

FINAL REPORT FOR AGREEMENT P0750011

Increasing Reproduction of Cactus Wrens (*Campylorhynchus brunneicapillus*) through the Strategic Placement of Artificial Nesting Sites in the San Joaquin Hills, Orange County, California 2008-2010



RA Hamilton¹ and JC Burger, PhD²

¹Hamilton Biological, Inc., 316 Monrovia Ave., Long Beach, CA 90803

²Irvine Ranch Conservancy, 4727 Portola Parkway, Irvine, CA

Photo credit: RA Hamilton

INTRODUCTION

Consistent with our proposal dated March 25, 2008, the Irvine Ranch Conservancy and consulting biologist Robert Hamilton have built, installed, and monitored several experimental artificial nesting substrates for the Cactus Wren (*Campylorhynchus brunneicapillus*; CACW) in the Irvine Ranch Wildlands in central and coastal Orange County, California, within the larger Nature Reserve of Orange County. The wren is one of two avian “focal species” of the Natural Communities Conservation Plan (NCCP) for coastal sage scrub in southern California, and its populations in both the central and coastal NCCP reserves are of special conservation concern due to rapidly declining numbers, reduced availability of favorable habitat with adequate nesting sites related to the wildfires of the past 16 years, and increasingly isolated sub-populations.

Background

A remarkable variety of declining bird species have benefitted from the provision of nesting substrates designed to meet their specific ecological needs. In the following bullet-points, the quoted phrases are from species accounts in the Birds of North America online resource: (<http://bna.birds.cornell.edu/BNA/>):

- Common Loon (*Gavia immer*). “. . . people have built artificial nesting platforms that substitute for small island nest sites; these platforms float up and down with water level fluctuations, allowing loons to nest away from mainland.”
- Black-vented Shearwater (*Puffinus opisthomelas*). “Artificial burrows that were placed on Natividad I. in last week of Dec 1996 were occupied the following breeding season...”
- White-tailed Tropicbird (*Phaethon lepturus*). “On Bermuda, artificial nest burrows that are constructed in sides of quarry walls and retaining walls simulate natural burrows destroyed by house construction on waterfront properties. On Phoenix Is., stacking of rocks in ways that provided shaded nesting shelters created dens that were occupied by tropicbirds within hours. Because availability of predator-free nest sites appears to be the single most important factor in regulating White-tailed Tropicbird populations, a program is currently being implemented that will increase the number of available nest sites by making portable artificial nests for use in selected sites in Bermuda and throughout various islands in West Indies and Bahamas.”
- Osprey (*Pandion haliaetus*). “Osprey nests in trees are increasingly rare along the northeast coast of the U.S., as artificial nest sites provide more stable and predator-free sites for the species.”

- Peregrine Falcon (*Falco peregrinus*). "...variety of buildings, churches, and bridges in metropolitan centers, usually aided by artificial nest box..."
- Atlantic Puffin (*Fratercula arctica*). "Puffins at 2 historic nesting colonies off coastal Maine . . . restored by translocating chicks . . . to artificial burrow."
- Burrowing Owl (*Athene cunicularia*). "Olenick used artificial burrows during a nesting study in Idaho and induced 100% of pairs to use them if he replaced the natural burrow chosen by the owls with an artificial burrow 4–7 d after the owls arrived on the study area."
- Great Gray Owl (*Strix nebulosa*). "This owl readily accepts artificial platforms even when previously used natural ones are available. Nest success 83% on artificial platforms vs. 66% at natural sites. Thus artificial platforms bring better nest success and allow the birds to nest in habitat that has no natural sites."
- Red-cockaded Woodpecker (*Picoides borealis*). "The development of artificial cavity construction techniques has allowed enhancement of cavity tree clusters and even the establishment of new groups. While of great significance to the conservation of the species, it is critical that these techniques be treated for what they are—time and dollar expensive tools to assist a seriously troubled species. They are not substitutes for quality habitat."
- Eastern Bluebird (*Sialia sialis*). "Where nesting boxes are placed in suitable habitat, bluebirds sometimes appear so rapidly that it has been joked that they 'spontaneously generate at the site of boxes' (PAG). A key element in successful management is placement of suitable nesting cavities. Importantly, there is no statistical difference in likelihood of successful nesting in natural cavities or in artificial nesting boxes."
- Akepa (*Loxops coccineus*). "Maintenance of some populations may depend on provision of artificial nest cavities."

These brief examples indicate the range of declining species that have responded positively to the provision of artificial nest substrates. Such a "hands-on" approach seldom represents a resource manager's first choice but, when faced with a declining bird population that does not seem to be stabilizing on its own, the provision of artificial structures often represents a viable conservation strategy, or at least one component of such a strategy. At least three wren species in North America, the House (*Troglodytes aedon*), Bewick's (*Thryomanes bewickii*), and Carolina (*Thryothorus ludovicianus*), are known to regularly nest in bird houses. This suggests that other wren species may also select artificial structures for nest sites if the location, height, orientation, materials, and dimensions satisfy the ecological requirements of the target species.



For CACW in coastal southern California, which is exhibiting declining populations even in areas not directly affected by habitat loss due to wildfires or other causes, a comprehensive conservation strategy should seek to identify ecological factors apart from lack of adequate nesting sites that may be limiting CACW productivity and/or survivorship across large areas.

Creation and Installation

Artificial cactus models: Irvine Ranch Conservancy staff (originally, D. Olson) and Mr. Hamilton developed two artificial cactus models to encourage nesting of CACW. One model consists of loops of barbed wire wrapped around a metal-pipe frame and the other is composed of branched PVC piping with needles melted into the pipes and loops of barbed wire incorporated into the structure. Artificial structures are shown in Figure 1. Both are over 1.5m in height. Eight of the “wire” structures and seven of the “PVC” structures were assembled and set out in the field during the summer and fall months of 2008, after completion of CACW nesting. Before installation, seven sites—five in the NCCP coastal reserve and two in the central reserve—that were occupied by CACW in 2008 were identified for installation. Each site received one of each type of structure, with one site receiving two wire structures. At the time the structures were installed, we verified the continued presence of CACW pairs at each of the seven sites.

In January 2009, and again later in the Spring, small bundles of grass were added to structures to provide nesting material and encourage nesting. In March 2009 we inserted up to three small, V-shaped wooden platforms into most of the structures in an effort to improve the structures’ ability to hold a CACW nest.

Artificial cactus sites are shown in Figures 3 and 4 at the end of this report, and are identified as follows:

- Shady Canyon (coastal reserve; one of each prototype established)
- Strawberry Farm (coastal reserve; one of each prototype established)
- Mule Deer Trail (coastal reserve; one of each prototype established)
- Hwy. 133 (coastal reserve; two wire prototypes and one PVC prototype established)
- Crystal Cove (coastal reserve; one of each prototype established)
- Fremont Canyon (central reserve; one of each prototype established)
- Irvine Park (central reserve; one of each prototype established)

In January and February 2009, we were not able to find CACW at the Hwy. 133 site, which is about two acres in size. Since the wrens were always easy to find there

during the years when they occupied this patch, we concluded that this patch had become unoccupied some time in recent months. Per our February monitoring report, the two structures at the nearby Mule Deer Trail site had shown signs of possible wren interest, so the three structures were moved from the Hwy. 133 site to the Mule Deer Trail site. This was accomplished on March 3 2009.

