Burrowing Owl Habitat Enhancement on CNLM's Johnson Ranch (S015) and Skunk Hollow (S028) Preserves

2010 Final Report
for Agreement No. P0760011

BUOW pair with seven chicks at artificial burrow B3P5

Center for Natural Lands Management

Report Preparer: Kim Klementowski, Preserve Manager; kklementowski@cnlm.org
Reviewer: Deborah L. Rogers, Director of Conservation Science; drogers@cnlm.org

215 West Ash Street
Fallbrook, CA 92028
Phone: 760.731.7790
www.cnlm.org

Prepared for:
California Department of Fish and Game
Leslie MacNair, LMacNair@dfg.ca.gov

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Summary

- Established 21 habitat enhancement experimental plots in spring 2008; 14 on Johnson Ranch Preserve and 7 on Skunk Hollow Preserve (Barry Jones Wetland Mitigation Bank)
- Collected pre-treatment vegetation data in March and April 2008
- Applied mowing treatment in April 2008 and burning treatment in May 2008 (no grazing in 2008)
- Installed artificial burrowing owl burrows in November 2008
- Installed wildlife motion-activated cameras in front of 12 artificial burrows in early February 2009 and rotated cameras throughout plots for duration of project
- Collected 2nd year vegetation data in March and April 2009
- Treated three of six of the mow plots in April 2009; three of six of the burn plots in June 2009; grazed all graze plots with sheep in spring 2009.
- Collected 3rd year vegetation data in March and April 2010.
- As of March 31, 2010, three artificial burrows appeared to be occupied by nesting pairs.
- May & June – band burrowing owls at both natural and artificial burrows.

I. Background

The Johnson Ranch Preserve (JRP) consists of approximately 1,700 acres in the unincorporated area of French Valley, Riverside County, California (Figure 1 and 2). The Center for Natural Lands Management (CNLM) manages more than 900 acres of JRP, that area owned by the Riverside County Regional Parks and Open Space District. Other protected portions of JRP that are not managed by CNLM are owned by the California Department of Fish and Game (CDFG) and the University of California, Riverside (UCR). JRP was established as part of the Assessment District 161 Multiple Species Sub-area Habitat Conservation Plan (AD161 HCP). Adjacent to this Preserve is another area managed by CNLM—the Skunk Hollow Preserve (SHP) (Figure 1 and 2). It consists of 138 acres of annual grassland, coastal sage scrub, and vernal pool ecosystems. Together, these preserves form a large contiguous area, capable of providing protection to populations of many species.

Western burrowing owl (*Athene cunicularia*) is not federally listed but is considered a California Bird Species of Special Concern. Western burrowing owl (BUOW) occurs on JRP, but it is not covered by the AD161 HCP. However, JRP is within the boundaries of the Western Riverside County Multiple Species Habitat Conservation Plan area (Riverside 2003) (MSHCP) and BUOW is a covered species in that plan. Five core areas for BUOW were identified in the MSHCP and JRP/SHP is found within the southernmost of these core areas, known as Core J. During the 2006 breeding season, 100% of all of the BUOW observations (seven pairs) in the MSHCP Skinner-Johnson Core J were found at JRP as determined by the MSHCP Biological Monitoring Crew (Riverside 2007).

Once a widespread species, the BUOW has seen a sharp decline across North America (Bates 2006). It has been extirpated from some of its range and is threatened and endangered in some states (e.g., Colorado, Minnesota). The decline is particularly disturbing in California where it has been extirpated or nearly extirpated from 16 counties (Miller 2003). Recent growth projections for Riverside County suggest that the human population may increase by over one million and add an additional 450,000

