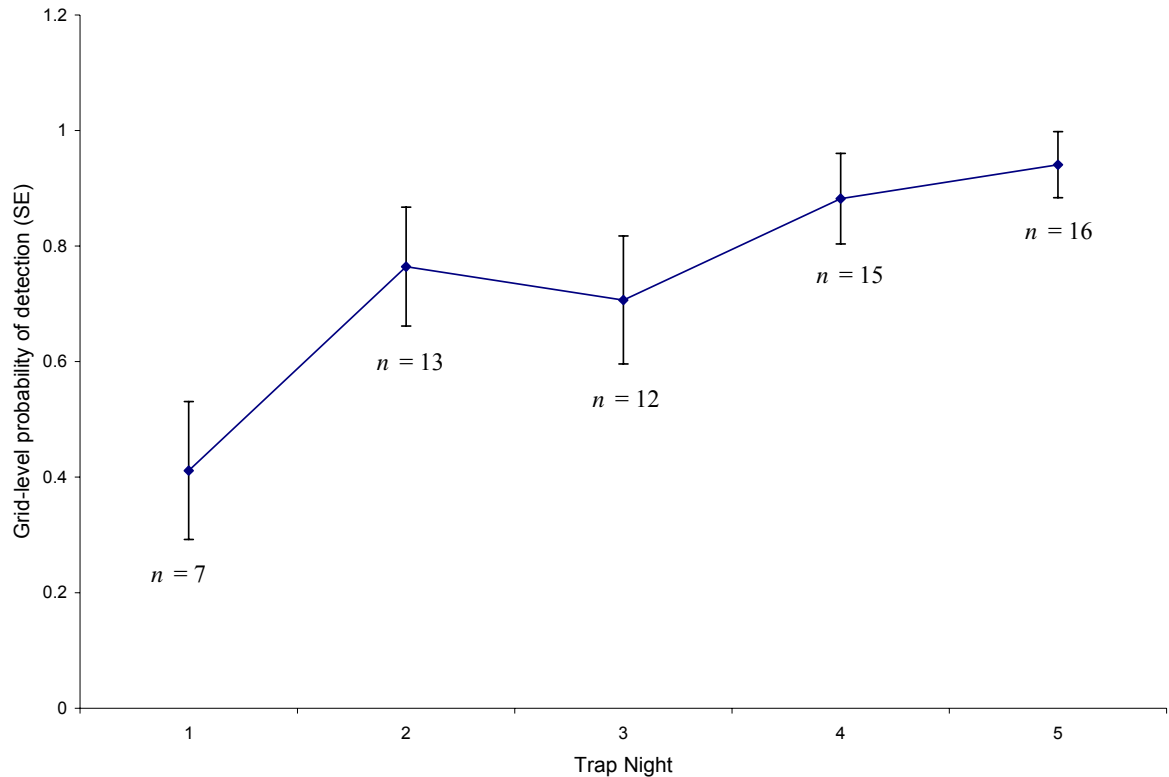
We captured Los Angeles pocket mouse on 5 grids sampled at the SJWA – Lake Perris State Park (12.5%; Figure 3). We considered a single model ( $w_i = 0.93$ ) that estimated grid-level probability of detection ( $p = 0.52$ ; SE = 0.13) and grid occupancy ( $\Psi = 0.13$ ; SE = 0.06) as constant across trap nights. The cumulative detection probability was  $P_c = 0.95$ . The extrapolated area of occupied moderate- to high-suitability habitat from our model-based estimates of grid occupancy at SJWA – Lake Perris State Park was 214.5 ha.

We captured Los Angeles pocket mouse on 7 grids sampled at Anza Valley (30%; Figure 3). We considered a single model ( $w_i = 0.95$ ) that estimated grid-level probability of detection ( $p = 0.35$ ; SE = 0.11) and grid occupancy ( $\Psi = 0.37$ ; SE = 0.13) as constant across trap nights. The cumulative detection probability was moderately high ( $P_c = 0.83$ ) across trap nights. The extrapolated area of occupied moderate- to high-suitability habitat from our model-based estimates of grid occupancy at Anza Valley was 172.6 ha. Following the 2010 survey season we discovered that 8 grids at Anza Valley were actually outside of the existing Conservation Area. These grids were located on lands adjacent to conserved parcels that we mistakenly included in the habitat model and have subsequently been removed from our study.

We captured Los Angeles pocket mouse on 17 grids sampled at San Jacinto River-Bautista Creek (85%; Figure 3). One grid in this Core Area was closed to trapping on night 5 due to excessive ants, which pose a threat to trapped animals. We had 2 models that appropriately modeled parameters but we selected a single model ( $w_i = 0.66$ ) that estimated  $p$  as varying across trap night. The grid-level probability of detection generally increased from 0.41 (SE = 0.12) on the first trap night to 0.94 (SE = 0.06) on the last night with  $P_c = 0.999$  (Figure 4). The extrapolated area of occupied moderate- to high-suitability habitat, from our model-based estimates of grid occupancy at San Jacinto River-Bautista Creek, was 176.1 ha.

We captured San Bernardino kangaroo rat, a Covered Species, on 12 grids at San Jacinto River-Bautista Creek (60%). We considered a single model ( $w_i = 0.88$ ) that estimated  $p$  as varying across trap night. The grid-level probability of detection increased from 0.25 (SE = 0.12) on the first trap night to 0.92 (SE = 0.08) on the last night, with  $P_c = 0.999$  (Figure 5).





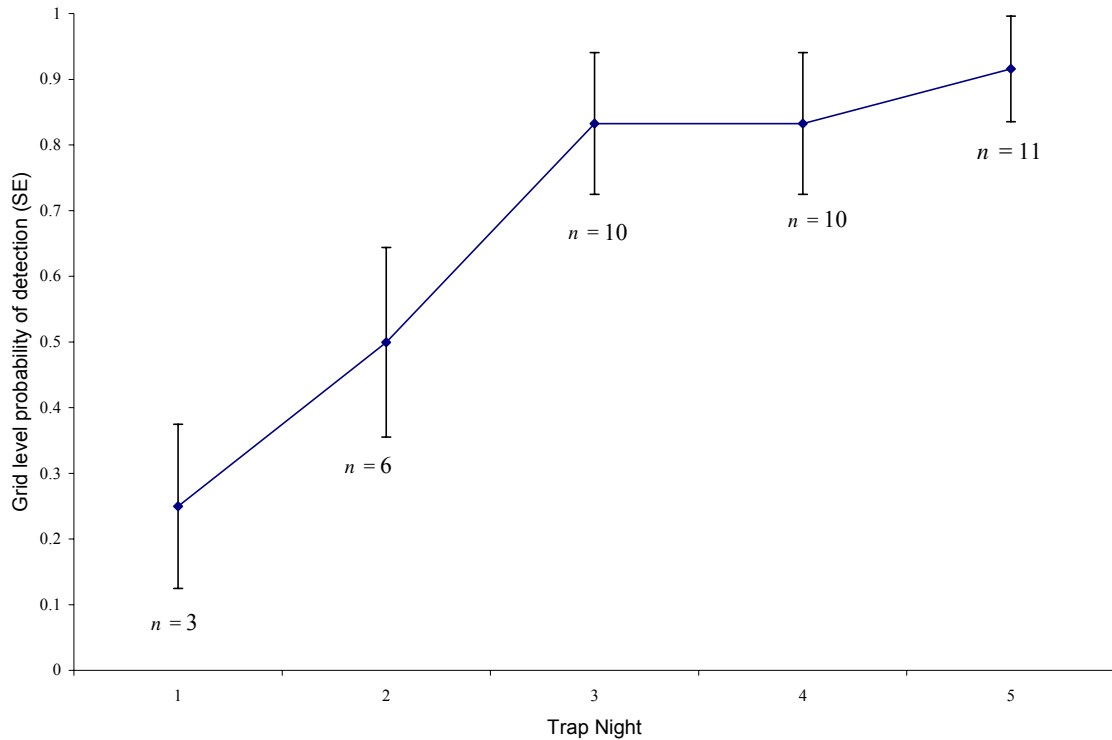
**Figure 4.** Sample detection probability for Los Angeles pocket mouse. Nightly grid-level detection probability based on a single occupancy model, and number of grids out of 20 where Los Angeles pocket mouse were captured ( $n$ ) during one 5-night effort at San Jacinto River-Bautista Creek. Values are estimates  $\pm$  standard error.

### Vegetation and Soil

On grids where Los Angeles pocket mouse were present the herbaceous layer was dominated by non-native grasses (mean = 18.62, SE = 2.05), native forbs (mean = 15.43, SE = 1.68) and non-native forbs (mean = 4.22, SE = 0.76); native grasses accounted for far less cover and did not contribute much to the overall composition of the layer. The ground layer was composed mainly of bare ground (mean = 59.83, SE = 2.73) and litter (mean = 33.28, SE = 2.19), thatch cover accounted for substantially less cover (mean = 6.55, SE = 1.02). We recorded a total of 11 shrub species with a mean percent cover of 8.71 (SE = 2.26). The dominant shrub species were *Lepidospartum squamatum*, *Eriogonum wrightii*, *Salix exigua*, *Adenostoma sparsifolium*, and *Eriogonum fasciculatum*.