CACW Nest boxes: In Spring 2009, CACW were observed nesting under a transmission box affixed on to a utility pole adjacent to - and well above - dense cactus scrub in San Dimas, Los Angeles County (Lance Benner, personal observation). This observation along with existing data supporting nesting preference for high points within suitable substrate led to the design and construction of a new nesting substrate prototype we refer to here as nest boxes. Nest boxes were constructed by Laguna Hills High School woodworking students, led by instructor Tom Williams. IRC staff completed construction and installed structures in December 2009 and early January 2010. See Figure 2 for nest box design. In total, 32 structures were installed at 16 sites across the North Ranch and City of Irvine Open Space Preserve South. All but one site had either been occupied by CACW in 2008 or at the time of installation. Two nest boxes were installed at one unoccupied site adjacent to a cactus restoration site (restoration also funded by DFG). See Figure 4 and 5 for nest box locations. Structures were installed in pairs at each site, with one box being affixed so that the base was horizontal and one affixed at a ca. 30 degree angle from horizontal. Holes were drilled into nest boxes to allow for drainage during rain events.

Monitoring

The purpose of the monitoring phase of this experimental study was to determine whether CACW were using any of the artificial structures as nesting sites (either for egg nests or brood/"dummy" nests). In January 2009 we began monthly visits to artificial cactus structures to record whether CACW were continuing to use the seven sites and whether they were using artificial structures for nesting or perching. Evidence that the birds are using the wire and/or PVC structures for nesting would indicate the potential to create usable CACW nesting habitat much more quickly after a wildfire event or as part of a restoration effort than would be possible relying upon the establishment of natural cactus patches. Natural cactus patches can take decades to grow large enough to be used by nesting wrens. During Summer and Winter 2009, sites were surveyed one additional time. Spring 2010 surveys will be conducted monthly at artificial nest and nest box sites.

For purposes of this study, CACW "use" is defined at three levels: (1) no evidence of visitation for nesting purposes; (2) evidence of nest-building, including construction of either brood or "dummy" nests; or (3) completed nest used for breeding, with breeding success determined through monitoring. Weathering of prototypes was recorded to determine their robustness in the field over the longer-term. If one of the experimental prototypes shows evidence of use by nesting wrens, more models of



the successful design will be constructed and installed where cactus resources are inadequate to provide suitable nesting sites but CACW would otherwise be able to establish.

During monitoring visits to each structure, the following information was recorded on a standardized data sheet:

- Observer(s)
- Nest presence/absence
- Grass presence/absence (clumps of grass were put into the structures beginning in fall 2008 in hopes of stimulating nesting behavior and we have kept track of whether the grass has remained in each structure or been removed, such as by rain, wind, or birds).
- Number of bird droppings on structure, as an estimate of how frequently birds are using the structures as perches. Although the species of bird involved typically cannot be determined in this manner, it may be useful to know which structures are being used by birds in general, even if not for nesting.
- Number and species of bird perched on structure. Again, this may give some indication of the structure's attractiveness to birds in general.
- Occurrence of CACW at site. We have kept track of whether each site still has CACW throughout the monitoring period. The loss of one or both CACW originally present would have obvious effects on the potential for wrens to nest at the structures.
- Whether playback was used to determine CACW status at the site.
- Start and end times of monitoring observations.
- Comments on anything potentially noteworthy observed during a monitoring visit.

SURVEY RESULTS

Artificial cactus models: To date, no CACW have constructed nests in any of the initial 15 artificial cactus structures. High counts of droppings on many (but not all) of the structures suggest that birds often use them as perches. We have observed the following species on structures: Morning Dove, Mockingbird, California Towhee, Cassin's Kingbird, House Finches, CACW, Blue-gray Gnatcatcher, and even California Gnatcatcher. Wire structures were slightly more commonly perched upon than PVC structures: 22% vs. 12% of surveys found perching birds on wire versus PVC, respectively. Marginally more bird droppings were found on wire versus PVC structures (mean = 26 droppings per visit vs. 17, respectively), but average numbers of droppings were similar. Note, however, that each wire structure had only one baffle and PVC structures had 4-5 baffles each. No differences were significant. In many cases, grass that we added to structures was removed between surveys. Overall, CACW were observed or heard in 76% of survey visits. Data summary does not include the March 2010 survey, though data are included in Appendix 1.

Surveys of artificial cactus structures and future nest box locations in late 2009 failed to detect CACW at the following previously occupied territories in the COI Open Space Preserve South: Shady Canyon¹, Strawberry Farms¹, Highway 133, and Crystal Cove. Spring surveys for 2010 began in February for both artificial cactus and nest box structures.

Nest boxes. Nest boxes were surveyed in February and March 2010 and will continue to be surveyed throughout the 2010 nesting season, after termination of the contract. To date, no CACW have been observed using nest boxes. However, CACW were observed at only six of the 16 sites at which nest boxes were installed.

CONCLUSIONS

At present, we have no evidence that CACW will use the artificial nest substrates constructed in this study. However, we have evidence that CACW can and do use artificial structures occasionally to reproduce (see Los Angeles County observation described above). Our efforts may be hampered by the necessity to test our hypotheses in the relatively few areas that have extant CACW pairs, all of which are characterized by high quality cactus scrub that has no shortage of attractive nesting sites. Still, the birds do build numerous nests, which increases the chances of them selecting one of the structures for a nesting substrate. The question remains unanswered whether land managers can identify the proper materials, dimensions, locations, height, and orientation that will persuade CACW to choose an artificial nesting substrate over the suitable natural substrates that are ubiquitous in mature cactus scrub. In addition to using all available knowledge of nesting preferences, other considerations in building structures include: (1) safety for wildlife, and (2) ample support and sufficient dimensions for a nest, and (3) some protection from predatory birds.

¹ CACW pair found during subsequent visits, however.





Figure 1. (A) Wire mesh and (B) PVC artificial nesting substrates.

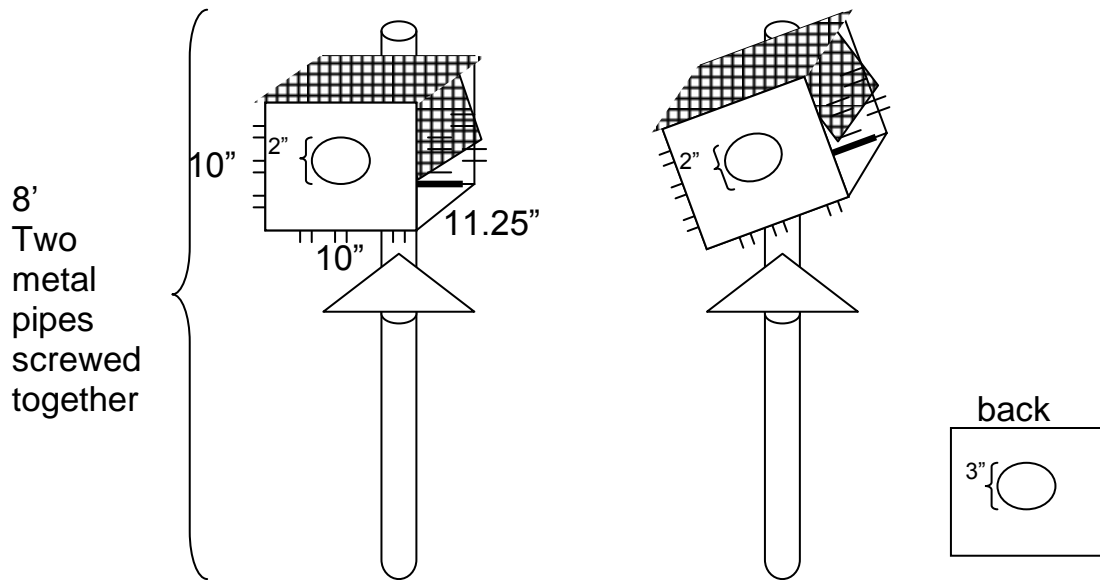


Figure 2. Nest box model. (A) Level; (B) tilted.



Figure 3. Installed nest boxes.