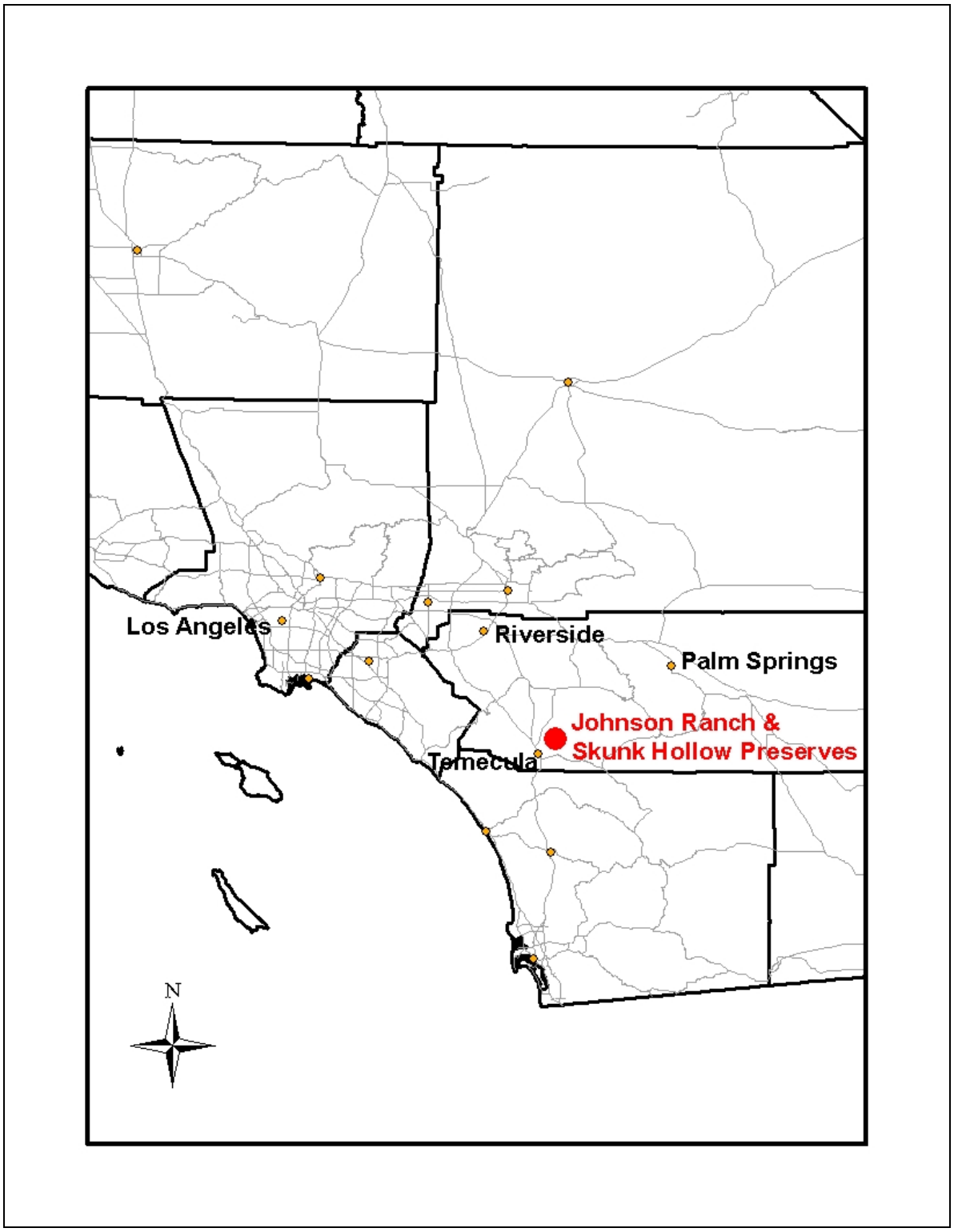

Figure 1. Johnson Ranch & Skunk Hollow Preserves: Regional Map

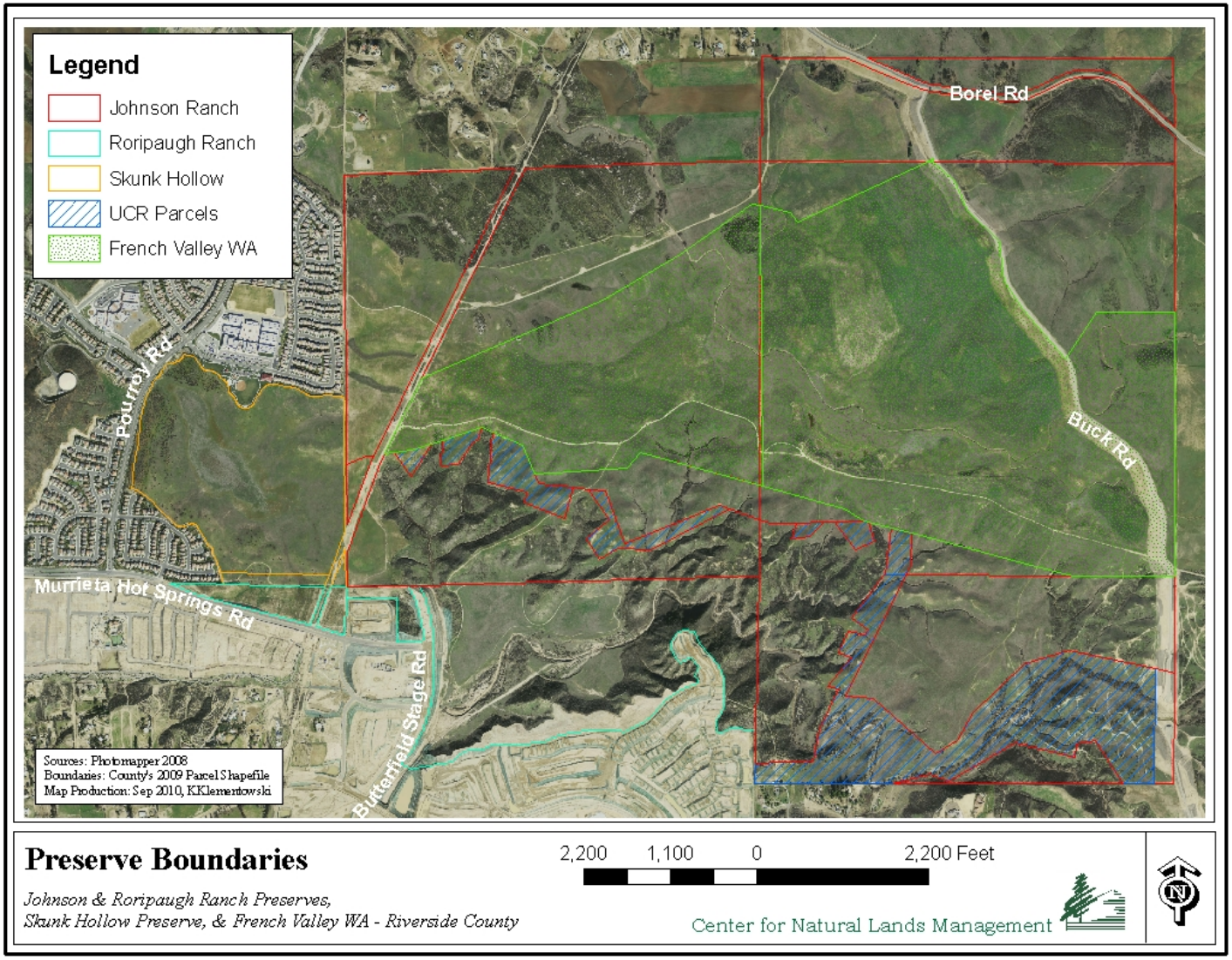

Figure 2. Johnson Ranch & Skunk Hollow Preserves: Vicinity Map

housing units by 2035 (Riverside 2010) indicating that there will be continued loss of owl habitat and habitat fragmentation from development. The majority of the land that has suitable burrowing owl habitat surrounding JRP and SHP is slated for development. Thus, these preserves are extremely important breeding grounds for burrowing owls that will certainly be displaced by future development.

Adding to the concern is that little is known about habitat requirements for burrowing owl, making it difficult to manage for this species. One known feature for adequate habitat for the burrowing owl is burrows. They require burrows for nesting, protection from predators, and for the dispersal activity of juvenile owls. As such, its existence (and persistence) is linked to the presence of fossorial mammals, specific, the California ground squirrel in Western Riverside County (Klute et al. 2003).

II. Goals and Objectives

In 2008, CNLM received a $21,843 grant from CDFG's NCCP Local Assistance Grant program. With these funds, CNLM implemented a vegetation management and habitat enhancement research project for BUOW on JRP (in locations where it was formally known) and on suitable areas on SHP (which is adjacent to known habitat). The goal of the research project is to gain a better understanding of what constitutes suitable habitat for BUOW and to gain information on the utility of two management tools—artificial burrows and vegetation management—in managing for BUOW breeding habitat. The two CNLM preserves selected for this study are simultaneously managed for Stephens' kangaroo rat (SKR) and the vegetation management treatments have also been selected towards informing management techniques for that species.