On grids where Los Angeles pocket mouse were not present the herbaceous layer was dominated by non-native grasses (mean = 53.22, SE = 2.24), native forbs (mean = 19.95, SE = 1.61) and non-native forbs (mean = 14.06, SE = 1.27); native grasses accounted for far less cover and did not contribute much to the overall composition of the layer. The ground layer was composed of litter (mean = 50.49, SE = 2.20) and thatch (mean = 32.27, SE = 2.61) and bare ground (mean = 15.72, SE = 1.61). We recorded a

total of 37 shrub species with a mean percent cover of 12.54 (SE = 1.56). The dominant shrub species at grids where Los Angeles pocket mouse were present were *Eriogonum fasciculatum*, *Corethrogyne filaginifolia*, *Adenostoma fasciculatum*, *Eriogonum wrightii*, and *Lotus scoparius*. Soil samples were not collected at these sites.



**Figure 5.** Sample detection probability for San Bernardino kangaroo rat. Nightly grid-level detection probability based on a single occupancy model, and number of grids out of 20 where San Bernardino kangaroo rat were captured ( $n$ ) during one 5-night effort at San Jacinto River-Bautista Creek. Values are estimates  $\pm$  standard error.

The most common soil type at grids where Los Angeles pocket mouse were present was sandy loam [number of grids ( $n$ ) = 21], followed by loamy sand ( $n$  = 3), loam ( $n$  = 2), sand ( $n$  = 2), and silt loam ( $n$  = 1). We did not include soil variables when developing habitat models as soil data were not collected at grids where Los Angeles pocket mouse were not present. Shrub variables were too numerous to include in habitat models; adding them would have caused over-parameterization of the models.

We compared habitat characteristics between grids with Los Angeles pocket mouse present and those with Los Angeles pocket mouse not present and found all varied significantly (Table 3). In general, grids with Los Angeles pocket mouse present had more bare ground ( $p < 0.001$ ) and less of all other habitat variables than grids where Los Angeles pocket mouse were not present (Table 3).

**Table 3.** Averages of ground layer variables measured at 168 Los Angeles pocket mouse grids from May - August 2010. Standard error is in parentheses.

<u>Ground Cover (%)</u>	LAPM present ( <i>n</i> = 29)	LAPM not present ( <i>n</i> = 139)	<i>p</i> -value
Bare ground	0.60 (0.06)	0.16 (0.02)	< 0.001
Litter	0.33 (0.05)	0.50 (0.02)	0.002
Thatch	0.07 (0.02)	0.32 (0.03)	< 0.001
Grass	0.19 (0.05)	0.53 (0.02)	< 0.001
Forb	0.18 (0.04)	0.31 (0.02)	0.002
<u>Average Depth (m)</u>			
Thatch	0.32 (0.10)	2.36 (0.24)	< 0.001
Litter	0.61 (0.12)	1.24 (0.08)	< 0.001

Our 3 best-supported habitat models (bare ground + percent thatch + thatch depth + percent grass; bare ground + percent litter + percent thatch + thatch depth + percent grass; bare ground + percent thatch + thatch depth) contained 25% of the Akaike weight with no other model accounting for > 5% (Table 4). Models that estimated grid occupancy with a bare ground effect accounted for 100% of weight in the candidate set, and suggest that bare ground played a significant role in driving Los Angeles pocket mouse distribution. However, elucidating the role bare ground ( $\Sigma w_i = 0.97$ ; SE = 5.71) played in Los Angeles pocket mouse distribution is difficult because of large estimated standard error for this variable. Similarly, the effect all other habitat variables had on grid occupancy was less clear because of large estimated standard errors: percent thatch cover ( $\Sigma w_i = 0.75$ ; SE = 4.98), average thatch depth ( $\Sigma w_i = 0.69$ ; SE = 1.50), percent grass ( $\Sigma w_i = 0.56$ ; SE = 1.79), percent litter ( $\Sigma w_i = 0.45$ ; SE = 3.00), average litter depth ( $\Sigma w_i = 0.28$ ; SE = 0.27), and percent forb ( $\Sigma w_i = 0.28$ ; SE = 0.34).

**Table 4.** Results of select habitat models using ground cover variables. Akaike Information Criterion for small samples (AICc), difference in AICc ( $\Delta AIC_c$ ), Akaike weights ( $w_i$ ), and estimated parameters (*K*) of the top 10 habitat models from a candidate set of 127 that examined effects of percent ground cover, percent bare ground, percent thatch cover, average thatch depth, average litter depth, grass, and forbs on Los Angeles pocket mouse distribution.

<u>Model</u>	<u>AICc</u>	<u><math>\Delta AIC_c</math></u>	<u><math>w_i</math></u>	<u><i>K</i></u>
Bare ground + thatch + thatch depth + grass	103.297	0.000	0.1148	5
Bare ground + litter + thatch + thatch depth + grass	104.306	1.010	0.0693	6
Bare ground + thatch + thatch depth	104.317	1.020	0.0689	4
Bare ground + thatch + thatch depth + grass + forb	105.146	1.849	0.0455	6
Bare ground + litter + thatch + grass	105.262	1.965	0.0430	5
Bare ground + thatch + litter depth + thatch depth + grass	105.291	1.994	0.0424	6
Bare ground + litter + thatch + thatch depth	105.654	2.357	0.0353	5
Bare ground + litter + thatch	106.072	2.775	0.0287	4
Bare ground + litter + thatch + litter depth + thatch depth + grass	106.187	2.890	0.0271	7
Bare ground	106.221	2.924	0.0266	2

## DISCUSSION

After creating a model of suitable habitat based on vegetation and soil characteristics presumed to be appropriate for this species, we trapped 3708 ha and

estimated that Los Angeles pocket mouse occupied approximately 563 ha (15%). Currently there are approximately 5825 ha of suitable Los Angeles pocket mouse habitat in conservation according to our model, which exceeds the 5665 ha (12,000 acre) goal stated in Objective 1 of the species account (Dudek & Associates 2003).

Data gathered to examine the relationship between Los Angeles pocket mouse presence and measurable habitat variables that may influence detectability of this species showed all variables had clear support in the GLM models. Bare ground dominated grids where Los Angeles pocket mouse were present while litter and thatch cover dominated grids where Los Angeles pocket mouse were not present. Similarly thatch and litter depth were deeper at grids where Los Angeles pocket mouse were not present. These observations of vegetation cover support assertions that Los Angeles pocket mouse select sparsely vegetated habitats.

San Jacinto River had the highest grid-level probability of detection of all the sites where Los Angeles pocket mouse were caught. High detection probability at this site is most likely due to it having the most bare ground of any occupied sites. Conversely, sites with low detection probability had more thatch/litter cover. The dominant soil type at occupied grids was sandy loam which is one of the known soil types that influences the distribution of the Pacific pocket mouse (Germano 1997, Bornyasz 2003). While this was the dominant soil type for all occupied grids, San Jacinto River grids were probably the most influenced by flood events and thus the deposition of new soil.

### **Recommendations for Future Surveys**

We will use data collected in 2010 as the baseline for Los Angeles pocket mouse distribution across the Plan Area and within Core Areas. Future efforts will concentrate on monitoring Los Angeles pocket mouse distribution within occupied Core Areas and comparing the relative abundance across years to assess whether Los Angeles pocket mouse populations are decreasing, stable, or increasing. The relatively high cumulative detection probabilities across occupied Core Areas (83%, 95%, and 99%) gives us good confidence that we are detecting Los Angeles pocket mouse when it is present with the current study design.

In an effort to refine our habitat suitability model, soil should be collected from all trapping grids and entered into the habitat GLM model. Even with the information obtained from model estimates, some questions remain concerning the roles that shrub cover, ground cover, and herbaceous cover type play in influencing the distribution of Los Angeles pocket mouse on the landscape. Baseline data from the 2010 trapping season will be used in conjunction with data from future trapping efforts to determine, more specifically, the roles of these habitat variables. Understanding the relationship between habitat features and the current distribution of Los Angeles pocket mouse within the Plan Area is a necessary step towards making better management plans. We hope to be able to better understand and quantify that relationship through further trapping efforts.

We should incorporate variable trapping patch size into future sampling designs with the goal of identifying the minimum area of suitable habitat required for presence of Los Angeles pocket mouse. Grids could be selectively installed within patches too small (e.g., < 0.4 ha, or < 30 m wide) for random placement. Selective placement of grids will

allow for trapping at locations with small size and where Los Angeles pocket mouse were caught during trapping efforts for other species (Temecula Creek Core Area). Care should be taken to determine accessibility (e.g., distance from roads, slope, etc.) before surveys are conducted because it may be impractical to conduct night surveys in remote areas of dense (e.g., > 60% cover) Riversidean alluvial fan scrub, coastal sage scrub, and chaparral, and > 5% cover for riparian scrub. Inferences should be made to only those areas that can be sampled. Additionally, care should be taken when using the soil and vegetation maps used for the 2010 trapping season as some mapped habitat features were incongruent with true conditions in the field. Scouting potential trapping sites prior to setting up trapping grids may ensure dense thatch or litter is avoided and cut down on unnecessarily trapping areas unlikely to be occupied.