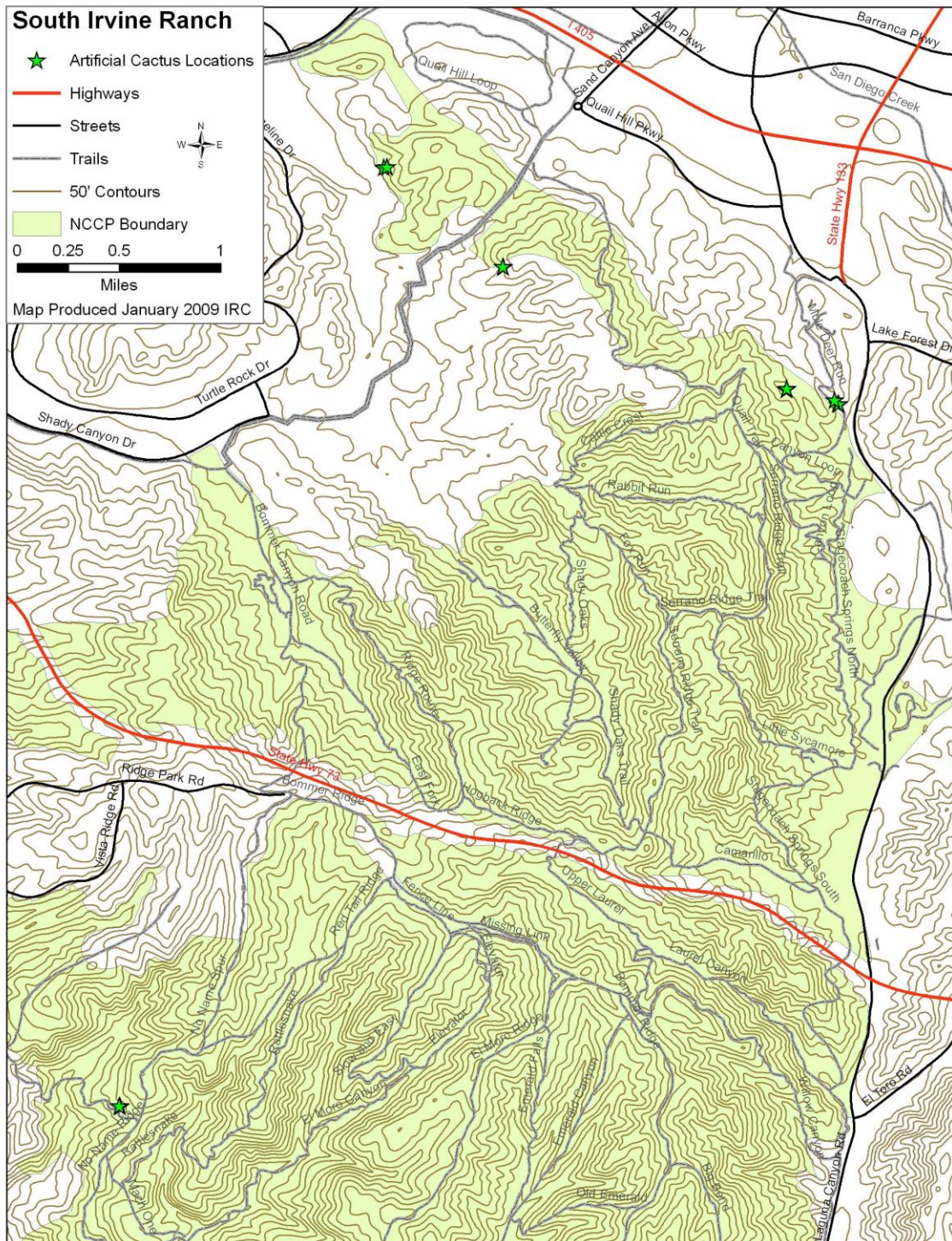


Figure 4. Artificial nesting substrate installation locations in the Orange County Coastal NCCP reserve. The northeastern structures shown above have been consolidated into one site.

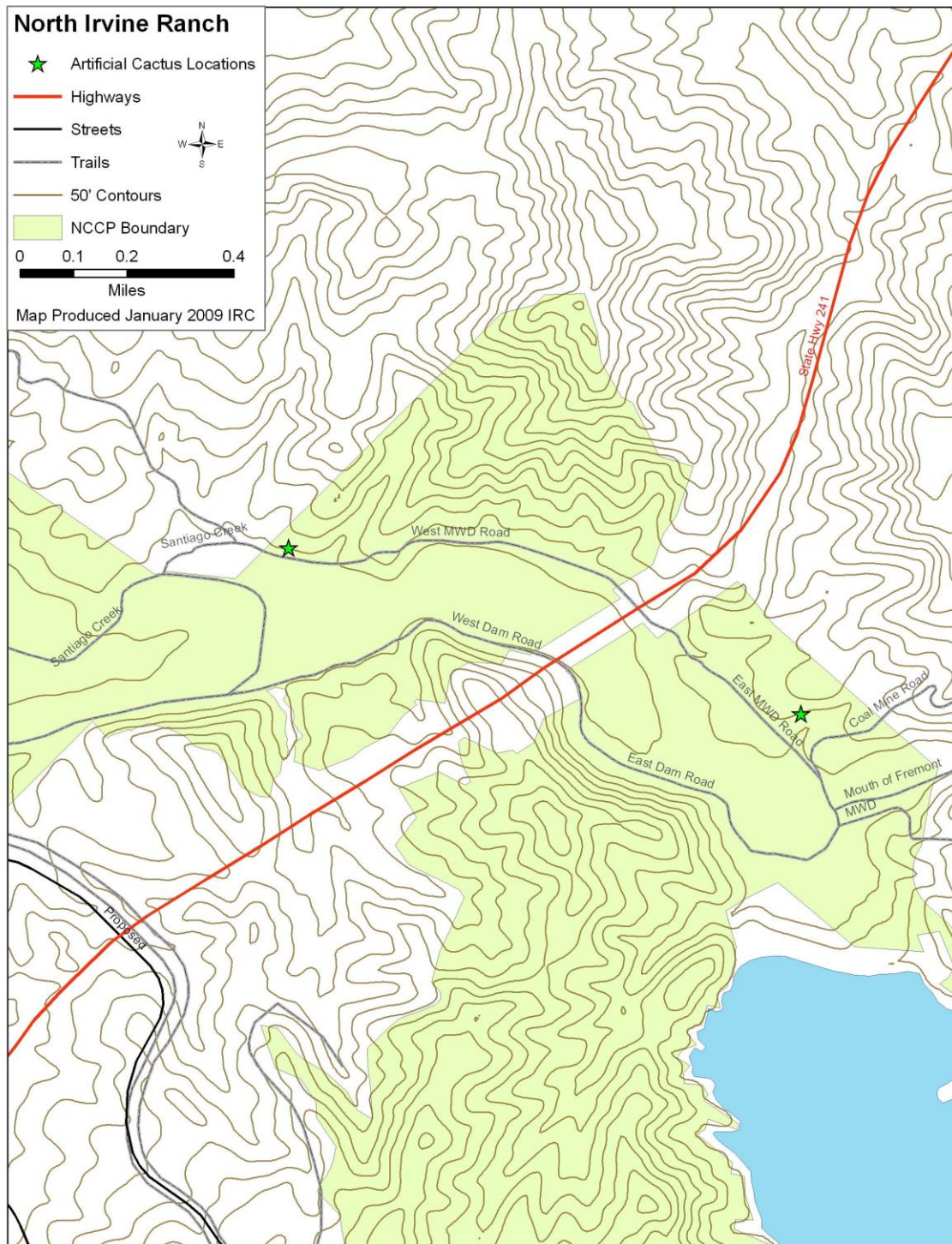


Figure 5. Artificial nesting substrate installation locations in the Orange County Central NCCP reserve.