The methods for the research project are to implement several vegetation management techniques in 21 plots, install artificial burrows in the center of each plot, record changes in vegetation, and monitor for BUOW visitation, presence, and use. Vegetation management included comparisons of mowing, grazing, prescribed burning and control plots. Vegetation management treatments should reduce the height and density of non-native grasses within the abandoned agricultural fields of JRP and SHP, presumably improving conditions for BUOW and other native fauna. Habitat enhancement included the installation and maintenance of 21 artificial burrows, one in each of the vegetation management plots. If enough artificial burrows are used then it may be able to infer which land management technique will attract and support burrowing owls. If burrow occupancy allows, there will also be an analysis of which vegetation management treatment (fire, mowing, or sheep grazing) is more cost effective and reduces non-native grasses for the longest time period, thus increasing the time interval for needing vegetation management (e.g., from needing to mow every two years to needing to burn every five years).

III. Study Implementation

A. Study design and establishment

Suitable sites were selected using the assistance of CNLM Preserve Manager, Ms. Ginny Short, who has substantial BUOW expertise, including the completion of a study of the (biotic and abiotic) environmental variables associated with burrowing owl occurrence in southern

California (Short 2008). The study was designed with three complete blocks (i.e., all treatments represented in each block). Each block was made up of two treatment plots of each of the three vegetation management treatments and one control plot. This design resulted in six plots of each treatment (over three blocks) and three control plots. Study plots were set-up in spring of 2008. CNLM staff placed two blocks, consisting of 14 plots, at JRP and one block of 7 plots, at SHP, for a total of 21 plots. Each plot is 70 m x 155 m in size and has an artificial burrow placed in or near the middle (Figure 3). Plots within blocks were not entirely randomized because of the practical considerations with some of the treatments.

B. Vegetation monitoring

The primary objective of this research is to determine the effects of our vegetation treatments on habitat of SKR and occupancy of burrows by burrowing owl. Vegetation data collection corresponded to 135-meter SKR burrow count transects in order to correlate changes seen in SKR burrow entrance densities with changes in vegetation. From the center point of each plot, a tape measure was extended to 24 meters to one side and 21 meters to the other side. From the center tape measure, four 135-meter parallel transects, spaced 15 meters apart, were extended 67.5 meters to the top of the plot and 67.5 meters to the bottom (Figure 4). Along each transect, four 1 x 0.5-meter quadrants were randomly placed and vegetation characteristics were measured within these quadrants following the protocols established by the Western Riverside County Multi-Species Habitat Conservation Plan Biological Monitoring Team (Riverside 2006).

Measurements in each quadrant include the following:

- Estimate ground cover for litter and bare ground to the nearest 5%
- Measure the depth of the thatch layer
- Measure average height of vegetation
- Record three dominant species for each of two vegetation categories: tall herbaceous (>10 cm), and small herbaceous (<10 cm). Shrub was originally a category within these data collection protocols; however, shrubs were rarely encountered within the plots.

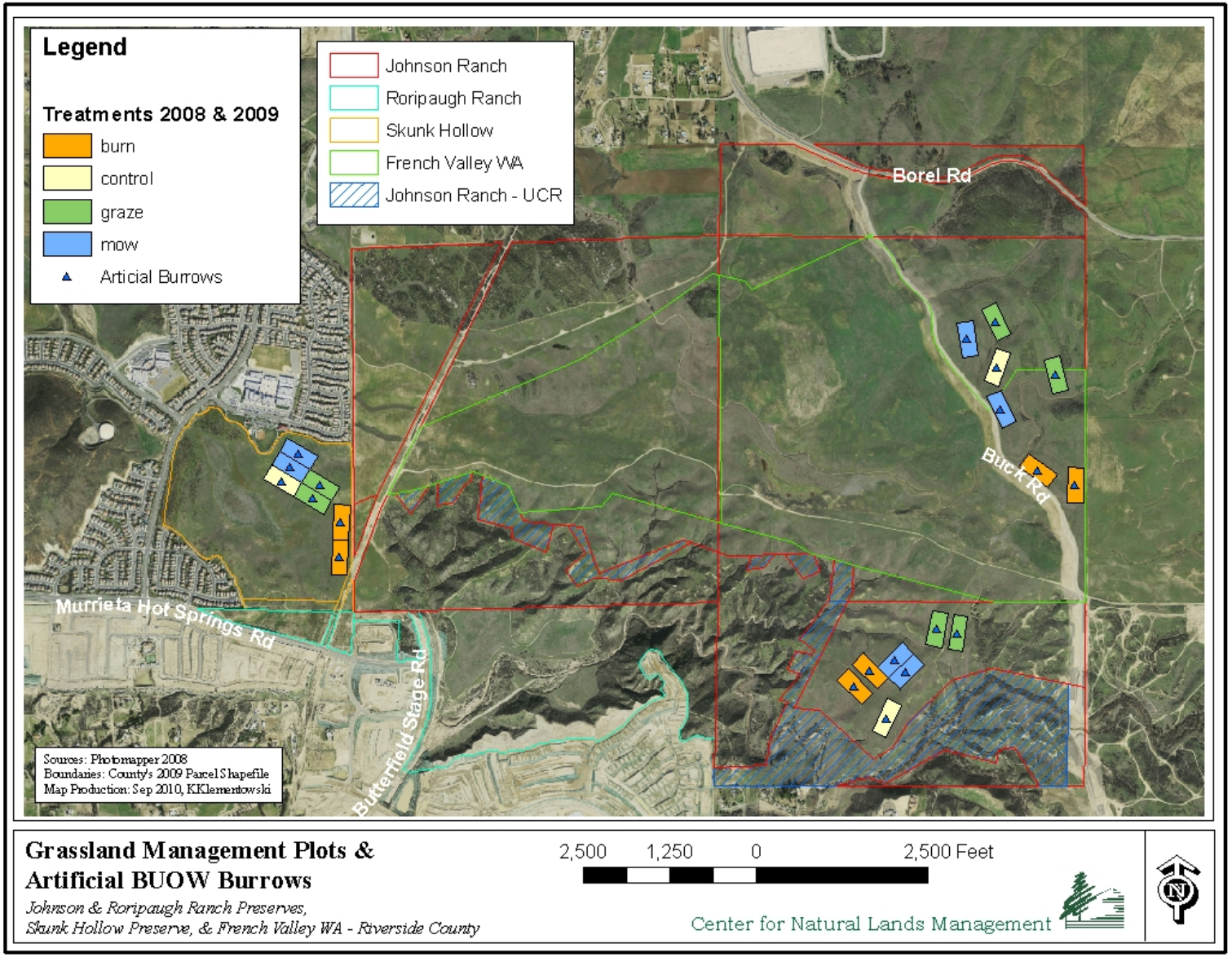

Figure 3. Locations of study plots and artificial burrows.

