

**CENTRAL RESERVE
CACTUS WREN HABITAT
ASSESSMENT AND SURVEY
2008**

LEATHERMAN BIOCONSULTING, INC.

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Prepared for:

NATURE RESERVE OF ORANGE COUNTY

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EXECUTIVE SUMMARY

A study to determine the status of the coastal cactus wren was conducted in the Coastal Reserve in 2006. The purpose of this study was to determine the status of the wren in the Central Reserve using the same methodology so that a baseline condition for cactus wren could be established reserve-wide.

All of the cactus resources in the Central Reserve were mapped in the spring of 2008, and two rounds of focused surveys for the cactus wren were conducted in cactus scrub judged mature enough to support nesting pairs. Unanticipated fires burned approximately 75% of the Central Reserve in 2007, so methods were developed to collect data that would enable an evaluation of the impact of the fires on the cactus resources within those areas. A total of 1,855 acres of cactus scrub was mapped in the Central Reserve. Of that total, 1,420 acres sustained Low, Moderate, or High levels of damage during the fires, 75% of which (1,059 acres) was severely burned and is not suitable for supporting nesting cactus wrens. Six hundred eighty three (683) acres were judged suitable for occupancy by cactus wrens and surveyed.

Within the 683 acres of cactus scrub judged suitable for occupancy by cactus wrens, 263 sites were delineated and surveyed for adult cactus wrens. Fifty eight (58) sites were found to be occupied during the first round of surveys, and 56 sites were found to be occupied during the second round of surveys. These occupied sites represent an estimated 67 territories, a decline of 82.1% since 374 territories were estimated in 2004.

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1.0 INTRODUCTION

This document presents the methods and results of the 2008 Central Reserve Cactus Wren Habitat Assessment and Survey (study) for the Nature Reserve of Orange County (NROC). The coastal cactus wren (*Campylorhynchus brunneicapillus*) is one of three target species covered by the Orange County Central/Coastal Natural Communities Conservation Plan (NCCP) Reserve, managed by the NROC. Annual surveys from 1999 to 2004 indicated that the cactus wren population declined 58% in the Coastal Reserve and 33% in the Central Reserve (Hamilton 2004).

Although the Laguna Fire of 1993 is considered a principal factor contributing to the steep population decline of the cactus wren within the Coastal Reserve (Bontrager 1995), the NROC is in the process of evaluating the status of the cactus wren throughout its reserve system to better understand the causes of its continued decline, and aid in the development of a long-term management program. To that end, cactus resources were mapped and a survey for the cactus wren was completed on the Coastal Reserve in 2006 and 2007 (Mitrovich and Hamilton 2007). NROC was in the process of planning a study to evaluate the status of the cactus wren in the Central Reserve when the unanticipated Windy Ridge Fire in March of 2007 and Santiago Fire in October of 2007 burned more than 75% of the reserve, elevating the concern regarding the status of cactus wren within the reserve system. The purpose of this 2008 study is to map, assess and survey the 19,944-acre Central Reserve, following the methods developed for the 2006 study, to document the loss and severity of damage to cactus resources resulting from the recent fires and to establish an updated baseline condition for the cactus wren reserve-wide.

The data collected for this study is reported in tabular form. Detailed statistical analyses will be performed by the NROC (in subsequent reports) to estimate occupancy rates, calculate detection probabilities, test models of habitat suitability, and make comparisons between the Coastal and Central Reserves. Covariate analysis using data collected on cactus structure, vegetation composition, and size of cactus patches will be used to assess the importance of these key habitat features in explaining species presence and absence and population trends.

2.0 METHODS

A key element of this study was the consistent application of the methodology developed for the 2006 study to achieve standardized data sets, thus allowing for meaningful comparisons between the Coastal and Central Reserve studies, and allowing data from both studies to be pooled for reserve-wide analyses. The methods used for 2006 study is described in detail in Mitrovich and Hamilton (2007) and Hamilton (2007). The recent Windy Ridge and Santiago fires necessitated the development of additional methods to map and collect data on burned cactus resources. A description of the methods used for the 2006 study and the methods developed to map and collect data on the burned cactus resources for this study are provided below.

2.1 Identification of Planning Areas

The 19,944-acre Central Reserve was divided into ten Planning Areas to facilitate project implementation and data collection (Figure 1). In general, the Planning Areas were designed to take advantage of the existing configuration of the reserve and existing landmarks (roads, ridges, ownership etc.). Each Planning Area was given an uppercase letter for identification and subsequent mapping.