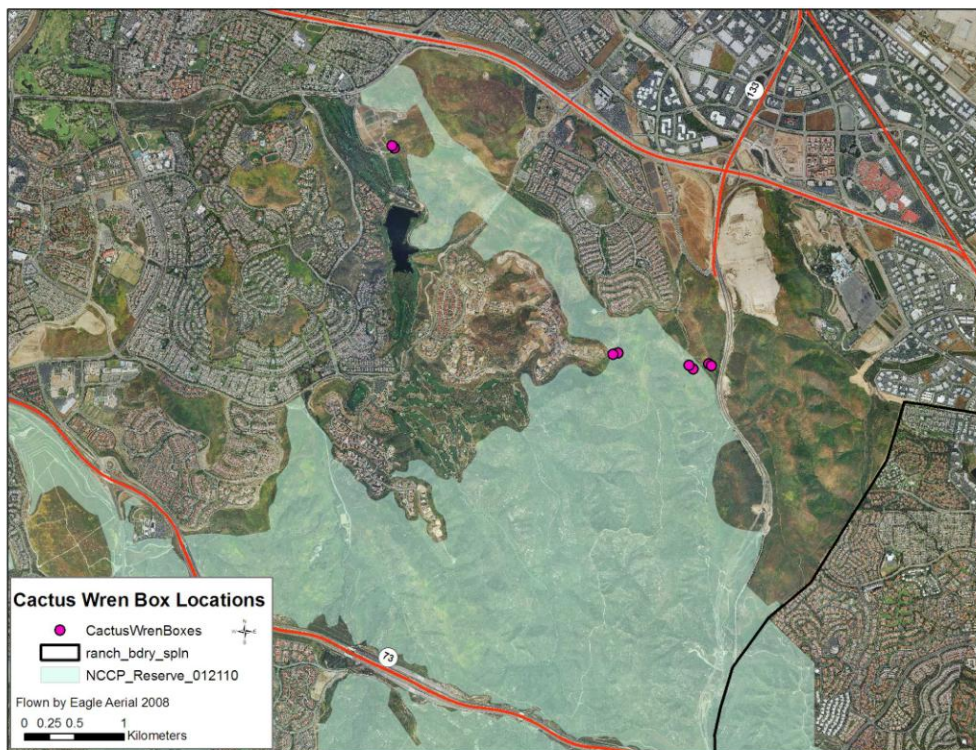
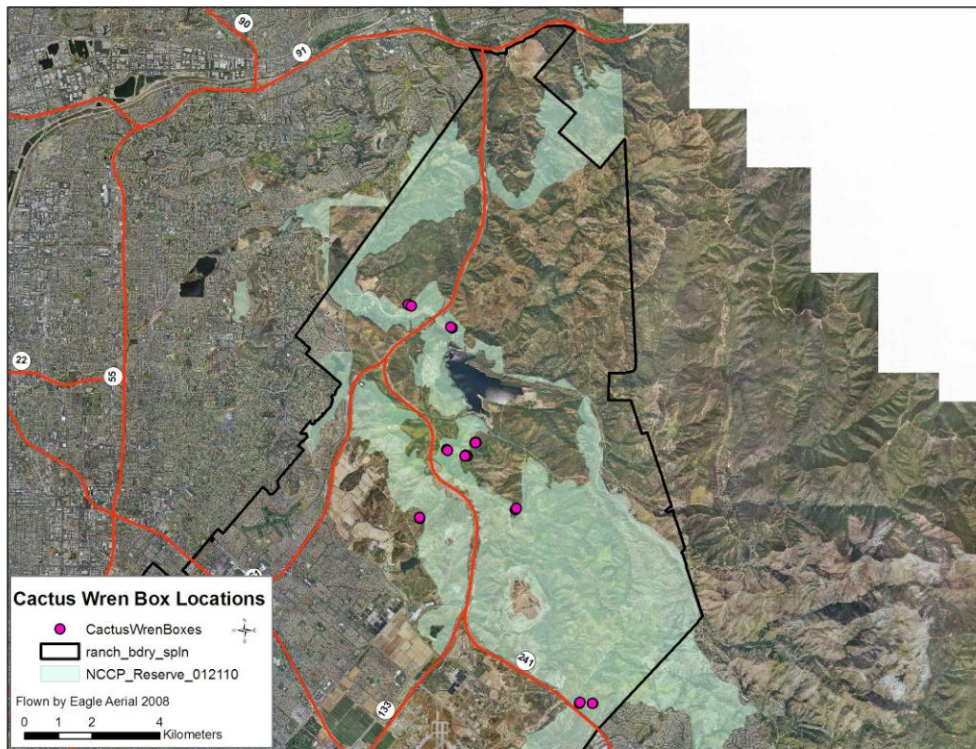


Figure 6. Nest box locations in (A) the North Ranch and (B) the City of Irvine Open Space Preserve South.

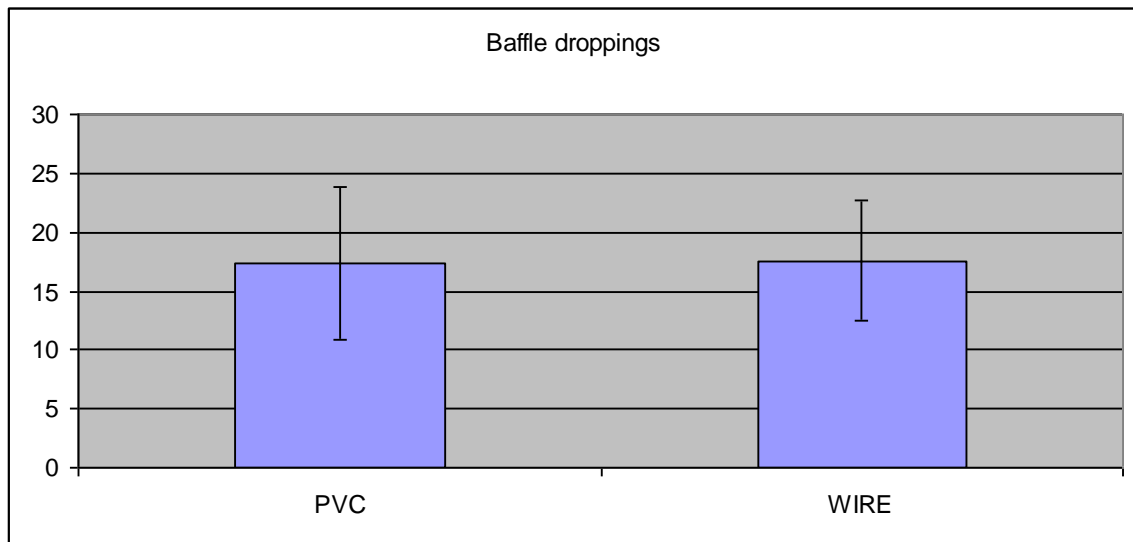


Figure 7. Average number of bird droppings per visit on rodent baffles fastened to PVC and wire mesh structures.