We should consider additional trapping sites (e.g., Jurupa Hills, Santa Ana River) within the Plan Area where Los Angeles pocket mouse have not been documented or monitored but the soils are appropriate. This may be undertaken in a timely manner if portions of Core Areas that have been extensively trapped for Stephens' kangaroo rat and Los Angeles pocket mouse (e.g., Potrero) where Los Angeles pocket mouse were not captured are not trapped again.

Though previously considered detrimental to capture success of small mammals, a recent study has shown bright moonlight may not affect the foraging and anti-predator behavior in small mammals (Prugh and Brashares 2010). Trapping conducted in the future may not need to be so strict in following the moon cycle.

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## APPENDIX A. Soil and Vegetation Attributes Used For Delineating Los Angeles Pocket Mouse Habitat in MSHCP Core Areas.

Soil (Table 1) and vegetation (Table 2) attributes described below represent feature classes included in GIS-based map layers clipped to the Western Riverside County MSCHP Plan Area boundary (CDFG 2006, Soil Survey Staff et al. 2006). Represented soil and vegetation also reflect habitat characteristics believed to support the occurrence of Los Angeles pocket mouse (*Perognathus longimembris brevinasus*). We used Arc GIS v. 9.3 (ESRI 2006) to select the described features, and merged layers to create a single Plan-area wide habitat model for Los Angeles pocket mouse. We then clipped the habitat model to MSHCP Core Areas for Los Angeles pocket mouse, and defined an area of inference based on modeled habitat that accounted for inaccessible slopes (e.g., > 24 degrees), road disturbance, and distance from roads. Grid centers were randomly distributed across the defined area of inference.

**Table 1.** Soil attributes included in suitable-habitat model for Los Angeles pocket mouse in western Riverside County. Area represents total mapped soils in Plan Area, not area included in final habitat model.

Series	Soil Classification	Symbol	Area (ha)
Anza	fine sandy loam	AcC	116.07
	loam	AdA	222.79
		AdC	205.59
Arbuckle	loam	AkC	532.97
		AkD	142.38
	gravelly loam	AIE	118.20
		AIE3	171.48
		AIC	1501.74
		AID	410.48
Arlington and Greenfield	fine sandy loams	AtF3	213.20
		AtC2	791.82
		AtD2	1833.45
Arlington	fine sandy loam	AnC	426.06
		AnD	201.83
		AoA	321.59
		AoC	2264.20
		AoD	209.97
		loam	ApB
	loam	ArB	646.36
		ArD	369.59
Blasingame	loam	116	626.42
Bonsall	fine sandy loam	BdC	364.45
		BdD	134.30
Botella	loam	131	5.63
Buchenau	loam	BhC	328.56

**Table 1.** Soil attributes continued.

<b>Series</b>	<b>Soil Classification</b>	<b>Symbol</b>	<b>Area (ha)</b>
Bull Trail	sandy loam	BsC2	1008.02
		BsD2	935.16
		BsE3	825.03
Buren	fine sandy loam	BuC2	1645.33
		BuD2	353.54
	loam	BvD3	55.51
		BxC2	360.82
Cajalco	fine sandy loam	CaF2	956.36
		CaC2	1121.57
		CaD2	2733.84
Calpine	loam	CdC2	185.60
	sandy loam	CcC2	1706.13
		CcD2	387.71
Capistrano	sandy loam	135	407.70
		136	10.75
Cieneba	sandy loam	ChF2	3388.15
		142	2671.51
		ChC	686.34
		ChD2	1992.13
Corralitos	loamy sand	146	16.40
		147	7.74
Cortina	gravelly coarse sandy loam	CnC	566.17
	gravelly loamy sand	CiC	187.52
	gravelly sandy loam	CpA	275.03
	sandy loam	CoA	130.70
Crafton	fine sandy loam	CtF2	156.53
Crouch	loamy sand	CvD2	418.07
	sandy loam	CwE2	575.29
		CwD2	854.40
Delhi	fine sand	DaD2	1491.65
Dello	loamy fine sand	DoA	320.34
		DrA	706.68
		DpB	248.29
	loamy sand	DgB	242.01
		DnB	245.88
	loamy sand	DmA	915.84

**Table 1.** Soil attributes continued.

<b>Series</b>	<b>Soil Classification</b>	<b>Symbol</b>	<b>Area (ha)</b>
Domino	fine sandy loam	Ds2	115.43
		Dt	650.84
Escondido	fine sandy loam	EcE2	403.80
		EcC2	749.95
		EcD2	1575.90
	very fine sandy loam	151	237.98
		150	85.41
Exeter	sandy loam	EnA	1472.69
		EnC2	860.49
		EpA	1298.94
		EpC2	479.86
		EoB	267.31
	very fine sandy loam	EwB	200.30
		EyB	213.39
Fallbrook	fine sandy loam	FfC2	1665.24
		FkD2	1633.91
	sandy loam	FaE2	506.37
		FaD2	2745.56
		FbF2	817.07
		FbC2	468.03
Friant	fine sandy loam	153	8357.81
		FwE2	1093.00
Garreston	gravelly very fine sandy loam	GdA	123.48
		GdC	3121.86
		155	114.47
		GdD2	122.99
	very fine sandy loam	GaA	180.85
		GaC	827.49
		GaD2	68.25
Gaviota	very fine sandy loam	GfF2	177.53
Gorgonio	gravelly loamy fine sand loamy sand	GmD	3328.64
		GhC	1382.33
		GhD	492.17
		GlC	1123.86
Greenfield	sandy loam	GyA	3621.48
		GyE2	325.35
		GyC2	9384.30
		GtC	0.66
		GyD2	1541.27

**Table 1.** Soil attributes continued.

<b>Series</b>	<b>Soil Classification</b>	<b>Symbol</b>	<b>Area (ha)</b>
Grangeville	fine sandy loam	Gr	21.54
		GtA	1552.34
		GtD	48.72
	fine sandy loam	GwA	293.76
		GxA	355.03
		GuB	960.41
		Gs	12.98
		GvB	1242.18
		GoB	1324.28
	sandy loam	GpB	251.34
		GrB	296.56
		GsB	347.81
Hanford	coarse sandy loam	HcA	1196.87
		HcC	15930.08
		HcD2	4063.83
		HeC2	176.69
	fine sandy loam	HgA	1785.80
		HaC	363.19
		HfD	405.32
	sandy loam	156	762.02
Hilmar	loamy fine sand	Hr	75.21
		HhA2	638.40
	loamy sand	HIA	619.98
		HIC	111.74
Honcut	loam	HuC2	408.19
		HnC	582.22
	sandy loam	HnD2	156.59
Las Posas	gravelly loam	159	368.28
		LaC	1338.34
	loam	LaC2	154.90
		LaD2	1346.97
		LaE3	272.60
Laughlin	gravelly loam	160	55.32
Lodo	gravelly loam	LoF2	1006.93
Madera	fine sandy loam	MaA	345.85
		MaB2	454.15
		MaD2	158.58
		MbC2	454.09
Modjeska	gravelly loam	169	35.69
		170	26.26

**Table 1.** Soil attributes continued.

<b>Series</b>	<b>Soil Classification</b>	<b>Symbol</b>	<b>Area (ha)</b>
Metz	gravelly sandy loam	MID	546.00
	loamy fine sand	MfA	311.49
		MgB	741.62
	fine sand	MhB	394.48
	loamy sand	163	1.15
		MdC	239.26
		MeD	662.71
Monserate	sandy loam	MmB	4531.51
		MmE3	355.18
		MmC2	2773.84
		MmD2	1566.78
		MnE3	625.73
		MnD2	1114.38
Mottsville	loamy sand	MoC	1848.49
		MoD	1390.11
	sandy loam	MsC	1896.65
		MsD	1210.49
Myford	sandy loam	175	5.41
Oak Glen	fine sandy loam	OkD	330.59
	gravelly sandy loam	OgE	334.95
		OgD	490.18
Pachappa	fine sandy loam	PaA	1374.43
		PaC2	1064.41
Perkins	gravelly loam	PgB	267.66
		PgC	178.62
		PgD2	172.42
	loam	PeC	352.50
Placentia	fine sandy loam	PIB	1306.51
		PID	1112.93
Ramona and Buren	loams	RnD2	193.47
		RnE3	1306.68
	sandy loams	RmE3	1918.47
Riverwash	Riverwash	191	233.70
		RsC	3679.27
San Timoteo	loam	SmF2	1296.00
		SmE2	1549.82
Saugus	sandy loam	ShF	270.12