A 1 km² numbered grid system covering the entire Central Reserve was developed by the County of Orange GIS Department. An aerial photograph with an overlay of the grid system, the boundary of the Central Reserve, and the footprint of the two burn areas was then provided as a reference. Because of the extent of the Central Reserve and large scale of the resulting aerial, smaller scale aerials with an overlay of the Central Reserve boundary and burn areas were also developed for each Planning Area to provide a more detailed reference. Each of the numbered 1 km² grids was then printed out at an approximate scale of 1 inch equals 100 feet, and organized by Planning Area.

2.2 Cactus Resource Classification and Mapping

Leatherman BioConsulting, Inc. teamed with The Wildlife Research Institute, Inc. and Consulting Ornithologist Mr. Dana Kamada to map and survey cactus resources within the Central Reserve. Biologists worked together at the beginning of the mapping process so that standardized mapping techniques and conventions developed for the project were applied consistently. Most of the habitat was mapped between April 22 and May 13, 2008, although several outlying areas in the Lomas East Planning Area (Planning Area H) were mapped as late as June 2. Each team was assigned an entire Planning Area and provided with a reference map for the Central Reserve, a reference map for the Planning Area they were mapping, and a set of aerials for each 1 km² grid within the Planning Area. All cactus resources within each grid were mapped directly on the aerial photographs using different colored fine-point *Sharpies*® as described below. When a patch of cactus overlapped the boundary of the Central Reserve, the entire patch was mapped and digitized (patches of cactus were not truncated at the reserve boundary). Use of different colored pens to map cactus resources in unburned areas and burned areas impacted by the fires at different severity levels allowed input and analysis of those attributes by the County of Orange GIS Department.

Following the 2006 methodology, all cactus resources detected were mapped either as polygons or as isolated, individual plants called satellites (Mitrovich and Hamilton 2007). The perimeter of cactus scrub habitat was mapped erring on the side of making larger polygons rather than dividing them into multiple smaller polygons. Polygons were evaluated and designated as either “proto scrub” or “cactus scrub” during the mapping process. “Proto scrub” was defined as cactus containing habitat judged as likely incapable of supporting a cactus wren nest. No additional data were recorded and no focused cactus wren surveys were completed in these areas. “Cactus scrub” was defined as expanses of mature cactus scrub judged as being of a stature (≥ 1 m tall) capable of

supporting a cactus wren nest. Cactus scrub was characterized and assigned to one of four basic cactus scrub types as follows:

- Cactus Scrub Type 1: Highest quality. Site includes at least 1.0 contiguous acre with $\geq 20\%$ estimated aerial cover of mature cactus (generally ≥ 1 m tall). Site may also include habitat with sparser cactus cover. May or may not have coastal cholla (*Opuntia prolifera*).
- Cactus Scrub Type 2: Site covers ≥ 1.0 acre. Well-developed cactus patches may be present, but site does not include 1.0 contiguous acre with $\geq 20\%$ estimated aerial cover of mature cactus (generally ≥ 1 m tall). May or may not have coastal cholla.
- Cactus Scrub Type 3: Small, isolated stands of mature cactus with coastal cholla. Polygon (a) covers less than 1.0 acre, and (b) includes at least one cholla plant ≥ 1 m tall. Density of cactus within the polygon is irrelevant.
- Cactus Scrub Type 4: Small, isolated stands of mature cactus without coastal cholla. Polygon (a) covers less than an acre, and (b) does not include at least one cholla plant ≥ 1 m tall. Density of cactus within the polygon is irrelevant.

The main criterion separating cactus scrub Types 1 and 2 from Types 3 and 4 is the aerial extent of the cactus patch being surveyed, with Types 1 and 2 being at least one acre in size. A 1 acre block was therefore provided in the legend of each 1 km² field map to provide the surveying biologists with a frame of reference for estimating aerial extent.

Cactus scrub with coastal cholla (may include Cactus Scrub Types 1, 2, or 3) was further characterized and assigned to one of three coastal cholla types as follows:

- Cholla Type 1: High quality. At least one cluster is fully developed, standing ≥ 1.3 m tall and in good health with extensive branching.
- Cholla Type 2: Medium quality. At least one plant/cluster is ≥ 1.0 m tall, in good health, with branching extensive enough to readily hold nest(s).
- Cholla Type 3: Poor quality. No plants/clusters appear to have branching extensive enough to readily hold nest(s).