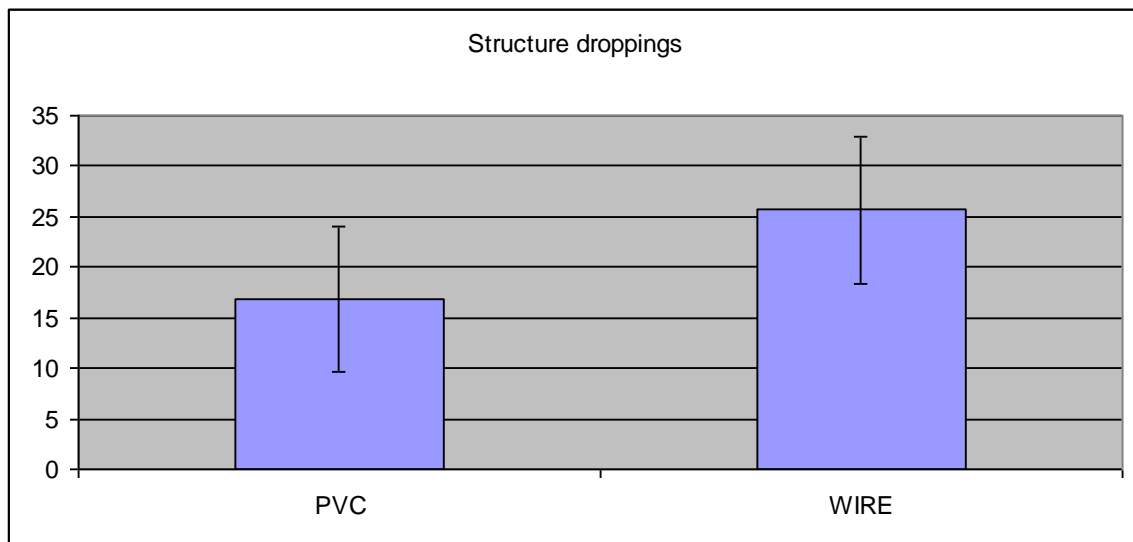


Figure 8. Average number of bird droppings per visit on PVC and barbed wire structures.

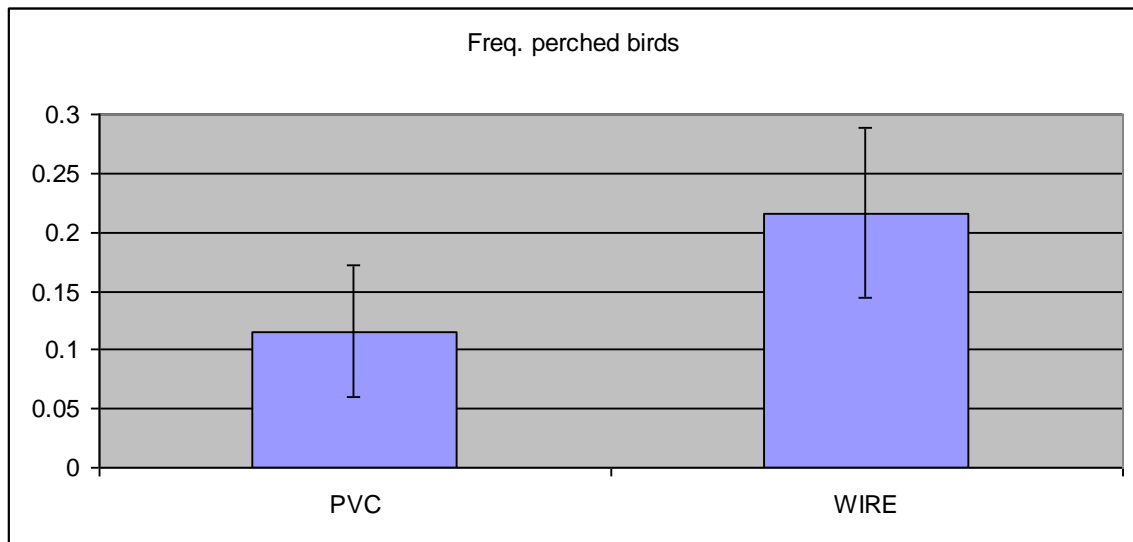


Figure 9. Frequency of visits during which birds perched on PVC and barbed wire structures.

Appendix 1. Raw data from field surveys.

Table 1. Survey Results for January 2009

Date	Site Name	Observers	Nest?	Grass?	Droppings On Baffles/Other	Bird(s) Perched?	CACW?	Playback?	Times	Comments
1/28/09	Shady_wire	JB, RH	No	some	2/0	—	Pair	Yes	10:22-11:00	Nest-building in cholla 60 m north of wire structure; CACW seen foraging on ground near nest site.
1/28/09	Shady_PVC	JB, RH	No	some	25/10	—	Pair	Yes	10:22-11:00	
1/28/09	Strawberry_wire	JB, RH	No	some	0/5	—	Male	Yes	11:35-11:55	2-m tall <i>O. oricola</i> near structures
1/28/09	Strawberry_PVC	JB, RH	No	some	7/5	—	Male	Yes	11:35-11:55	
1/28/09	Muledeer_wire	JB, RH	No	most	50/30	—	0	Yes	13:55-14:07	
1/28/09	Muledeer_PVC	JB, RH	No	some	9/0	—	0	Yes	13:55-14:07	
1/28/09	Hwy 133_wire_low	JB, RH	No	some	5/4	Cassin's Kingbird	0	Yes	13:15-13:40	
1/28/09	Hwy 133_wire_high	JB, RH	No	some	8/15	—	0	Yes	13:15-13:40	
1/28/09	Hwy 133_wire_PVC	JB, RH	No	some	2/2	—	0	Yes	13:15-13:40	
1/29/09	Crystal Cove_wire	RH	No	some	2/1	—	Male	Yes	14:20-15:00	Nest on south side of access road 30 m west of structures, in large patch of prickly-pear. Lone male calling "chuck" notes near structures, then flew 100 m west of structures.
1/29/09	Crystal Cove_PVC	RH	No	some	4/3	—	Male	Yes	14:20-15:00	
1/28/09	Fremont_wire	JB, RH	No	some	20/35	California Towhee	Pair	Yes	8:48-9:00	Pair 50 m NE at hilltop calling. Active nest with fresh grass and droppings low in prickly-pear, 20 m south of structures. Greater Roadrunner feather in nest.
1/28/09	Fremont_PVC	JB, RH	No	some	0/2	—	Pair	Yes	8:48-9:00	Lone male 100 m SW calling in <i>Malosma</i> .
1/28/09	Irvine Park_wire	JB, RH	No	some	0/0	—	Pair	Yes	8:15-8:45	
1/28/09	Irvine Park_PVC	JB, RH	No	some	5/0	—	Pair	Yes	8:15-8:45	Marks suggest bill-sharpening on PVC

Table 2. Survey Results for February 2009

Date	Site Name	Observers	Nest?	Grass?	Droppings On Baffles/Other	Bird(s) Perched?	CACW?	Playback?	Times	Comments
2/21/09	Shady_wire	RH	No	little	3/0	—	0	Yes	11:45-12:00	
2/21/09	Shady_PVC	RH	No	little	4/3	—	0	Yes	11:45-12:00	
2/21/09	Strawberry_wire	RH	No	little	6/2	—	0	Yes	12:15-12:45	
2/21/09	Strawberry_PVC	RH	No	little	5/2	—	0	Yes	12:15-12:45	
2/21/09	Muledeer_wire	RH	No	most	50/50	—	Pair	Yes	11:05-11:30	Lots of purple, seedy cactus droppings on wire structure. Only a few on PVC structure. Recommend moving the structures from Hwy. 133 to here.
2/21/09	Muledeer_PVC	RH	No	some	9/1	Northern Mockingbird	Pair	Yes	11:05-11:30	Pair foraging apart from each other in the canyon on either side of the nest structures.
2/21/09	Hwy 133_wire_low	RH	No	some	4/2	—	0	Yes	10:45-11:00	
2/21/09	Hwy 133_wire_high	RH	No	some	3/8	—	0	Yes	10:45-11:00	
2/21/09	Hwy 133_wire_PVC	RH	No	some	2/2	—	0	Yes	10:45-11:00	
2/21/09	Crystal Cove_wire	RH	No	some	3/3	—	Pair	Yes	09:35-10:15	Pair 50 m north of structures.
2/21/09	Crystal Cove_PVC	RH	No	some	0/0	—	Pair	Yes	09:35-10:15	
2/21/09	Fremont_wire	RH	No	some	12/3	—	Pair	Yes	13:40-14:00	Some purple, seedy cactus droppings on structure.
2/21/09	Fremont_PVC	RH	No	little	3/2	—	Pair	Yes	13:40-14:00	One cactus dropping on structure.
2/21/09	Irvine Park_wire	RH	No	little	5/0	—	Pair	Yes	13:15-13:35	Pair 50 m north of structures.
2/21/09	Irvine Park_PVC	RH	No	little	4/0	—	Pair	Yes	13:15-13:35	