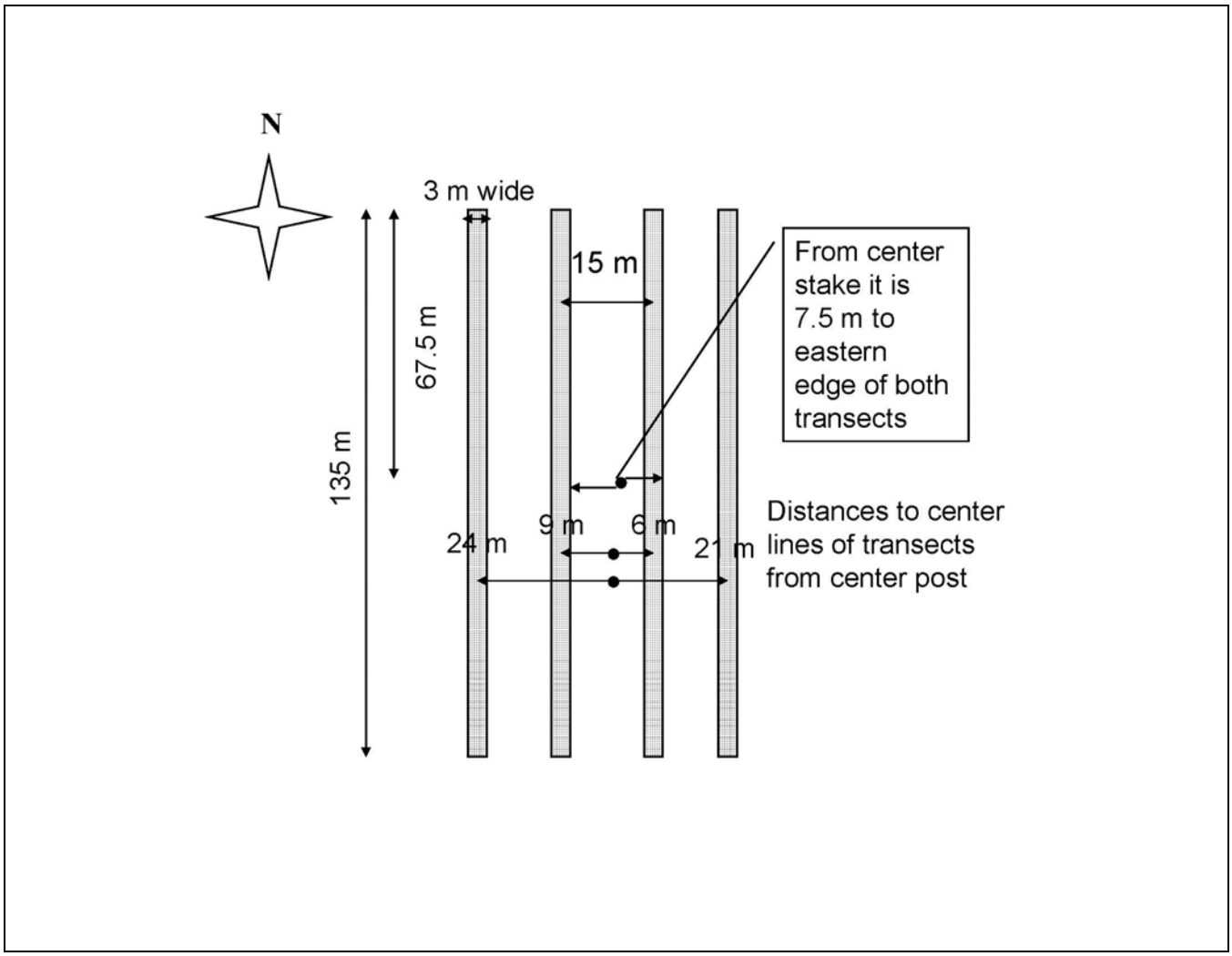

Figure 4. Diagram of study plot transect layout.

C. Treatment Application

CNLM staff applied vegetation treatments to all six of the mow plots and all six of the burn plots in spring of 2008. In 2009, only three of the mow plots and three of the burn plots were treated. All six graze plots were treated in 2009. Photographs of study plot treatment application are in Appendix 1. Examples of each study plot treatment application can be found in Table 1.

Table 1. Study plots by treatments and year(s).

Block/Plot	Treatment	Year(s) Treated
B1P1	Graze	2009
B1P2	Graze	2009
B1P3	Mow	2008 & 2009
B1P4	Mow	2008

B1P5	Burn	2008 & 2009
B1P6	Burn	2008
B1P7	Control	N/A
B2P1	Mow	2008 & 2009
B2P2	Mow	2008
B2P3	Graze	2009
B2P4	Control	N/A
B2P5	Graze	2009
B2P6	Burn	2008 & 2009
B2P7	Burn	2008
B3P1	Mow	2008
B3P2	Graze	2009
B3P3	Burn	2008 & 2009
B3P4	Burn	2008
B3P5	Control	N/A
B3P6	Mow	2008 & 2009
B3P7	Graze	2009

1. Grazing
   Logistical complications prevented the grazing of plots in 2008. CNLM either had to provide 200 acres of forage to make it worthwhile for the herder to bring his sheep to the site or CNLM would have had to pay $3,500 to graze the plots. An agreement was reached with CDFG to graze larger portions of their French Valley Wildlife Area (center of Johnson Ranch) as part of a different research question regarding grazing. This additional acreage made it worthwhile for the sheepherder to graze the experimental plots in 2009. Therefore, all six of the graze plots were treated in 2009, and the grazing portion of the study did not follow the methodology of treating only three of the plots in the following year.