For areas within a burn footprint, cactus resources were evaluated for fire severity and mapped accordingly. Fire severity categories were defined as follows:

- High: Cactus burned to the point that it is no longer likely to support cactus wrens. Nearly complete loss of cactus structure and high cactus mortality.
- Moderate: Damage to cactus and associated vegetation appreciable, but a component of the original patch usually remains that may have potential to support cactus wrens. Portions of cactus patch burned but green cactus remains.
- Low: Cactus falls within burn footprint but the loss of cactus not appreciable and the patch remains largely intact, although the perimeter may be burned. This

category also included cactus resources within a burn footprint but untouched by the fire.

For areas outside a burn footprint, cactus resources were mapped with a blue *Sharpie*®. Cactus scrub and proto scrub were mapped as polygons; proto scrub was labeled on the field map with capital “P,” whereas cactus scrub was left without a label so that additional data could be recorded during the subsequent focused cactus wren surveys. Individual cactus plants (satellites) were marked as an X on the map and labeled “CC” for coastal cholla (*Opuntia prolifera*) or “PP” for prickly pear [which included coastal prickly pear (*Opuntia littoralis*) and/or oracle prickly pear (*Opuntia oricola*)].

Within a burn area, cactus resources in the High severity category were mapped with a black *Sharpie*®. Because cactus resources in this category were severely impacted, generally resulting in complete loss of cactus structure, no attempt was made to classify the cactus patch as proto scrub or cactus scrub, and no focused cactus wren surveys were conducted. Burned cactus resources in the Moderate severity category were mapped with a red *Sharpie*®, and cactus resources in the Low category were mapped with green *Sharpie*®. Cactus scrub, proto scrub and individual cactus plants were mapped using the same conventions described above for cactus resources outside a burn area.

In instances where severely burned cactus scrub (in the High severity category) surrounded or adjoined intact scrub meeting the criteria for cactus wren surveys (scrub in the Moderate or Low severity categories), two polygons were delineated; one delineating the burn perimeter and the second delineating the intact cactus scrub perimeter. The locations of all coastal cholla plants were mapped, regardless of whether they occurred within polygons or as satellites outside a polygon.

2.3 Focused Cactus Wren Surveys

Cactus wren surveys were not conducted until all the cactus resources were mapped within each Planning Area. All areas mapped as cactus scrub (including burned and unburned areas) that were judged to be suitable for supporting nests were surveyed twice for the presence of adult cactus wrens. Most of the surveys were conducted by two teams of two biologists (only one team was used as the second round of surveys neared completion). Teams of biologists were used to minimize the time required to complete one round of surveys. The first and second rounds of surveys were generally completed at least two weeks apart: the first round of surveys was completed between May 15 and June 11, and the second round of surveys was completed between June 5 and June 25.

For the purpose of conducting cactus wren surveys and recording data, each polygon consisted of at least one site. Each site was surveyed from a strategically located survey point within or near the site. Large polygons that could not be surveyed adequately from a single point were divided into the minimum number of sites necessary to effectively survey the entire polygon. In general, ridges (or other topographic features) and/or breaks in cactus scrub habitat were used to delineate one survey site from another. The

intent was to identify sites that were independent by choosing survey points such that cactus wren vocalizations could not be heard from one site to the next.

Each site received a unique alphanumeric code. The first part of the alphanumeric code is the capital letter used to identify the Planning Area where a polygon is located; next is the number assigned to the polygon; third is a lower case letter assigned to the site. A large polygon split into two sites within the Peter's Canyon Planning Area therefore might be designated as sites "E01a" and "E01b." Numbering of polygons restarted at "1" within each Planning Area.

The strategically located survey point for each site was recorded as a waypoint using GPS technology (using NAD 83 datum) and noted clearly on the field map. The waypoint was saved using the site's unique alphanumeric code to allow download into a spreadsheet. It also allowed biologists conducting the second cactus wren survey to navigate directly to the survey point by using the GO TO feature of the GPS units, increasing survey efficiency and ensuring that the same survey point was used.