**Table 1.** Soil attributes continued.

<b>Series</b>	<b>Soil Classification</b>	<b>Symbol</b>	<b>Area (ha)</b>	
Ramona	fine sandy loam	186	153.36	
	gravelly fine sandy loam	187	158.24	
	gravelly sandy loam	ReD	13.25	
	sandy loam	RaA	2150.21	
		RaB3	1765.31	
		RaE3	667.93	
		RaB2	5859.91	
		RaC2	1249.64	
		RaC3	520.11	
		RaD2	960.81	
		RaD3	1186.74	
		RdE3	117.96	
		RdD2	267.02	
		very fine sandy loam	ReC2	1282.73
			RfC2	46.43
San Emigdio	fine sandy loam	SeA	3191.89	
		SeC2	2769.60	
		SeD2	892.47	
		SfA	1422.62	
	fine sandy loam	196	3.15	
	gravelly sandy loam	SbC	2.67	
	loam	SgA	1404.62	
		SgC	2048.87	
		SgD2	297.08	
	sandy loam	SdD	306.64	
Sheephead	fine sandy loam	SnD2	371.69	
Soboba	gravelly loamy sand	197	426.40	
Soper	gravelly loam	202	20.94	
		SrF	33.19	
	loam	StF2	92.59	
Temescal	loam	TaF2	191.61	
Tollhouse	sandy loam	ThE2	593.17	
		ToF	0.57	
		ThD2	500.06	
Traver	fine sandy loam	Tt2	1161.84	
	loamy fine sand	Tp2	499.75	
	loamy fine sand	Tr2	1512.58	
Tujunga	gravelly loamy sand	TwC	605.79	
	loamy sand	TuB	378.49	
	loamy sand	TvC	1914.93	

**Table 1.** Soil attributes continued.

<b>Series</b>	<b>Soil Classification</b>	<b>Symbol</b>	<b>Area (ha)</b>
Vallecitos	loam	VaE3	473.59
		VeF2	202.34
		VeC2	318.66
		VeD2	285.51
Visalia	fine sandy loam	VmA	127.67
		VmC	105.76
	sandy loam	VIC2	213.81
		VaB	5.62
		VaC	7.29
		VaD	3.17
Vista	coarse sandy loam	214	47.27
		VsF2	1302.24
		VsC	1413.69
		215	205.67
		VsD2	3814.82
		213	81.98
Waukena	fine sandy loam	We	286.42
	loam	Wd	294.26
	loamy fine sand	Wa	365.46
Wet alluvial land	Wet alluvial land	WeD	297.16
Wyman	fine sandy loam	WxD2	104.09
	loam	WyC2	997.60
		WmC	3.02
Yokohl	loam	YbC	788.95
		YbD2	229.45
		YbE3	130.72
Yorba	gravelly sandy loam	221	62.40
		222	29.03
Ysidora	gravelly very fine sandy loam	YsC2	172.60
		YsE2	393.68
		YsE3	157.58
	very fine sandy loam	YrD2	155.47

**Table 2.** Vegetation attributes included in suitable-habitat model for Los Angeles pocket mouse in western Riverside County, and based on the Western Habitat Relationships classification system unless otherwise noted. Area represents total polygons included in final habitat model.

Code <sup>1</sup>	Name	Density <sup>2</sup>	Area (ha)
ACS	Alkali Desert Scrub	2	0.16
		3	2.83
		4	53.19
		5	2.05
AGS	Annual Grassland	1	21455.70
		2	1314.86
		3	52.56
		4	38.00
		5	1039.98
COV	Cropland and Orchard-Vineyard	0	41.17
		9	47121.48
CRC	Chamise-Red Shank Chaparral	0	0.91
		2	1367.42
		3	534.12
		4	338.04
		5	43.93
CSC	Coastal Scrub	0	9.98
		2	3276.14
		3	4630.61
		4	4917.44
		5	3376.11
DRI, DSW	Desert Riparian, Desert Wash	5	2.56
DSW	Desert Wash	2	41.98
		3	258.57
		4	36.21
		5	7.26
FEW <sup>3</sup>	Fresh Emergent Wetland	0	3.52
		1	293.83
		2	34.66
		3	2.36
		4	1.09
		5	85.88

<sup>1</sup> Mayer KE, Laudenslayer WF. 1988. A guide to wildlife habitats of California. California Department of Forestry, Sacramento, California.

<sup>2</sup> 0 = unknown, 1 = > 60%, 2 = 40 - 60%, 3 = 24 - 40%, 4 = 10 - 25%, 5 = 2 - 10%, 9 = not applicable

<sup>3</sup> *Baccharis salicifolia* and *Arundo donax* associations under CNPS classification system (Sawyer JO, Keeler-Wolf T. 1995. A Manual of California Vegetation. California Native Plant Society, Scaramento, CA.

**Table 2.** Vegetation attributes continued.

<b>Code<sup>1</sup></b>	<b>Name</b>	<b>Density<sup>2</sup></b>	<b>Area (ha)</b>
MCH	Mixed Chaparral	0	7.88
		2	2665.15
		3	797.78
		4	586.28
		5	293.23
MRI	Montane Riparian	5	0.82
RIV, LAC	Riverine, Lacustrine	0	0.81
		4	0.64
		9	400.67
SGB	Sagebrush Scrub	2	402.95
		3	472.52
		4	567.64
		5	156.90
URB <sup>3</sup>	Urban	2	0.83
		3	2.51
		4	0.74
		5	2.39
		9	75.41
VRI	Valley Foothill Riparian	5	390.99
WTM <sup>4</sup>	Wet Meadow	1	212.72
		2	32.12
		4	53.99
		5	31.50

<sup>1</sup> Mayer KE, Laudenslayer WF. 1988. A guide to wildlife habitats of California. California Department of Forestry, Sacramento, California.

<sup>2</sup> 0 = unknown, 1 = > 60%, 2 = 40 - 60%, 3 = 24 - 40%, 4 = 10 - 25%, 5 = 2 - 10%, 9 = not applicable.

<sup>3</sup> Includes conserved lands where development had been removed. Existing development at time of survey, as determined by aerial imagery, was excluded from model.

<sup>4</sup> Mountain meadows and alkaline ephemeral wetland associations under CNPS classification system.

## **APPENDIX B. Small Mammal Trapping Standard Operating Procedures V.2**

These are standard procedures developed by the Western Riverside County MSHCP Biological Monitoring Program for trapping small mammals. Individual projects may have specific procedures and requirements that vary from those described here. Variations from these standard procedures will be described in the Methods section of individual project protocols.

All of the procedures described below require training and experience. It is your responsibility to alert the Mammal Program Lead or other lead staff if you are not comfortable with the training you have received. Alert the Mammal Program Lead or other lead staff if you are scheduled for an activity that you do not feel qualified to conduct.

### **I. Site Selection**

Site selection criteria is project specific, but generally involve the use of Geographic Information Systems (GIS) software to stratify Core Areas by suitable habitat based on vegetation, soil, and slope characteristics known to be associated with the target species. An area of inference is drawn from modeled habitat that accounts for site accessibility (e.g., distance from road, slope, land ownership), and points are randomly distributed across this area. Universal Transverse Mercator (UTM) coordinates are assigned to each random point, and field crew verify accessibility of points. Area of inference is adjusted and points redistributed in the event that plots can not be accessed. Trapping plots are then centered on each random point.

### **II. Installing Trap Plots**

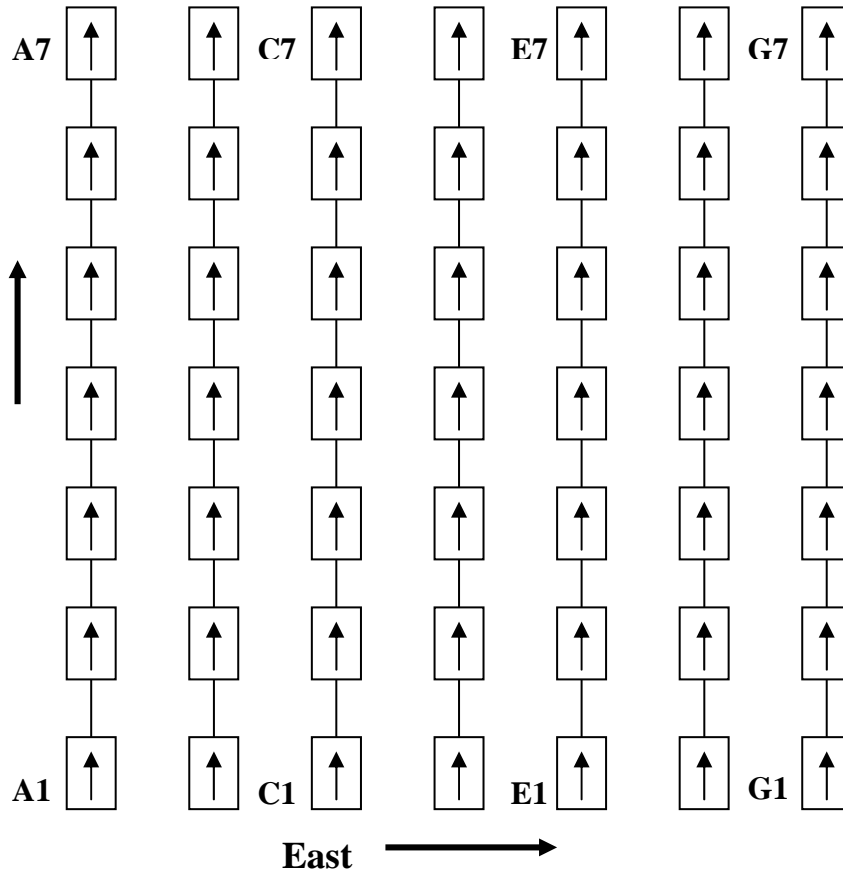
Equipment:

Modified Sherman traps	Reflective tape
Millet	Sharpie pens
Coordinates	Trap carrying bags
Ant powder	Handheld GPS unit/ Compass
50-m or 100-m tape	Trash bags
Flagging/Pin flags	

#### **Plot Layout**

Trap grids vary in size according to project-specific goals, but are installed following identical procedures. Coordinates of points randomly generated in the office represent trapping grid centers (e.g., trap station C3 for a 5x5 grid). Trap lines are labeled alphabetically and increasing eastward, with trap stations within a line labeled numerically (e.g. A1, A2...A7) and increasing northward (Figure 2). Each trap station is marked with a labeled pin flag and, when necessary, flagging and reflective tape. Trap lines are also marked with reflective tape if landscape features make it difficult to follow them in the dark. Trap spacing, number of trap lines within a grid, and the number of stations on a line varies according to project-specific goals.

Grid lines are installed by stretching 2 measuring tapes (e.g., 50 m, 100 m) north-south and east-west from the random point, using a declinated compass as a guide.

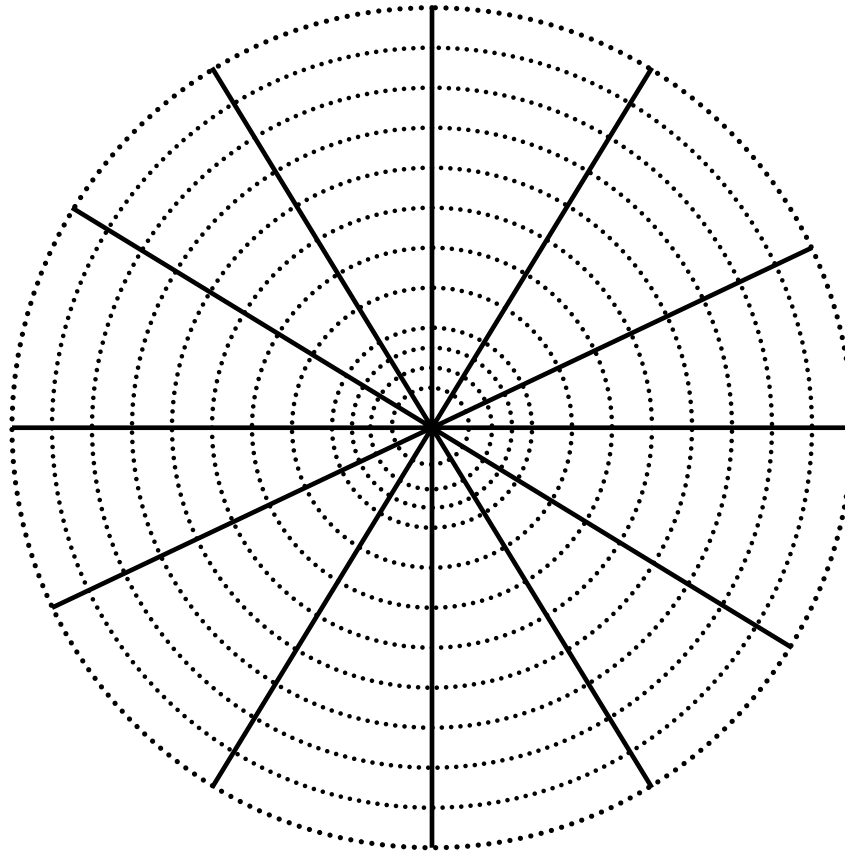


**Figure 2.** Grid design (7x7) for trapping small mammals. Boxes represent individual traps and arrows indicate direction that open doors face. Traps are labeled alphabetically and increasing to the east, numerically and increasing to the north.

Measuring tapes are held taut and close to the ground, and secured with survey pins. Pin flags are then distributed along the tapes at the appropriate intervals, depending on project-specific protocol. Finally, measuring tapes are stretched north-south from each of the pin flags placed along the east-west line described above. Pin flags are then distributed along these north-south lines to fill-out the rest of the grid (Figure 2).

We may also use a trapping web design, depending on project-specific goals. Trap lines within a web radiate from a central point at regular intervals, with a greater density of traps occurring near the center relative to the edges (Figure 2). Trap stations along each trap line are assigned an alpha-numeric label similar to that used for grids, with numbers increasing as you move away from the web center. Trap stations and lines are marked as described above for grids, and routes between lines at the web perimeter are marked with reflective tape. Trap spacing, number of trap lines, and number of traps per line varies depending on the target species.

Trapping webs are installed by stretching a measuring tape from the random point in a predetermined bearing. The tape is held taunt and close to the ground, and secured with survey pins. Additional tapes are stretched from the center point at regular intervals until the circle is filled. Pin flags are distributed along each line according to project-specific protocol.



**Figure 2.** Trapping web design where solid lines represent trap lines radiating from a central point, and dashed lines represent concentric trap rings set at defined distances. Trap stations are placed where solid and dashed lines intersect.

### Trap Placement and Setting

Unfold the trap and push the front door until it engages with the treadle tab. The front door can easily be found by noticing that there is a seam on the left side of the trap when the door is facing you. There should also be a paperclip that prevents that door from completely closing and potentially damaging animal tails (replace paperclip is missing).

Lightly tap on the side or bottom of trap. A light tap will be about as hard as if you were trying to make a spider fall off the side of the trap. The door should snap shut if the trap is set properly. You can adjust the sensitivity by pulling the tab forward or pushing it backward if. Pushing back will make the door more sensitive, a forward pull will make it less sensitive. Please ask if you cannot find the tab.

Place the trap on the ground at the station (marked with labeled pin flag) parallel with the trap line and with the opening facing northward once you are sure the sensitivity is correct. Traps should be placed on a level surface so that the entrance is flush with the ground, and it does not teeter. Use your boot to scrape out an even space if necessary. Traps should be placed parallel to the trap line. Take about 1 tablespoon of millet and toss most of it into the trap. Make sure that the millet is in the back of the trap, behind the treadle, otherwise an animal is likely to be too close to the door when it shuts and damage its tail. Place the remainder of the millet in a line just in front of the trap (e.g., about 5 – 10 seeds).

#### Ant Caution

Ants can kill animals in a trap. Sprinkle provided ant powder liberally under and in front of traps if ants are present. Make sure that there are no ants inside the trap before you add bait. Apply ant powder if there are ants even if you are doing the last trap check of the day/night unless the grid is being closed. Do not set a trap if the ants are particularly thick and you feel they are too numerous for the powder to be effective. Be sure to record that the trap was not set.

### III. Checking Traps

#### Equipment per handler

1 Headlamp	Animal Mortality Record
3 Pesola® Scales: 20g, 100g and 300g	Species field guide/key
1 Ruler (clear 6-inch)	Digital camera
1 Kestrel (per team)	Waste bags for used millet
3 Animal handling bags	Ant powder (pre approved only)
PDA (1 per team if grids)	Extra batteries
Non-toxic marker	

Traps are checked twice per night. The first check (i.e. midnight check) is approximately 5 hours after sunset, and the second check is just before dawn. Grids are typically checked in teams of 2, and webs in teams of 4 to 8. Grid teams consist of a single recorder, with both crew members handling animals. Handlers typically record their own data on trapping webs, depending on trap-line assignments. Each trap line is typically checked by a single person regardless of trap design used.

Walk along trap lines noting pin-flag number and whether each trap is open, closed and empty, or closed with a capture. Make note of the status of each trap in the appropriate box on your trap-check quality control sheet to ensure that no traps are missed. Mark “O” for open traps, “C” for closed with no capture, “R” for robbed traps, (traps that are open with no bait inside), and use the four-letter species alpha code for traps closed with an animal inside. Only record the status of the traps you or your handling/recording partner checked. Adjust the treadle on robbed traps.

#### Empty traps

Visually check each open trap to verify that it is not occupied by a pocket mouse. We have captured several pocket mice in seemingly open traps because the animal had not tripped the treadle. Physically pick-up the trap to check for bait and ensure that

treadles are set properly. Place the trap parallel to the trap line and facing north if you are conducting a midnight check. See instructions below for closing traps after a dawn check.