2. Mowing
   Mowing was applied using a PTO-driven rotary mower attached to a small John Deere 4300 tractor. Mowing was timed according to phenology of the dominant grass species—when grasses were flowering but not yet gone to seed (typically in late March or April). In 2008, the plots were mowed again about one month after the initial mowing because mustard (i.e. *Brassica geniculata*) had started to flower and threatened to replace the grasses. Plots were mowed only once in 2009.

3. Prescribed burn
   Prescribed burns were conducted by CAL-FIRE, with logistical support by CNLM. Burning was timed for when grasses where dry enough to burn, but had not yet dropped their seed. Burns were conducted in May of both 2008 and 2009.

D. Artificial Burrow Construction

Artificial BUOW burrows were installed the week of November 17th, 2008 following a modified design found in Barclay (2008).

Materials required:

- Plastic irrigation valve box w/ removable lid to serve as nesting chamber
- 2-3 meters of 10-cm diameter corrugated flexible plastic pipe for two burrow entrances
- 2 hollow concrete blocks to secure plastic pipe entrance tunnels at surface
- Rope for marking location of nest chamber at ground surface
- Small perching post (t-post, rebar, wood)
- Excavator

One burrow with two entrances was constructed in the middle of each study plots. Soil was excavated to the approximate depth of 91 cm (approx. three ft) using a backhoe. Plastic piping was attached to two sides of the irrigation boxes, rope was secured on the top of the box, and boxes were then carefully lowered down into the hole while keeping the plastic piping at the surface. The surface end of each plastic piping was inserted into a hollow concrete block to prevent the artificial tunnel from collapsing. Excavated soil was then pushed back into the hole and lightly compacted using a tractor. Small artificial perches were installed behind the burrow entrances. All burrows also had t-posts (for cameras) and rebar (for vegetation monitoring) installed within a short distance to the burrows that also served as artificial perches. Vegetation within an approximate five to ten meter radius was weed whacked down to a low height and maintained throughout the project duration.

The only slight modification to the design was to increase the depth to the bottom of the nest chamber; subsequently, the length of the plastic pipe was increased to keep the slope of the entrance similar to that in the original design. The reasoning for making the burrows deeper was to ensure that they are cool during summer months. The burrows Barclay (2008) installed were primarily in Sacramento, where temperatures are generally not as high those in Riverside County. Photographs of the burrow installation are in Appendix 1.

E. Artificial Burrow Monitoring

Artificial burrows were monitored by biologists and volunteers as well as by motion-activated wildlife cameras. After installation in late November 2008, biologists observed the burrows at least once monthly during breeding season (January – June) and four times during the non-breeding season (July – December). Twelve motion-activated wildlife cameras were installed in various treatment plots in each block in early February 2009 and were rotated throughout the plots during the duration of the project.

IV. BUOW Monitoring Results

A. 2009 Monitoring Season

During the 2009 breeding and post-breeding season, biologists documented frequent use of the artificial burrows by BUOW. BY the end of 2009, nineteen of the 21 artificial burrows (90%) were confirmed to have been visited by BUOW either by visual confirmation from biologist during monitoring session, by inspection of burrow site (pellets present), or by motion-activated cameras. Pellets were collected at each monitoring session in order to better track visitation to the burrows and to potentially determine prey availability. Results of pellet dissection were not available during the drafting of this report. Collection of pellets was discontinued in 2010 since BUOW are known to "decorate" their burrows with their own pellets and mammal scat in order to attract prey (Smith and Conway 2006). A messy burrow entrance can frequently be used to determine whether it is an active burrow and/or a nesting burrow (Short, pers. comm.). One pair was confirmed (at some point during the calendar year) at an artificial burrow (B2P7), but were observed utilizing a natural burrow about 50 meters south of the artificial burrow but still within the study plot. This pair and its three fledglings utilized the artificial burrow in B2P7 and other nearby artificial burrows throughout the year. A single BUOW was observed at B3P2 multiple times late in the breeding season, but was not paired. No pairs nested in the artificial burrows in 2009. Figure 5 shows locations of all BUOW nests in 2009.

Additional species detected by biologists and/or motion-activated cameras to be utilizing the artificial burrows and/or artificial burrow areas include western meadowlarks (*Sturnella neglecta*), red-tailed hawk (*Buteo jamaicensis*), barn owl (*Tyto alba*), mule deer (*Odocoileus hemionus*), Say's phoebe *(Sayornis saya)*, loggerhead shrike (*Lanius ludovicianus*), king bird (*Tyrannus* species), raven (*Corvus* species), American kestrel (*Falco sparverius*), turkey vulture (*Cathartes aura*), coyote (*Canis latrans*), long-tailed weasel (*Mustela frenata*), California ground squirrel (*Otospermophilus beecheyi*), brush rabbits (*Sylvilagus bachmani*), black-tailed jack rabbit (*Lepus californicus*), western spadefoot toad (*Spea hammondii*), variety of unidentifiable lizards, domesticated dogs and trespassing humans (*Homo sapien sapien*). An assortment of photos captured by the motion-activated cameras can be found in Appendix 1.

B. 2010 Monitoring Season

In February 2010, Kim Klementowski of CNLM, Dustin McLain of Riverside County Parks & Open Space District, and Bill Kronland of Western Riverside County MSHCP Monitoring Crew visited all of the artificial burrows with a peep scope. The peep scope is a small camera on the end of a long cable that can then be inserted down into the burrow tunnel and nest chamber to look for owl usage and to inspect the interior condition burrow condition (Photo in Appendix 1). Seven BUOW were detected during this monitoring session. One BUOW, which did not flush from inside the burrow, was confirmed through the peep scope to be banded on the left leg with 7M. Follow-up revealed the BUOW was banded at Johnson Ranch Preserve by Ms. Ginny Short in 2006. A second BUOW was discovered by binoculars during this monitoring session to be

banded, although no color or combo was confirmed, the band does appear to be white (Photo in Appendix 1). The peep scope also assisted in discovering some issues with eight different burrows. Two of the burrows (B3P3 and B3P4) appear to each have two collapsed tunnels rendering the burrows ineffective. These two burrows will be dug up and fixed in the fall, post-breeding season. Three of the burrows (B3P6 and B1P2) have one collapsed tunnel each; this has not rendered them ineffective as each of these burrows has seen visitation and one had a breeding pair with chicks. Three burrows in SHP (B2P1, P2, and P3) were discovered to be partially flooded inside the nest box. The cause is uncertain since there is no bottom on the irrigation box, but it was surmised that perhaps the water table was high in that immediate area. Options for solution to the flooding of these three boxes will be discussed during an upcoming newly planned BUOW Working Group Meeting.