Table 3. Survey Results for March 2009

Date	Site Name	Obs	Nest?	Grass?	Droppings On Baffles/Other	Bird(s) Perched?	CACW?	Playback?	Times	Comments
3/27/09	Shady_wire	RH	No	No	17/30	Blue-gray Gnatcatcher	Male	Yes	1435-1510	2 nest platforms installed
3/27/09	Shady_PVC	RH	No	No	15/10	Northern Mockingbird	Male	Yes	1525-1545	1 nest platform installed
3/27/09	Strawberry_wire	RH	No	No	6/0	—	0	Yes	1525-1545	1 nest platform installed
3/27/09	Strawberry_PVC	RH	No	Some	10/5	—	0	Yes	1600-1630	No nest platform installed
3/27/09	Muledeer_wire_upstream	RH	No	Some	10/7	—	0	Yes	1600-1630	2 nest platforms installed
3/27/09	Muledeer_wire middle	RH	No	Some	10/20	—	0	Yes	1600-1630	Photo; 2 nest platforms installed
3/27/09	Muledeer_wire_downstream	RH	No	Little	50/50	—	0	Yes	1600-1630	2 nest platforms installed
3/27/09	Muledeer_PVC high	RH	No	Some	50/50	—	0	Yes	1600-1630	Photo; 1 nest platform installed
3/27/09	Muledeer_PVC low	RH	No	Some	10/25	—	0	Yes	1600-1630	1 nest platform installed
3/27/09	Crystal Cove_wire	RH	No	Some	7/4	—	Male	Yes	1345-1410	No nest platform installed
3/27/09	Crystal Cove_PVC	RH	No	Some	1/2	—	Male	Yes	1345-1410	No nest platform installed
3/27/09	Fremont_wire	RH	No	Some	15/15	—	Male	No	1705-1735	2 nest platforms installed
3/27/09	Fremont_PVC	RH	No	little	2/4	—	Male	No	1705-1735	No nest platform installed
3/27/09	Irvine Park_wire	RH	No	Little	1/2	—	Pair	No	1740-1800	2 nest platforms installed
3/27/09	Irvine Park_PVC	RH	No	Little	1/0	—	Pair	No	1740-1800	1 nest platform installed

Table 4. Survey Results for April 2009

Date	Site Name	Obs	Nest?	Grass?	Droppings On Baffles/Other	Bird(s) Perched?	CACW?	Playback?	Times	Comments
4/28/09	Shady_wire	RH	No	None	20/20	California Gnatcatchers	No	Yes	8:39-9:18	Pair of gnatcatchers came to structure in response to Cactus Wren playback (photo of female)
4/28/09	Shady_PVC	RH	No	None	45/35	—	No	Yes	8:39-9:18	
4/28/09	Strawberry_wire	RH	No	None	18/4	—	Heard	Yes	8:04-8:31	
4/28/09	Strawberry_PVC	RH	No	None	35/25	—	Heard	Yes	8:04-8:31	
4/28/09	Muledeer_wire_upstream	RH	No	None	20/100	—	No	Yes	9:34-9:54	
4/28/09	Muledeer_wire middle	RH	No	Some	35/60	2 House Finches	No	Yes	9:34-9:54	
4/28/09	Muledeer_wire_downstream	RH	No	Some	80/70	Costa's Hummingbird	No	Yes	9:34-9:54	
4/28/09	Muledeer_PVC high	RH	No	None	120/100	Mourning Dove	No	Yes	9:34-9:54	
4/28/09	Muledeer_PVC low	RH	No	None	25/35	—	No	Yes	9:34-9:54	
4/30/09	Crystal Cove_wire	RH	No	Some	4/1	—	Juvenile	Yes	7:10-7:42	
4/30/09	Crystal Cove_PVC	RH	No	Some	6/2	—	Juvenile	Yes	7:10-7:42	
4/28/09	Fremont_wire	RH	No	Some	12/20	CACW perched on structure	Adult at site	Yes	10:31-11:11	Artemisia californica growing into structure;
4/28/09	Fremont_PVC	RH JB	No	Some	3/5	—	Adult at site	Yes	10:31-11:11	
4/28/09	Irvine Park_wire	RH JB	No	Some	6/10	—	Adult 70 E of site	Yes	11:15-12:20	Cactus Wren brood nest in cactus within 10 feet of PVC structure (photo).
4/28/09	Irvine Park_PVC	RH JB	No	None	7/7	—	Adult 70 E of site	Yes	11:15-12:20	

Table 5. Survey Results for May 2009

Date	Site Name	Obs.	Nest?	Grass?	Droppings Baffles/Other	Bird Perched?	CACW?	Playback?	Times	Comments
5/31/09	Shady_wire	RH	No	None	20/20	California Gnatcatcher	No	No	8:39-9:18	Pair of CAGN came to structure in response to playback
5/31/09	Shady_PVC	RH	No	None	45/35	.	No	No	8:39-9:18	—
5/31/09	Strawberry_wire	RH	No	None	18/4	.	Heard	Yes	8:04-8:31	—
5/31/09	Strawberry_PVC	RH	No	None	35/25	.	Heard	Yes	8:04-8:31	—
5/31/09	Muledeer_wire_upstre am	RH	No	None	20/100	.	No	Yes	9:34-9:54	—
5/31/09	Muledeer_wire middle	RH	No	None	35/60	2 House Finches	No	Yes	9:34-9:54	—
5/31/09	Muledeer_wire_downs tream	RH	No	Some	80/70	Costa's Hummingbird!	No	Yes	9:34-9:54	—
5/31/09	Muledeer_PVC high	RH	No	None	120/100	Mourning Dove	No	Yes	9:34-9:54	—
5/31/09	Muledeer_PVC low	RH	No	None	25/35	.	No	Yes	9:34-9:54	—
5/31/09	Crystal Cove_wire	RH	No	Some	4/1	.	Juvenile	Yes	7:10-7:42	—
5/31/09	Crystal Cove_PVC	RH	No	Some	6/2	.	Juvenile	Yes	7:10-7:42	—
5/31/09	Fremont_wire	RH	No	Some	12/20	.	Pair SE of site	Yes	10:31-11:11	Artemisia growing in structure
5/31/09	Fremont_PVC	RH	No	Some	3/5	.	Pair SE of site	Yes	10:31-11:11	
5/31/09	Irvine Park_wire	RH	No	Some	6/10	.	Adult w food near structure	Yes	11:15- 12:20	CAWR brood nest w/in 10' of structure
5/31/09	Irvine Park_PVC	RH	No	None	7/7	.	Adult w food near structure	Yes	11:15- 12:20	