Pick-up closed traps and gently shake with the door facing upwards so that the contents move to the back of the trap. This will ensure that very small animals (e.g. pocket mouse) will not be crushed when you open the trap door. Slowly open traps that seem too light to contain an animal to ensure that a pocket mouse or small *Peromyscus* is not inside. Gently depress the treadle to check for animals underneath. Harvest mice, pocket mice and determined *Peromyscus* fit easily under the treadle. Set treadle, replace bait (in necessary) and place trap parallel to trap line if empty. Follow animal handling procedures described below if there is an animal in the trap.

#### Occupied traps

Pick up the trap if the door is closed, and take notice of the weight. Follow the directions below if it feels like an animal is inside. Use caution as occasionally non-mammal species may be captured (see rattlesnakes below).

Hold the trap parallel to your body with the door facing upward and the side of the trap with the split panel facing you (solid panel should be facing you if left handed). Place a handling bag over the top of the trap so that the crease at the bag's opening fits snugly into a trap corner. Wrap the excess portion of the bag around the trap so that there are no spaces, and hold it securely against the trap with your working hand (e.g. right hand). Extend the bag so that there is a large and unobstructed space opening into the bag from the trap door. Gently shake the trap downward so that the animal moves to the back of the trap and will not be crushed by the door as you open it inwards. Open and hold the trap door through the bag with the fingers on your working hand. Invert the trap quickly and firmly with a downward shake so that the animal falls into the bag. Be firm but remember you have a live animal in the trap. Quickly grasp the plastic bag and form a tight barrier between the animal and the trap as soon as it enters the bag and is completely clear from the trap door. Many species have very long tails and you should be careful that these too are clear from trap doors before allowing them to close. Remove the bag completely from the trap. Be careful of wire hinges on the trap tearing into the plastic bag.

Be aware of ants! Treat as needed as specified above.

#### Closing traps

Traps should be closed after dawn checks by disposing of excess bait in a waste bag, closing traps, and placing them on the ground perpendicular to trap lines. Closed traps must be placed perpendicular to distinguish them from non-checked parallel traps, and to ensure that we do not leave an animal in a trap during the day. Also, each trap must be checked for animals before closing by placing your hand inside and pushing the treadle to the bottom. Animals sometimes hide under the treadle and go undetected. Never close a trap without looking inside and checking the treadle first.

Animals left in traps after the dawn check will die as a result of extreme heat exposure. Animals that enter and trip traps left open after the dawn check will also perish. Take precautions to ensure that all traps are empty and closed after each dawn check.

### Missing traps

Make a methodical search if you can not find a trap at a station. Do another search once you are finished checking the grid and make note for bait and trapping crews if the trap can not be located. You should look until you either find the trap or you are very certain it is not in the area. Involve other crew members in the search if they are available. Leave notice for the morning or bait crews if the trap can not be found so that a daylight search can occur. You should be very reluctant to leave a trap unaccounted for because captured animals will die from daytime heat, or a predator will likely return for a second helping if it had moved the trap.

### Rattlesnake in trap

Traps will feel abnormally heavy when occupied by a snake. Tap on the trap lightly and listen for a rattle if you are uncertain if a snake is in the trap. Note, however, that rattlesnakes tend to not rattle, even when disturbed, if the ambient temperature is particularly cold. Do the following if you hear a rattle or are otherwise certain that a rattlesnake is in a trap: 1) Look around and choose location that is free of obstacles. 2) Place the trap on the ground with the door facing you. 3) Pull the pin out of the bottom-left side of the trap being careful to move backwards away from the trap. 4) The trap should collapse and the snake will be free to exit. 5) *Cautiously* use a shovel handle (located in field vehicle) to collapse the trap from a safe distance if needed (note that rattlesnakes can strike to distance of 1/3 to 1/2 their body length!). You can turn the trap upside down if that makes it easier for you to remove the pin. This procedure will free all snakes in a trap, but you need to be alert and prepared to move when you are releasing a rattlesnake. *Do not attempt to remove a rattlesnake if you are at all uncomfortable with the procedure.* Rather, ask an experienced crew member for help.

Make note of the incident on the data sheet in the notes section. Either repair the trap in the field or replace it with an extra one and repair it in the office.

## IV. Processing Animals

### Weighing the animal

Be sure to zero the Pesola® scale each night before attempting to weigh animals. Look at the scale while it is empty and see that it reads zero. Use the knob at the top of the scale to adjust as necessary.

Seal opening in the handling bag by folding the corners inward and the top down over the folded corners. Wait until the animal is calm, then clip the scale to the top flap of the bag, making sure that each flap is within the grasp of the scale's clamp. Record weight in grams under 'Total wt' on the data sheet. Save bag contents to weigh later.

### Handling the animal

Work the animal to the bottom of the handling bag, trying to avoid trapping its head in a corner. This is best accomplished by placing the bag against your thigh, and decreasing the amount of open space by sliding your hand downward from the top of the bag against your leg. Secure the animal through the bag in the palm of your working hand (e.g., right-handed, left-handed), being careful to avoid the head and biting teeth. Open bag and grasp the animal firmly by the scruff of the neck with your non-working hand.

Alternatively, grasp the animal's tail *at the base* after you have secured them through the bag with your non-working hand. Never hold an animal by its tail away from the base. The tail can easily break off or, more likely, the skin will slide away and leave a bloody appendage. Let the animal rest on your upper leg or chest (you are still holding its tail at the base) and scruff it snugly.

#### Incidental deaths

Record the species and sex and under fate record "dead" if an animal is found dead in a trap. Place the deceased animal in two Ziploc® bags (one inside the other, both zipped closed) if it is a Covered Species. Use a marker to label the top bag with the date, time, site, grid ID, trap ID, and observer initials. Bring the animal back to the office to be placed in the freezer for later disposition. Fill out a mortality record form located in the trap kits for each dead animal or incident while you are in the field. Place the completed form on the Mammal Program Lead's desk when you return to the office. If the dead animal is a listed species (SKR, SBKR), also put a copy of the Mortality Record on the Program Administrator's desk. Designate one crew member to call the Program Administrator at home on Saturday morning if the mortality occurs on a Friday night. We are required to notify the Fish and Wildlife Service within 24 hours of finding a listed animal that is dead.

#### Incidental births

Place the mother on the ground and watch her if she enters a burrow if an animal gives birth while in the trap. Place the babies in the entrance of that burrow and leave them alone. Place the babies outside the trap and record the incident in the notes section on the data sheet if you do not know where she went.

#### Hot or cold animals

Place cold animals (lethargic and unresponsive) in a pocket close to your body until it is revived. You can bring the animal into a heated vehicle if you are really worried, but be careful about placing the animal directly in front of heater vents. They are small and can overheat quickly. Release the animal at the station where it was captured once it begins to warm up and move around. An animal that is overheated will also be lethargic and may have moisture around its mouth. Cool down an overheated animal by wetting its fur with plain water and fanning or blowing on the animal. Record the species and sex of the animal and make note of the incident and the outcome.

#### Marking the animal

Animals are marked by injecting a PIT tags, applying an ear tag, or coloring with a non-toxic marker. Always be clear about the marking method being used when you are checking traps or recording data.

Marker: Write on the ventral surface of the animal with a specified color.

PIT tag: See separate protocol for marking PIT tags. Do not attempt this procedure without training and permission lead staff.

Ear tag: See protocol for applying ear tags. Do not attempt this procedure without training and permission from lead staff.

### Recaptured animals

An animal is considered a “recapture” if it was previously captured during the particular survey effort that you are trapping. Recaptured animals are identified by the color mark on their ventral side that is unique to a particular trapping effort. Other marks will vary from project to project and may even vary from night to night. Be sure you are clear on the marking scheme being used anytime you are trapping. Only record species, sex, and reproductive condition for recaptured animals.

### Identify the species

You should be comfortable with identification of local small mammal species before conducting surveys. Use the field guide included in your mammal packet to help with identification as needed. You can also consult crew mates if there is confusion. Record the species on your data sheet the 4 letter alpha code. Species codes are included in your mammal packet if you forget one. If you cannot identify a species, take and record all standard measurements, and take photographs of the animal for later identification. Do not spend too much time on this task. Record the capture as new or recapture on the data sheet.

### Sexing the animal

Males and females can be differentiated using the following cues:

- Look first for an enlarged scrotum or signs of lactation (bare skin around enlarged nipples).
- Males have a greater distance between anus and genitals than females (in females the genitalia is typically within 1-2 mm of the anus). The skin between the anus and genitals tends to be hairless in females.
- Check for baculum: Using your finger or the tip of a pencil, gently push the genitalia upward (toward the animal’s head). If a tiny boney spur protrudes from the genitalia, the animal is a male. Record the ‘sex’ on the data sheet.

### Reproductive status of the animal

The categories of reproductive status are: scrotal, or not reproductive for males; pregnant, perforate, lactating, plugged or not reproductive for females. Record the status on the data sheet under ‘condition’.