During the February 2010 monitoring session, preliminary data were collected for a trial-run of the MSHCP BUOW Artificial Burrow Site Assessment (BUOW ABSA). Data collected includes weather conditions, vegetation characteristics surrounding the burrow, determination of other available burrows and perches, evidence of predators or predation, recommendation of maintenance needed, BUOW detection, and evidence of burrow usage. Due to data collection being a trial-run of multiple forms on a PDA, some data are incomplete. MSHCP ABSA data can be available upon request.

By completion of this report, biologists have confirmed three breeding pairs with chicks at three artificial burrows (B1P2 graze, B1P3 mow, B3P5 control). An additional fourth breeding pair had utilized 2-3 artificial burrows (B2P5 graze, B2P6 burn, B2P7 burn) within the same vicinity during the non-breeding season, but then moved to a natural burrow located about 20-meters from one of the artificial burrows. The natural burrow was still located within the prescribed burn treatment influence of plot B2P6. The male was frequently seen using the artificial burrow during the breeding season, as males are known to keep multiple burrows or "bachelor" burrows (pers. communication with Ginny Short 2010). Figure 5 shows locations of all BUOW nests in 2010.

Ginny Short performed two nights of trapping and banding in 2010 on May 24 and June 8. Of the three pairs confirmed to be breeding at the artificial burrows, seven chicks and the female were banded at plot B3P5 and the female from B1P2. Three chicks were banded from the natural burrow located in B2P6. Two unsuccessful attempts were made to capture and band chicks at B1P2 and B1P3; failure was due to the pairs still having eggs or very young hatchlings as proven later after reviewing motion-activated cameras. Chicks were first documented in pictures as emerging from the burrows on June 14 and June 15, respectively. Pictures also revealed that B1P2 had at least three chicks, while B1P3 had at least four chicks. Photographs of banding activities can be found in Appendix 1. Complete project monitoring data can be found in Appendix 2.

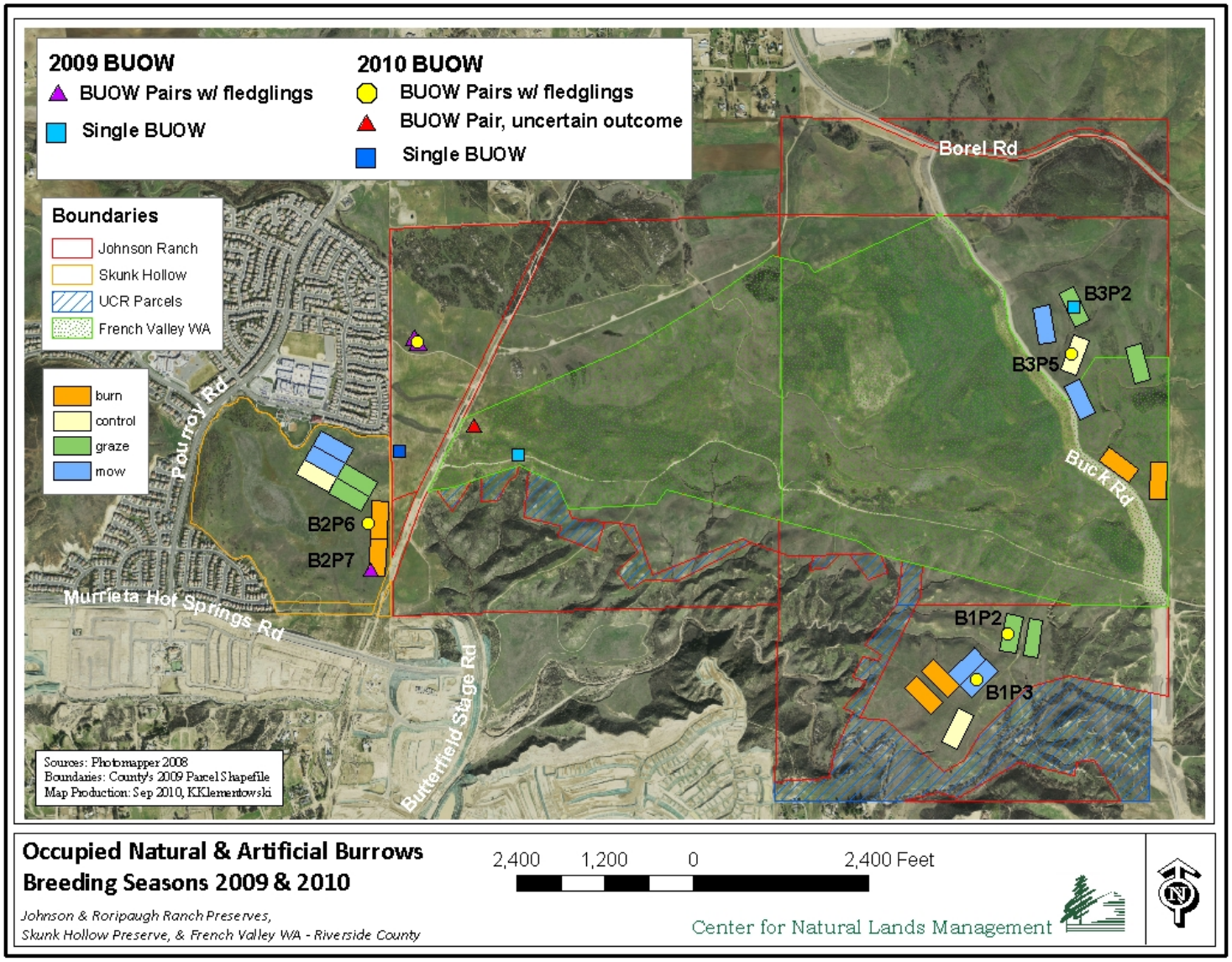

Figure 5. Locations of occupied natural and artificial BUOW burrows: 2009 & 2010 breeding seasons.

V. Vegetation Monitoring Results

See Appendix 3.