Presence or absence of adult cactus wrens within each site was determined by playing tapes of the cactus wren call and listening and watching for a response. Specifically, cactus wren vocalizations were played for one minute, stopped for two minutes to listen and watch for a response, then repeated to complete a 6 minute survey period. All biologists conducting surveys used the same cactus wren vocalizations played on a 2gb MuVo T100 MP3 player connected to a battery powered iSymphony™ speaker. Speaker volume was adjusted depending on the size and topography of the site and the ambient noise levels during the survey.

Once an adult cactus wren was detected, the vocalizations were discontinued, the detection was recorded on the data sheet, and the location of the cactus wren was plotted on the aerial photograph. Cactus wrens were not recorded outside the 6 minute period (unless it was necessary to verify presence if a bird may have been heard or detected). However, cactus wrens that were observed outside the 6 minute period were noted in the comments section of the data sheet. If an adult cactus wren was observed moving between sites during the survey, the cactus wren's presence was recorded in the data column for the site being surveyed and noted in the comments section of the data sheet for the other site. This study is intended to measure habitat occupancy/use based on the detection of adult cactus wrens; juvenile cactus wrens, when detected, were therefore recorded separately.

Presence of the California gnatcatcher (*Poliophtila californica*) and brown-headed cowbird (*Molothrus ater*) were also recorded on the data sheets and plotted on the field maps at each site. These species were only recorded if the birds were detected within the 6-minute survey period and were within or near the site, but incidental observations were recorded on field maps and noted in the comments section of the data sheet.

Additional data recorded at each site included the four most dominant shrubs within the site (in decreasing order of estimated cover), whether the site was within or partially

within a fuel modification zone, and the presence or absence of prickly pear ≥ 1 m tall (*Opuntia littoralis* or *O. oricola*), coastal cholla (*O. prolifera*), lemonade berry (*Rhus integrifolia*), and Mexican elderberry (*Sambucus mexicana*). Within the footprint of the burn areas, the fire severity category, evidence of re-sprouting cactus, and presence of unburned associated vegetation was also recorded for each site. A copy of the mapping and survey instructions used by the biologists in the field and a copy of the field data sheet are included as Appendix A.

All data sheets were checked for completeness at the end of each field day. If a data field was found to be blank after the first survey, it was highlighted and completed during the second survey. Information on the data sheets was also cross checked with the information recorded directly on the field maps to ensure accuracy, and all field maps were checked to make sure that burn data, survey points (and associated UTM coordinates), cactus wren observations, and California gnatcatcher observations were recorded as necessary. All field maps were submitted to the County of Orange GIS Department for digitizing on July 10, 2008. The County digitized the data and printed out maps for quality assurance on November 20, 2008. The scale of the digitized maps used for proofing was approximately 1 inch equals 1,000 feet but varied depending on the size of the area being printed.

3.0 RESULTS AND DISCUSSION

3.1 Cactus Resources

Table 1 summarizes the total acreage for cactus resources in the Central Reserve. In the Central Reserve as a whole, a total of 1,855 acres of cactus resources was identified and mapped (Figure 2). Of the 1,855 acres, 683 acres were designated as cactus scrub suitable for nesting, and 114 acres were mapped as proto scrub and appeared to be insufficiently developed to be used by nesting cactus wrens. Relative to severity of damage caused the Windy Ridge Fire and Santiago Fire in 2007, 1,059 acres (57 %) were assigned the High severity category and are currently unusable as a nesting resource by cactus wrens, 302 acres were assigned to the Moderate severity category, and 59 acres were assigned to the Low severity category.

The acreage of cactus resources within the ten Planning Areas is summarized in Table 2. Few cactus resources were mapped within the Coal Canyon Planning Area (Planning Area A), although several patches of habitat and many satellites were documented beyond the western boundary of the area. Therefore, although the Coal Canyon Planning Area represents 9.0% of the Central Reserve, it does not support measurable cactus resources at this time (satellite cacti were not included in the acreage calculations). The location of this Planning Area on the north face of Sierra Peak, the northernmost peak in the Santa Ana Mountains, limits availability of southern exposures favored by cactus.

The El Modena (Planning Area C) and Aliso Creek (Planning Area J) Planning Areas are similar in that they are small when compared to other Planning Areas yet the aerial coverage of cactus scrub is very high within them. El Modena is only 107 acres in size

but supports 49 acres of cactus resources (46 % of its size). Aliso Creek is only 247 acres in size but supports 117 acres of cactus resources (47 % of its size). Together, the two planning areas represent only 1.8% of the reserve yet they support 9 % of the mapped cactus resources.