Females: Note if the individual is lactating by the presence of enlarged nipples with an area of bare skin immediately surrounding the nipple. Large extended abdomen indicating possible pregnancy. Perforate means the vagina is open. Plugged means a copulatory plug is present. This is a mucous plug that forms in the vaginal orifice a few hours after mating. It looks like a big mucus scab over the vaginal area.

Males: Look for the presence of an enlarged, deflated, or small wrinkled scrotum in males. Any visual indication of a scrotum is to be considered a reproductive individual.

### Age

Note the age as juvenile ‘J’ or adult ‘A’ depending on pelage. Juveniles of all species are smaller and usually quite gray. They may appear to have large ears and feet in relation to the body size.

## Measuring the animal

Be sure you are comfortable with all of these procedures.

Tail length: measure from the dorsal side (top) to the end of the tail bone (not the end of the hair).

Hind foot: Measure from the heel to the tip of the longest claw.

Ear: Distance from notch at front base of ear to distal-most border of the fleshy part of the ear. Do not push on or deform the ear with your ruler.

Take all measurements on all animals whenever possible. Weather conditions, personnel shortages, or other foreseen reasons may require that some data not be recorded. At a minimum, record species, sex, and reproductive status. You should make educated decisions about what to record and how to protect animals if some crisis occurs (e.g., trap predation). See separately provided Mammal Trapping Guidelines for weather guidance. The following measurements can be used to identify species, and are the minimum measurements that are to be recorded for each.

- *Chaetodipus* – weight, ear at notch, hind foot length. (guards hairs on rump distinguish from *Perognathus*)
- *Peromyscus* – all measurements on data sheet
- *Neotoma* – weight, color of top of hind foot, color of hairs on the throat at their base.
- *Dipodomys* – weight, ear length, number of toes
- *Reithrodontomys* – weight, spots on ear bases? Grooves on upper incisors?
- *Microtus* – weight
- *Perognathus* – LAPM: weight, spots on ears, and lacking guard hairs.

Record species and measurements taken for purpose of identifying all other species not listed above.

Remove the animal from the bag after processing, and gently release it by placing on the ground at the trap station where it was captured. Weigh the bag with the contents, and record that weight under ‘bag wt’. Do not remove millet, waste, etc. from bag before obtaining bag weight. Transfer excess millet or feces from the handling bag to a waste bag. The handling bag is then reused for the next animal unless it is torn or soiled. Record the fate of the animal as ‘R’ released, ‘E’ escaped, or ‘D’ dead.

Grid quality control:

Trapping teams must verify that all traps have been checked when a grid is completed by reviewing the quality-control form. Each crew member that checked traps will say out loud which traps they checked starting with trap A-1 and finishing at the last trap (G-7 or H-8). Sign the sheet recording that you verified that all traps had been checked. Count robbed and closed-but-empty traps after you have ensured that all traps have been checked, and subtract them from the total number of traps on the grid. Record that number as the number of trap nights.

## V. Picking up Trap lines

Equipment:

- Shoulder bags for carrying traps and pin flags
- Rubber bands/Trap boxes
- Waste bag for emptying traps

Collect traps as you check grids on the final check of a survey effort. Empty remaining millet and waste into a trash bag, and collapse the trap for easy carrying in the shoulder bags. Pin flags are to be left in the field, only during ongoing projects. Flagging placed to mark trails must be picked up on the way out of the grid for the last time during that trapping session. If we are using the grid again, the trail can be remarked when the grid is reopened. Count the traps at the end of the collection effort. Make sure all of the traps are accounted for after collection at each grid.

Sort pin flags by letter and place rubber bands around sorted groups if they are to be collected. Make sure that all pin flags, flagging tape, and reflective tape is removed, as we do not want to be responsible for trash in the Conservation Area.

## **VI. Cleaning and storing traps**

All traps must be cleaned and disinfected before being between sites. Make sure all millet and waste material are knocked out of the traps before soaking them in a 10% bleach and water solution for 10 minutes. Thoroughly rinse the traps with water and allow them to air dry outside preferably in the sun. Place the folded traps into the plastic buckets with lids once dry.

**APPENDIX C. Species recorded per grid while surveying for Los Angeles pocket mouse, May - August 2010.**

<b>Grid</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Covered</b>	<b>Total</b>
ANVA-01	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
ANVA-02	NONE	-	-	-
ANVA-03	<i>Chaetodipus californicus</i>	California pocket mouse	N	1
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
ANVA-04	<i>Peromyscus boylii</i>	Brush mouse	N	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
ANVA-05	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	3
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	1
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	2
ANVA-06	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	3
ANVA-07	NONE	-	-	-
ANVA-08	NONE	-	-	-
ANVA-09	NONE	-	-	-
ANVA-10	<i>Chaetodipus californicus</i>	California pocket mouse	N	1
	<i>Peromyscus boylii</i>	Brush mouse	N	3
ANVA-11	NONE	-	-	-
ANVA-12	<i>Peromyscus boylii</i>	Brush mouse	N	3
ANVA-13	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
ANVA-14	NONE	-	-	-
ANVA-15	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	1
ANVA-16	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
ANVA-17	<i>Peromyscus maniculatus</i>	Deer mouse	N	2
ANVA-18	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	1
ANVA-19	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	2
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	2
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	6
ANVA-20	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	1
ANVA-21	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	5
ANVA-22	<i>Peromyscus boylii</i>	Brush mouse	N	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	7
BAST-01	NONE	-	-	-
BAST-02	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	9
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
BAST-03	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	2

**APPENDIX C. Cont.**

<b>Grid</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Covered</b>	<b>Total</b>
BAST-04	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	2
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
BAST-05	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	15
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
BAST-06	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	8
BAST-06	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	2
	<i>Microtus californicus</i>	California vole	N	1
	<i>Neotoma fuscipes</i>	Dusky footed woodrat	N	3
	<i>Peromyscus boylii</i>	Brush mouse	N	5
	<i>Peromyscus maniculatus</i>	Deer mouse	N	71
BAST-07	<i>Microtus californicus</i>	California vole	N	1
BAST-08	<i>Microtus californicus</i>	California vole	N	1
BAST-09	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
BAST-10	NONE	-	-	-
BAST-11	NONE	-	-	-
BAST-12	<i>Microtus californicus</i>	California vole	N	14
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
BAST-13	NONE	-	-	-
BAST-14	NONE	-	-	-
BAST-15	NONE	-	-	-
BAST-16	NONE	-	-	-
BAST-17	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	5
BAST-18	NONE	-	-	-
BAST-19	NONE	-	-	-
BAST-20	<i>Microtus californicus</i>	California vole	N	1
LPSJ-01	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	5
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	2
LPSJ-02	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
LPSJ-03	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	5
LPSJ-04	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	1
LPSJ-05	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
LPSJ-06	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	4
LPSJ-07	NONE	-	-	-
LPSJ-08	NONE	-	-	-
LPSJ-09	NONE	-	-	-
LPSJ-10	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	1

**APPENDIX C. Cont.**

<b>Grid</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Covered</b>	<b>Total</b>
LPSJ-11	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	15
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	3
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	1
	<i>Neotoma</i> spp	Unidentified woodrat	-	1
	<i>Neotoma fuscipes</i>	Dusky footed woodrat	N	15
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
LPSJ-12	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	2
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	2
LPSJ-13	NONE	-	-	-
LPSJ-14	NONE	-	-	-
LPSJ-15	NONE	-	-	-
LPSJ-16	NONE	-	-	-
LPSJ-17	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	8
LPSJ-18	NONE	-	-	-
LPSJ-19	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
LPSJ-20	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
LPSJ-21	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
LPSJ-22	NONE	-	-	-
LPSJ-23	NONE	-	-	-
LPSJ-24	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	2
LPSJ-25	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
LPSJ-26	<i>Microtus californicus</i>	California vole	N	1
LPSJ-27	NONE	-	-	-
LPSJ-28	<i>Thomomys bottae</i>	Botta's pocket gopher	N	2
LPSJ-29	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	8
LPSJ-30	NONE	-	-	-
LPSJ-31	NONE	-	-	-
LPSJ-32	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
LPSJ-33	<i>Microtus californicus</i>	California vole	N	1
	<i>Peromyscus</i> spp	Unidentified <i>Peromyscus</i>	N	1
	<i>Thomomys bottae</i>	Botta's pocket gopher	N	1
LPSJ-34	<i>Microtus californicus</i>	California vole	N	1
LPSJ-35	NONE	-	-	-
LPSJ-36	NONE	-	-	-
LPSJ-37	<i>Microtus californicus</i>	California vole	N	4
LPSJ-38	<i>Microtus californicus</i>	California vole	N	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
LPSJ-39	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	2
LPSJ-40	<i>Peromyscus eremicus</i>	Cactus mouse	N	1