VI. Future Management Actions

- All artificial burrows will be peep scoped annually, prior to breeding season, to assess entrance tunnel and nest box conditions.
- Artificial burrows previously determined to have two clogged or collapsed tunnels will be rechecked via peep scope, then unearthed and repaired in fall/winter 2010; new tunnel material may be added or design improved.
- Artificial burrows previously determined to be flooded will be the subject of discussion among land managers participating in the soon to be organized BUOW Working Group. Options might include unearthing and moving burrows to a new location, leave burrows as is for use during non-breeding season burrows (i.e. dry season), or leave burrows as is for use during dry breeding seasons.
- A five to ten meter radius area will be weed whacked of vegetation multiple times throughout the year, every year, as need.
- Monthly monitoring of artificial burrows will occur February – August. Artificial burrows will be monitored at least three times between September and January.
- CNLM will coordinate monitoring efforts with MSHCP Monitoring Crew and utilize the new BUOW ABSA database.
- CNLM has designated a small amount of 2010-2011 fiscal year preserve management budget to increase BUOW banding efforts at both Johnson Ranch and Skunk Hollow Preserves. This will aide with monitoring efforts at a regional level and help in understanding local and regional BUOW dispersal.
- CNLM will continue to enhance habitat on an annual basis utilizing grazing, mowing, and/or prescribed burns. Treatment regime will likely be modified to a larger landscape perspective, with each block of seven plots being treated using just one of the tools. Control plots will remain as control plots. Vegetation data will be collected in spring 2011.

VII. References

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VIII. Appendices

Appendix 1. Photographs of project activities, BUOW, and other species.

CAL-Fire implementing prescribed burn within a study plot.

Two burn plots within larger prescribed burn; two mow plots can be distinguished from landscape in upper left hand corner of picture.

Sheep grazing in study plot, with artificial burrow and perches in center of picture, as captured by motion-activated camera.

CNLM staff preparing to mow study plot.

CNLM staff positioning artificial burrow entrances prior to burying.

CNLM staff completing artificial burrow installation.

Area around artificial burrowing being weed whacked to manage height of vegetation.


Artificial burrow with motion-activated camera positioned in front of burrow entrances.

Coyote pups (MSHCP species) playing in front of artificial burrows (family photographed within same study plot many times throughout 2009).

Long-tailed weasel (MSHCP species) captured in center left of picture.

Loggerhead shrike (MSHCP species); also captured pictures of pair within same plot.

Turkey vulture (MSHCP species)

American kestrels frequently utilized the artificial perches.

Barn owl pellets were sometimes found under perches.

CNLM, MSHCP, and County staff monitoring burrows using peep scope.

Coyote with burrowing owl in foreground; burrowing owl wearing unknown white bands.

Burrowing owl family, which bred in natural burrow located 20 meters from this artificial burrow, shown above using the artificial burrow after fledging. One owl is perched and three are positioned at left burrow entrance.

First picture of burrowing owl chicks emerging from artificial burrow B1P2. Camera confirmed at least three chicks from this artificial burrow.

Confirmation of at least four chicks at artificial burrow B1P3; female at far left is banded with XX.

Ginny Short setting up BUOW traps for banding activities.

Ginny Short assessing leg size of BUOW chick prior to banding.

Releasing BUOW chick back into artificial burrow.

Appendix 2: Complete project data

*Blue fill indicates successful breeding pair in or near artificial burrow
**Gray fill indicates maintenance of artificial burrow is needed

January 2009 – March 2009

Block/ Plot	Name	Burrow Azimuth	Treatment	Year(s) Treated	Plot Aspect	Date Installed	1/26/2009	2/5/2009	3/6/2009	3/20/2009
B1P1	No $ Down	10	Graze	2009	10	11/13/08	Lots of grass on top of and around burrow, coyote print in front of burrow - chewed on black plastic entrance	BUOW feather on wooden stake	Three droppings	One pellet, several droppings, barn owl pellet next to pole
B1P2	No HOA	10	Graze	2009	10	11/13/08	Lots of grass on top of and around burrow		Three pellets, several droppings	Two pellets (probably same as before), several droppings
B1P3	San Jacinto View	44	Mow	2008 & 2009	44	11/13/08	Two pellets, droppings			Droppings around perch
B1P4	Team Rat	44	Mow	2008	44	11/13/08	Two pellets, droppings		Four droppings	One pellet (old)

B1P5	Keith's Kottage	315	Burn	2008 & 2009	315	11/13/08				Several dropings
B1P6	Arroyo Ave	135	Burn	2008	315	11/13/08	Burrow was not placed at center of plot because of arroyo			Several droppings
B1P7	Palm Dos	36	Control	N/A	36	11/13/08			Several droppings	Several droppings
B2P1	Whooters	300	Mow	2008 & 2009	300	11/13/08	One pellet, some droppings			
B2P2	Casa Dulce	300	Mow	2008	300	11/13/08			Two droppings, front of entrance damp	Lots of droppings
B2P3	Home Sweet Home	300	Graze	2009	300	11/13/08			One dropping, entrance damp	Couple droppings
B2P4	Buena Vida	300	Control	N/A	300	11/13/08			Many droppings	Several droppings, signs of squirrels
B2P5	Welcome	300	Graze	2009	300	11/13/08			One dropping, entrance damp	Few droppings, signs of sqiurrels

B2P6	Lupine Hill	0	Burn	2008 & 2009	0	11/13/08			Entrance blocked by gopher dirt	One pellet, one beetle carcass, lots of droppings,
B2P7	Vernal Palace	180	Burn	2008	0	11/13/08		One BUOW using burrow on edge of plot	One BUOW at artificial burrow	Five pellets, one beetle carcass, lots of droppings
B3P1	Feliz	170	Mow	2008	350	11/6/08	Pellets, droppings	Old pellets	Three droppings	One pellet, several droppings
B3P2	Wilkkommen	334	Graze	2009	334	11/6/08				Four pellets, several droppings
B3P3	Front-Back	305	Burn	2008 & 2009	305	11/6/08			Two droppings	Few droppings
B3P4	Open House	0	Burn	2008	0	11/6/08			One dropping	

B3P5	For Rent	200	Control	N/A	20	11/6/08			One dropping	One BUOW flushed to B3P7, three pellets
B3P6	No Name	335	Mow	2008 & 2009	335	11/6/08		BUOW feathers and droppings	BUOW present, flew to B3P5 when flushed, three pellets, piece of rope	Five pellets, lots of droppings
B3P7	Foreclos ure	169	Graze	2009	349	11/6/08	One BUOW flushed from burrow	Flushed one BUOW	Three pellets, cobwebs over entrances	BUOW at left entrance flushed to nearby perch, Seven pellets

April 2009 – May 2009

Block/ Plot	4/9/2009	4/24/2009	5/11/2009	5/15/2009	5/28/2009
B1P1	One droping	Looks like sheep came thru and didn't do much			Few droppings
B1P2	Two droppings	Few droppings			
B1P3				Few droppings	
B1P4					
B1P5					
B1P6	Few droppings	One dropping			Few droppings

B1P7					
B2P1					
B2P2	Few droppings		Few droppings		
B2P3	Few droppings	Few droppings			
B2P4	Few droppings	Few droppings under perch	Lots of droppings		
B2P5	Lots of droppings under perch				
B2P6	Few droppings		A few droppings. Took out posts for burn.		