Table 6. Survey Results for June 2009

Date	Site Name	Obs	Nest?	Grass?	Droppings On Baffles/Other	Bird(s) Perched?	CACW?	Playback?	Times	Comments
6/28/09	Shady_wire	RH JB	No	None	23/55	California Gnatcatcher	Adult ~30 m north of site	Yes	9:40-10:15	CAGN female and juvenile came to structure in response to Cactus Wren playback
6/28/09	Shady_PVC	RH JB	No	None	70/62	—	Adult ~30 m north of site	Yes	9:40-10:15	
6/28/09	Strawberry_wire	RH JB	No	None	35/18	—	No	Yes	9:00-9:30	10 mouse droppings on baffle; Rhus integrifolia growing into structure. 4 sticks placed in structure – nest investigation?
6/28/09	Strawberry_PVC	RH JB	No	None	58/35	—	No	Yes	9:00-9:30	
6/28/09	Muledeer_wire_upstream	RH JB	No	None	27/100+	—	Adult ~80 m south of site	Yes	10:40-11:30	
6/28/09	Muledeer_wire middle	RH JB	No	None	60/60	House Finch	Adult ~80 m south of site	Yes	10:40-11:30	
6/28/09	Muledeer_wire_downstrea m	RH JB	No	None	35/100+	—	Adult ~80 m south of site	Yes	10:40-11:30	
6/28/09	Muledeer_PVC high	RH JB	No	None	80/100+	—	Adult ~80 m south of site	Yes	10:40-11:30	
6/28/09	Muledeer_PVC low	RH JB	No	None	80/90	—	Adult ~80 m south of site	Yes	10:40-11:30	
6/28/09	Crystal Cove_wire	RH JB	No	Some	8/8	California Towhee	Juvenile	Yes	7:25-8:00	
6/28/09	Crystal Cove_PVC	RH	No	Some	5/14	—	Juvenile	Yes	7:25-8:00	30 mouse droppings on baffles; ARCA growing into structure
6/28/09	Fremont_wire	RH JB	No	Some	11/35	—	Pair SE of site	Yes	13:30-13:50	
6/28/09	Fremont_PVC	RH JB	No	Some	12/25	—	Pair SE of site	Yes	13:30-13:50	
6/28/09	Irvine Park_wire	RH JB	No	Some	48/50	—	Adult with food near structures	Yes	13:05-13:25	
6/28/09	Irvine Park_PVC	RH JB	No	None	16/18	—	Adult with food near structures	Yes	13:05-13:25	

Table 7. Survey Results for February 2010

Date	Site Name	Obs.	Nest?	Grass?	Droppings Baffles/Other	Bird Perched?	CACW?	Playback?	Times	Comments (weathering/integrity)
2/4/10	Fremont_wire	RH, SA	No	None, added	0/10	Northern Mockingbird	2 Pair 50m upslope & 20m downslope	Yes	9:40 – 9:50	—
2/4/10	Fremont_PVC	RH, SA	No	None, added	0/8	—	2 Pair 50m upslope & 20m downslope	Yes	9:40 – 9:50	—
2/4/10	Irvine Park_wire	RH, SA	No	None, added	5/10	—	Pair ~50m East	Yes	9:00 – 9:15	—
2/4/10	Irvine Park_PVC	RH, SA	No	None, added	0/2	—	Pair ~50m East	Yes	9:00 – 9:15	—
2/8/10	Strawberry_wire	RH	No	None	0/1	—	Pair near PVC structure	Yes	11:50 – 12:10	—
2/8/10	Strawberry_PVC	RH	No	None	0/0	—	Pair near PVC structure	Yes	11:50 – 12:10	—
2/8/10	Shady_wire	RH	No	None	0/3	—	Pair at top of slope	Yes	12:50 – 13:20	—
2/8/10	Shady_PVC	RH	No	None	0/1	—	Pair at top of slope	Yes	12:50 – 13:20	—
2/8/10	Muledeer_wire_upstream	RH	No	None	1/4	—	Pair downstream near boxes	Yes	14:20 – 14:45	structure fell over
2/8/10	Muledeer_wire middle	RH	No	None	5/15	Northern Mockingbird	Pair downstream near boxes	Yes	14:20 – 14:45	—
2/8/10	Muledeer_wire_ downstream	RH	No	None	3/17	—	Pair downstream near boxes	Yes	14:20 – 14:45	—
2/8/10	Muledeer_PVC high	RH	No	None	3/7	—	Pair downstream near boxes	Yes	14:20 – 14:45	—
2/8/10	Muledeer_PVC low	RH	No	None	0/5	—	Pair downstream near boxes	Yes	14:20 – 14:45	—
	Crystal Cove_wire							Yes		
	Crystal Cove_PVC							Yes		

Date	Site Name	Obs.	Nest?	Grass?	Droppings Baffles/Other	Bird Perched?	CACW?	Playback?	Times	Comments (weathering/integrity)
CACW Nest Boxes *										
2/4/10	Fremont A	RH, SA	No	None, added	0/0	—	No	Yes	9:53 – 10:05	Box integrity OK
2/4/10	Fremont B	RH, SA	No	None, added	0/0	—	No	Yes	9:53 – 10:05	Could staple wire down to box
2/4/10	Irvine Park West A	RH, SA	No	None, added	0/1	—	No	Yes	8:45 – 9:00	Box integrity OK
2/4/10	Irvine Park West B	RH, SA	No	None, added	0/5	—	No	Yes	8:45 – 9:00	Back wall bowed out
2/4/10	Irvine Park East A	RH, SA	No	None, added	0/0	—	Pair ~50m East	Yes	9:00 – 9:15	Box integrity OK
2/4/10	Irvine Park East B	RH, SA	No	None, added	2/8	—	Pair ~50m East	Yes	9:00 – 9:15	Box integrity OK
2/4/10	Shoestring 1A	RH, SA	No	None, added	0/5	—	No	Yes	11:15 – 11:25	Box integrity OK
2/4/10	Shoestring 1B	RH, SA	No	None, added	0/5	—	No	Yes	11:15 – 11:25	Bottom buckling
2/4/10	Shoestring 2A	RH, SA	No	None, added	0/4	—	No	Yes	11:20 – 11:25	Box integrity OK
2/4/10	Shoestring 2B	RH, SA	No	None, added	0/0	—	No	Yes	11:22 – 11:25	Box integrity OK
2/4/10	Shoestring 3A	RH, SA	No	None, added	0/0	—	No	Yes	11:00 - 11:10	Box integrity OK
2/4/10	Shoestring 3B	RH, SA	No	None, added	0/0	—	No	Yes	11:00 - 11:10	Box integrity OK
2/4/10	Shoestring 4A	RH, SA	No	None, added	0/0	—	No	Yes	10:48 – 11:10	Side bowed out
2/4/10	Shoestring 4B	RH, SA	No	None, added	0/0	—	No	Yes	10:55 – 11:10	Box integrity OK
2/4/10	Loma Hilltop A	RH, SA	No	None, added	0/1	—	No	Yes	11:35 – 11:50	Box integrity OK
2/4/10	Loma Hilltop B	RH, SA	No	None, added	0/1	—	No	Yes	11:47 – 11:50	Box integrity OK

Date	Site Name	Obs.	Nest?	Grass?	Droppings Baffles/Other	Bird Perched?	CACW?	Playback?	Times	Comments (weathering/integrity)
2/4/10	Hicks Haul Rd. A	RH, SA	No	None, added	0/3	—	Pair very close	Yes	12:15 – 12:23	Top of post appears broken/rough
2/4/10	Hicks Haul Rd. B	RH, SA	No	None, added	1/1	—	Pair very close	Yes	12:15 – 12:23	Box integrity OK
2/4/10	Orchard Hills A	RH, SA	No	None, added	0/0	—	No	Yes	12:55 – 1:10	Box integrity OK
2/4/10	Orchard Hills B	RH, SA	No	None, added	0/0	—	No	Yes	12:55 – 1:10	Bowed bottom
2/4/10	Agua Chinon 1A	RH, SA	No	None, added	0/0	—	No	Yes	2:17 – 2:40	Box integrity OK
2/4/10	Agua Chinon 1B	RH, SA	No	None, added	0/0	—	No	Yes	2:15 – 2:40	Sides a little detached
2/4/10	Agua Chinon 2A	RH, SA	No	None, added	0/0	—	Pair in orchard	Yes	2:25 – 2:33	Small gap on bottom between side wall
2/4/10	Agua Chinon 2B	RH, SA	No	None, added	0/0	—	Pair in orchard	Yes	2:25 – 2:33	Box integrity OK
2/8/10	Strawberry Farm 1A	RH	No	None, added	0/0	—	No	Yes	11:30 – 11:45	Box integrity OK
2/8/10	Strawberry Farm 1B	RH	No	None, added	0/0	—	No	Yes	11:30 – 11:45	Box integrity OK
2/8/10	Shady Canyon A	RH	No	None, added	0/30	Northern Mockingbird	No	Yes	13:30 – 14:10	Box integrity OK
2/8/10	Shady Canyon B	RH	No	None, added	0	—	No	Yes	13:30 – 14:10	Box integrity OK
2/10/10	Hwy. 133 A	RH	No	None, added	0/5	—	No	Yes	15:25 – 15:40	Box integrity OK; box too close to tall scrub vegetation, possible snake access issue
2/10/10	Hwy. 133 B	RH	No	None, added	0/4	—	No	Yes	15:25 – 15:40	Box integrity OK
2/8/10	Muledeer A	RH	No	None, added	0/7	—	Pair very close	Yes	14:50 – 15:00	Box integrity OK
2/8/10	Muledeer B	RH	No	None, added	0/4	—	Pair very close	Yes	14:50 – 15:00	Box integrity OK