**APPENDIX C. Cont.**

<b>Grid</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Covered</b>	<b>Total</b>
MSR-01	<i>Mus musculus</i>	House mouse	N	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
MSR-02	<i>Mus musculus</i>	House mouse	N	4
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
MSR-03	NONE	-	-	-
MSR-04	<i>Chaetodipus californicus</i>	California pocket mouse	N	1
	<i>Mus musculus</i>	House mouse	N	3
MSR-05	<i>Chaetodipus californicus</i>	California pocket mouse	N	2
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
MSR-06	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	1
	<i>Mus musculus</i>	House mouse	N	1
MSR-07	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	3
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	3
	<i>Peromyscus eremicus</i>	Cactus mouse	N	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	2
MSR-08	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
	NONE	-	-	-
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	10
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	3
MSR-09	<i>Neotoma lepidus intermedia</i>	San Diego desert woodrat	Y	3
	<i>Peromyscus boylii</i>	Brush mouse	N	3
	<i>Peromyscus eremicus</i>	Cactus mouse	N	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	4
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
MSR-10	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	1
	<i>Microtus californicus</i>	California vole	N	3
	<i>Mus musculus</i>	House mouse	N	8
	<i>Peromyscus maniculatus</i>	Deer mouse	N	2
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	5
MSR-11	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	2
	<i>Microtus californicus</i>	California vole	N	1
	<i>Mus musculus</i>	House mouse	N	4
	<i>Peromyscus maniculatus</i>	Deer mouse	N	16
	<i>Sceloporus occidentalis</i>	Western fence lizard	N	1
MSR-12	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	13
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	3
	<i>Mus musculus</i>	House mouse	N	1
	<i>Neotoma lepidus intermedia</i>	San Diego desert woodrat	Y	1
	<i>Peromyscus boylii</i>	Brush mouse	N	3
	<i>Peromyscus eremicus</i>	Cactus mouse	N	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	8

**APPENDIX C. Cont.**

<b>Grid</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Covered</b>	<b>Total</b>
MSR-13	<i>Chaetodipus californicus</i>	California pocket mouse	N	1
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	7
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	2
	<i>Neotoma lepidus intermedia</i>	San Diego desert woodrat	Y	1
	<i>Thomomys bottae</i>	Botta's pocket gopher	N	1
MSR-14	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	8
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	8
MSR-15	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	3
	<i>Crotalus viridis helleri</i>	Southern pacific rattlesnake	N	1
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
	<i>Mus musculus</i>	House mouse	N	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
MSR-16	<i>Peromyscus maniculatus</i>	Deer mouse	N	7
MSR-17	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	5
	<i>Peromyscus maniculatus</i>	Deer mouse	N	2
MSR-18	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	12
	<i>Peromyscus eremicus</i>	Cactus mouse	N	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	2
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	2
MSR-19	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	8
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
MSR-20	<i>Chaetodipus</i> spp	Unidentified spiny pocket mouse	-	1
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	12
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	7
	<i>Peromyscus eremicus</i>	Cactus mouse	N	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
MSR-21	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
MSR-22	NONE	-	-	-
	NONE	-	-	-
MSR-24	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
MSR-25	<i>Chaetodipus californicus</i>	California pocket mouse	N	1
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	4
MSR-26	NONE	-	-	-
MSR-27	NONE	-	-	-
MSR-28	NONE	-	-	-
MSR-29	<i>Chaetodipus californicus</i>	California pocket mouse	N	1
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
	<i>Eumeces skiltonianus</i>	Western skink	N	1
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	3
MSR-30	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	3
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	4
	<i>Peromyscus eremicus</i>	Cactus mouse	N	1
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1

**APPENDIX C. Cont.**

<b>Grid</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Covered</b>	<b>Total</b>
MSR-31	<i>Chaetodipus californicus</i>	California pocket mouse	N	1
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	6
	<i>Peromyscus eremicus</i>	Cactus mouse	N	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	2
	Unidentified bird	-	-	1
MSR-32	<i>Chaetodipus</i> spp	Unidentified spiny pocket mouse	-	1
	<i>Chaetodipus californicus</i>	California pocket mouse	N	3
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	18
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
	<i>Neotoma lepidus intermedia</i>	San Diego desert woodrat	Y	1
	<i>Peromyscus boylii</i>	Brush mouse	N	1
	<i>Peromyscus eremicus</i>	Cactus mouse	N	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
POTR-01	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	3
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	32
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
POTR-02	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	5
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	3
POTR-03	<i>Peromyscus eremicus</i>	Cactus mouse	N	1
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	2
POTR-04	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
	<i>Microtus californicus</i>	California vole	N	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
POTR-05	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	2
POTR-05	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
POTR-06	NONE	-	-	-
POTR-07	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	5
	<i>Peromyscus maniculatus</i>	Deer mouse	N	12
POTR-08	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	5
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	8
	<i>Peromyscus maniculatus</i>	Deer mouse	N	2
POTR-09	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
POTR-10	<i>Peromyscus eremicus</i>	Cactus mouse	N	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	3
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	2
POTR-11	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	9
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	9
	<i>Peromyscus boylii</i>	Brush mouse	N	2
POTR-12	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	21
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	5

**APPENDIX C. Cont.**

<b>Grid</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Covered</b>	<b>Total</b>
POTR-13	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	11
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	10
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
POTR-14	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	11
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	5
POTR-15	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	12
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	12
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1
POTR-16	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	4
POTR-17	NONE	-	-	-
POTR-18	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	23
	<i>Cnemidophorus hyperythrus beldingi</i>	Belding's orange-throated whiptail	Y	1
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
POTR-19	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	20
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	2
	<i>Peromyscus eremicus</i>	Cactus mouse	N	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	3
POTR-20	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	18
	<i>Dipodomys spp</i>	Unidentified kangaroo rat	-	1
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	8
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	1
	<i>Peromyscus eremicus</i>	Cactus mouse	N	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	10
POTR-21	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	4
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	5
	<i>Peromyscus maniculatus</i>	Deer mouse	N	4
POTR-22	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	2
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	7
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	5
POTR-23	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	2
	<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	Y	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
POTR-24	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	6
	<i>Peromyscus maniculatus</i>	Deer mouse	N	2
POTR-25	<i>Chaetodipus californicus</i>	California pocket mouse	N	1
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	10
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	17
	<i>Peromyscus maniculatus</i>	Deer mouse	N	10

**APPENDIX C. Cont.**

<b>Grid</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Covered</b>	<b>Total</b>
POTR-26	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	2
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	4
POTR-27	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	8
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	3
POTR-28	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
	<i>Crotalus ruber ruber</i>	Northern red-diamond rattlesnake	Y	1
POTR-29	<i>Chaetodipus californicus</i>	California pocket mouse	N	1
	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	4
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	4
SJRI-01	NONE	-	-	-
SJRI-02	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	1
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
SJRI-02	<i>Peromyscus maniculatus</i>	Deer mouse	N	79
SJRI-03	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	2
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	58
SJRI-04	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	3
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	2
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	36
SJRI-05	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	2
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	9
	<i>Peromyscus maniculatus</i>	Deer mouse	N	8
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	2
SJRI-06	<i>Dipodomys spp</i>	Unidentified kangaroo rat	-	1
	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	2
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	10
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	35
SJRI-07	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	8
SJRI-08	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	6
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	6
SJRI-08	<i>Peromyscus maniculatus</i>	Deer mouse	N	21
SJRI-09	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	2
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	8
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	83
SJRI-10	<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	Y	3
	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	1
	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	10
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	71

**APPENDIX C. Cont.**

<b>Grid</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Covered</b>	<b>Total</b>
SJRI-11	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	1
	<i>Mus musculus</i>	House mouse	N	1
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	5
	<i>Peromyscus maniculatus</i>	Deer mouse	N	17
SJRI-12	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	1
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	3
	<i>Peromyscus maniculatus</i>	Deer mouse	N	18
SJRI-13	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	1
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	12
	<i>Peromyscus maniculatus</i>	Deer mouse	N	20
SJRI-14	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	1
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	2
	<i>Peromyscus maniculatus</i>	Deer mouse	N	13
SJRI-15	<i>Chaetodipus</i> spp	Unidentified spiny pocket mouse	-	1
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	4
SJRI-16	<i>Peromyscus maniculatus</i>	Deer mouse	N	65
	<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	Y	4
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	9
	<i>Peromyscus maniculatus</i>	Deer mouse	N	20
SJRI-17	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	7
	<i>Peromyscus maniculatus</i>	Deer mouse	N	1
SJRI-18	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	3
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	11
	<i>Peromyscus maniculatus</i>	Deer mouse	N	23
SJRI-19	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	1
SJRI-20	<i>Dipodomys simulans</i>	Dulzura kangaroo rat	Y	1
	<i>Perognathus longimembris brevinasus</i>	Los Angeles pocket mouse	Y	3
	<i>Peromyscus eremicus</i>	Cactus mouse	N	1
	<i>Peromyscus maniculatus</i>	Deer mouse	N	39
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	N	1

<sup>1</sup> Non-covered species were not marked, and total refers to the number of times these species were captured, not number of individuals detected.