B2P7	BUOW pair now in natural burrow ~ 50' from artificial burrow; flushed pair from about 50'. Male perched in corner rebar scolding. Rabbit parent and baby in artificial burrow. One pellet at artificial burrow	BUOW at natural burrow. Flushed male, scolded, perched on stick next to burrow.	Natural burrow: Two owls, lots of pellets. Installed camera from B2P5 at natural burrow. Male was perched nearby, female came out of burrow while I was setting up, cleared some veg in front of camera.	Changed memory card and flushed male	Switched memory card, flushed male and female.
B3P1	Few droppings	Few droppings			Few droppings
B3P2	Few droppings	Grazed, doesn't look like much was eaten		One BUOW, two pellets, flushed owl, area around burrow grazed down very low.	One BUOW perched on rebar next to burrow, did not approach, took photo
B3P3					
B3P4					
B3P5	Four pellets, several droppings	Lots of droppings		BUOW from B3P2 perched on post, flew off back to B3P2	Lots of droppings

B3P6	Two pellets, several droppings	A few droppings , old, one barn owl pellet			
B3P7	One pellet. Several droppings, cobwebs over one entrance			Heavily grazed	Few droppings

June 2009 – December 2009

Block/ Plot	6/16/2009	8/5/2009	9/3/2009	9/19/2009	12/26/2009
B1P1				One pellet, some white wash, feathers near hole	One pellet, some droppings
B1P2	Barn owl pellets		Some white wash on stakes	Few pellets	Some pellets & droppings
B1P3	Looks like MODO was killed, can't read screen on camera well			One pellet, pile of feathers in hole	Pellets

B1P4					
B1P5					Two pellets
B1P6				Few pellets	One owl flushed to B1P7; pellets and droppings
B1P7					One owl, probably previously flushed from B1P6… flushed towards B1P6 or 5; some pellets & droppings
B2P1					
B2P2		Few droppings	Some pellets under post	Few pellets	Barn owl pellets
B2P3		Few droppings			
B2P4					
B2P5	Barn owl pellet, memory full on camera			One BUOW, few pellets, some droppings	Lots of pellets & droppings

B2P6		Few pellets, some white wash; no owl observed but owl from B2P7 flushed here when we checked that plot	One BUOW; flushed to B2P3	Few droppings	One BUOW, lots of pellets & droppings
B2P7	Both parents near/next to burrow, male on perch, female next to burrow, didn't approach, switched memory card	Two BUOW at artificial burrow, flushed to natural burrow then to B2P6	Two BUOW flushed away	Lots of pellets	Lots of pellets & droppings
B3P1			One BUOW; feathers at burrow		Pellets & droppings
B3P2	One BUOW, flushed, several pellets - did not collect, and coyote scat, he flew to B3P5 and then B3P6	Few pellets, some droppings		Pellets, feathers around both holes	Pellets & droppings
B3P3			One BUOW flushed down	Some droppings	Some pellets & white wash
B3P4					Some pellets & white wash

B3P5	BUOW from B3P2 for a few mins		Two pellets	Pellets & droppings	Pellets & droppings
B3P6	BUOW from B3P2 for a few mins		Few pellets, some droppings	Pellets	Pellets & droppings
B3P7	Few droppings		Few pellets	Pellets & droppings	Pellets & droppings

February 2010 – June 2010

Block/Plot	2/12/2010	3/5/2010 w/ peep scope	After BUOW LAG expired, but prior to Final Report being submitted
B1P1			
B1P2		West tunnel clogged	BUOW pair appears to be nesting; female trapped and banded w/ lrg brood patch; have been seen flushing to B1P1; 2nd trap attempt unsuccessful; follow-up in late June found at least 3 chicks

B1P3			BUOW pair appears to be nesting; female has recently been spotted outside burrow; hope to make another attempt to trap; 2nd attempt successfully trapped & banded female; follow-up in late June found at least 3 chicks
B1P4		Pipes clear; next box has 2" mud inside	
B1P5		One BUOW inside burrow	
B1P6	Few pellets		
B1P7			
B2P1		Standing water inside	
B2P2	Flooded entry	Standing water inside	
B2P3		Little bit of standing water inside; spadefoot toad inside	
B2P4	Standing water ~1"		
B2P5		Standing water inside	

B2P6	Saw two flush to this plot from B2P7, but was only one on-site; pellets & droppings		BUOW pair is utilizing natural burrow just west of artificial burrow as nesting burrow; male is utilizing artificial burrow as bachelor burrow (although female has recently been seen here); both m & f have been seen flushing to both B2P7 & 5; 3 chicks banded from natural burrow; follow-up in late June found chicks utilizing artificial burrow
B2P7	Two BUOW, flushed to B2P6; pellets & droppings	Two BUOW, one appears to be banded; flushed to B2P6	
B3P1	One BUOW flushed toward B3P5; some pellets & droppings	One BUOW, flushed to B3P5	
B3P2		One BUOW, banded with 7M on left leg; east tunnel clogged	
B3P3		Both sides clogged	

B3P4		Both sides clogged	
B3P5	One BUOW flushed toward B3P6; some droppings	Two BUOW (one from B3P1)	BUOW pair is utilizing artificial burrow; trapped and banded 7 chicks and female; have been seen flushing to and/or utilizing B3P1 & 2; male may be banded 7M (L)
B3P6	One BUOW flushed back toward B3P5; pieces of pellets	One BUOW flushed; one side clogged	
B3P7			