* Tilted (slanted) nest boxes = A, while untitled boxes = B

Table 7. Survey Results for March 2010

Date	Site Name	Obs.	Nest?	Grass?	Droppings Baffles/Other	Bird Perched?	CACW?	Playback?	Times	Comments (weathering/integrity)
3/13/10	Fremont_wire	RAH	No	some; added	3/10	see note	pair came to wire structure	Yes	1210-1230	CACW pair came in to wire structure in response to playback, and hopped around inside the structure for about 45 seconds
3/13/10	Fremont_PVC	RAH	No	some; added	5/5	No	pair came to wire structure	Yes	1210-1230	—
3/13/10	Irvine Park_wire	RAH	No	some; added	3/10	No	pair heard >100 meters west	Yes	1232-1245	—
3/13/10	Irvine Park_PVC	RAH	No	some; added	4/2	No	pair heard >100 meters west	Yes	1232-1245	—
3/5/10	Strawberry_wire	RH, SA	No	None	5/10	—	Single bird ~100 m. east	Yes	8:10 – 8:30	—
3/5/10	Strawberry_PVC	RH, SA	No	None	5/12	—	Single bird ~100 m. east	Yes	8:10 – 8:30	One leg & baffle fallen, still sturdy
3/5/10	Shady_wire	RH, SA	No	None, added	1/5	—	Pair at top of slope	Yes	8:40 – 9:10	—
3/5/10	Shady_PVC	RH, SA	No	None, added	15/20	California Towhee	Pair at top of slope	Yes	8:40 – 8:10	—
3/5/10	Muledeer_wire_upstream	RH, SA	No	None, added	2/10	—	Pair downstream near boxes	Yes	10:15 – 10:30	structure fixed
3/5/10	Muledeer_wire middle	RH, SA	No	None, added	5/20	—	Pair downstream near boxes	Yes	10:15 – 10:30	—
3/5/10	Muledeer_wire_ downstream	RH, SA	No	None, added	10/30	—	Pair downstream near boxes	Yes	10:15 – 10:30	—
3/5/10	Muledeer_PVC high	RH, SA	No	None, added	15/25	—	Pair downstream near boxes	Yes	10:15 – 10:30	—
3/5/10	Muledeer_PVC low	RH, SA	No	None, added	10/10	—	Pair downstream near boxes	Yes	10:15 – 10:30	—
	Crystal Cove_wire									
	Crystal Cove_PVC									

Date	Site Name	Obs.	Nest?	Grass?	Droppings Baffles/Other	Bird Perched?	CACW?	Playback?	Times	Comments (weathering/integrity)
CACW Nest Boxes *										
3/13/10	Fremont A	RAH	No	some; added	0/0	No	male near boxes	Yes	1015-1035	male singing near boxes in response to playback
3/13/10	Fremont B	RAH	No	some; added	0/0	No	male near boxes	Yes	1015-1035	box is coming apart
3/13/10	Irvine Park West A	RAH	No	some; added	0/3	No	pair 30 meters north	Yes	1106-1125	
3/13/10	Irvine Park West B	RAH	No	some; added	1/3	No	pair 30 meters north	Yes	1105-1125	
3/13/10	Irvine Park East A	RAH	No	some; added	3/5	No	pair heard >100 meters west	Yes	1105-1210	
3/13/10	Irvine Park East B	RAH	No	some; added	1/5	No	pair heard >100 meters west	Yes	1105-1210	
3/13/10	Shoestring 1A	RAH	No	some; added	0/5	No	Not detected	Yes	1210-1230	
3/13/10	Shoestring 1B	RAH	No	some; added	0/0	No	Not detected	Yes	1210-1230	
3/13/10	Shoestring 2A	RAH	No	some; added	0/0	No	Not detected	Yes	1210-1230	
3/13/10	Shoestring 2B	RAH	No	some; added	0/0	No	Not detected	Yes	1210-1230	
3/13/10	Shoestring 3A	RAH	No	some; added	3/15	No	Not detected	Yes	1210-1230	
3/13/10	Shoestring 3B	RAH	No	yes	5/20	No	Not detected	Yes	1210-1230	
3/13/10	Shoestring 4A	RAH	No	some; added	3/10	No	Not detected	Yes	1232-1245	
3/13/10	Shoestring 4B	RAH	No	yes	0/0	No	Not detected	Yes	1232-1245	
3/13/10	Loma Hilltop A	RAH	No	some; added	0/0	No	pair 100 m NE of boxes	Yes	1250-1325	
3/13/10	Loma Hilltop B	RAH	No	some; added	1/0	No	pair 100 m NE of boxes	Yes	1250-1325	
3/13/10	Hicks Haul Rd. A	RAH	No	some; added	3/50	No	male near boxes	Yes	1330-1344	

Date	Site Name	Obs.	Nest?	Grass?	Droppings Baffles/Other	Bird Perched?	CACW?	Playback?	Times	Comments (weathering/integrity)
3/13/10	Hicks Haul Rd. B	RAH	No	some; added	0/5	No	male near boxes	Yes	1330-1344	
3/13/10	Orchard Hills A	RAH	No	some; added	0/0	No	not detected	Yes	1455-1515	
3/13/10	Orchard Hills B	RAH	No	some; added	0/0	No	not detected	Yes	1455-1515	
3/13/10	Agua Chinon 1A	RAH	No	some; added	0/0	No	male near boxes	Yes	1405-1415	
3/13/10	Agua Chinon 1B	RAH	No	some; added	0/0	No	male near boxes	Yes	1405-1415	
3/13/10	Agua Chinon 2A	RAH	No	some; added	0/0	No	pair flew to boxes	Yes	1416-1425	pair flew in from south in response to playback
3/13/10	Agua Chinon 2B	RAH	No	some; added	0/0	No	pair flew to boxes	Yes	1416-1425	pair flew in from south in response to playback
3/5/10	Strawberry Farm 1A	RH, SA	No	Yes	0/0	—	No	Yes	7:55 – 8:05	
3/5/10	Strawberry Farm 1B	RH, SA	No	Yes	2/5	—	No	Yes	7:55 – 8:05	
3/5/10	Shady Canyon A	RH, SA	No	Yes	9/50	—	No	Yes	9:30 – 9:50	
3/5/10	Shady Canyon B	RH, SA	No	Yes	0/12	—	No	Yes	9:30 – 9:50	
3/5/10	Hwy. 133 A	RH, SA	No	Yes	0/5	—	No	Yes	10:35 – 10:45	Box integrity OK; box moved away from nearby shrubs
3/5/10	Hwy. 133 B	RH, SA	No	Yes	1/5	—	No	Yes	10:35 – 10:45	
3/5/10	Muledeer A	RH, SA	No	Yes	5/15	—	Pair very close	Yes	10:00 – 10:10	
3/5/10	Muledeer B	RH, SA	No	Yes	0/10	—	Pair very close	Yes	10:00 – 10:10	