Most of the cactus resources within the Central Reserve (49 %) occur within the Lomas East Planning Area (Planning Area H). Although this is an artifact of the large size of the Planning Area itself, cactus resources within this Planning Area are an integral component of the reserve system. In addition to the extent of cactus, the configuration of the Lomas East Planning Area minimizes the ratio of edge to interior habitat, its habitat is continuous within the Planning Area allowing for unrestricted movement of dispersing wrens (within biological constraints), and its central location in the reserve provides a linkage that allows wrens (and other wildlife) to disperse among many of the other Planning Areas. Unfortunately, the entire Planning Area is within the Santiago Fire footprint, and most of the cactus patches sustained High levels of damage during the fire.

Table 3 identifies the number of polygons of cactus mapped during the study and the number of sites surveyed for cactus wrens in burned and unburned portions of the Central Reserve. A total of 219 polygons of cactus were split into 263 sites surveyed for cactus wrens. Although approximately 25 % of the Central Reserve remained unburned after the 2007 fires, 46 % of the sites surveyed were within the unburned area; another indication of the extent of the loss of cactus scrub in the burned portion of the reserve.

Table 3 also summarizes the severity of the fire's impact on cactus resources and whether re-sprouting of cactus plants had occurred by the time the surveys were conducted. Unburned vegetation associated with the cactus patches remained in only 50 (35%) of the surveyed sites. This indicates that even in areas where the cactus scrub was only moderately or barely touched by the fire, other vegetation did not fare so well. However, nearly every site (141 of 143) exhibited re-growth of the cactus itself, suggesting that with sufficient precipitation cactus survival may be higher than anticipated, potentially reducing the overall recovery period for the habitat.

3.2 Focused Cactus Wren Surveys

Table 4 summarizes the results of the cactus wren surveys for the Central Reserve. Within the 683 acres of cactus scrub judged suitable for occupancy by cactus wrens, 263 sites were delineated and surveyed for adult cactus wrens. Of these 263 sites, 58 sites were found to be occupied during the first round of surveys, and 56 sites were found to be occupied during the second round of surveys. These data will be subjected to statistical analyses to estimate current population size within the Central Reserve. Cactus wren locations are shown in Figure 3.

The number of occupied sites within the burned and unburned areas was similar. During the first round of surveys, 26 of 120 sites (21.7%) were occupied in unburned areas while 32 of 143 (22.4%) were occupied in burned areas. The second round of surveys was nearly identical; 27 of 120 sites (22.5%) were occupied in unburned areas while 29 of

143 (20.3%) were occupied in burned areas. Although the documented occupancy rates within the burned and unburned areas is roughly the same, an unknown number of occupied sites and cactus polygons were likely destroyed that would have affected these data. It is the unknown number of occupied sites that were lost in the Low and Moderate severity burn areas and in the 1,059 acres of severely burned cactus that give greatest cause for concern.

California gnatcatchers were detected in 30 sites during the first round of surveys and in 31 sites during the second round of surveys; the total of number of occupied sites was 45. Unlike the cactus wren data, the number of occupied sites within the burn areas was substantially lower than the number of occupied sites in the unburned area during both rounds of surveys (6 vs. 24 in first round and 3 vs. 28 in the second round). This disparity is ostensibly due to that fact that most coastal sage scrub within the burn areas was destroyed (only 50 sites within the burn areas had unburned vegetation, which may or may not have coastal sage scrub).

The number of sites surveyed, occupied sites, and estimated likely territories for cactus wrens within each Planning Area is provided in Table 5. Although the total number of occupied sites combined for both surveys was 80, the number of likely cactus wren territories in the Central Reserve was estimated to be 67 territories. This number is based on recorded observations of cactus wren movements and behaviors within and among the surveyed sites during the surveys, and the subsequent application of professional experience and judgment to those observations. This estimated number of cactus wren territories represents an 82.1% decline in the Central Reserve since 374 (± 113) territories were last estimated in 2004 (Hamilton 2004).

The highest number of occupied sites within the Central Reserve occurs within the Lomas East Planning Area (Planning Area H); however, again, this is at least partially an artifact of the large size of the Planning Area. Weir Canyon (Planning Area B) had the second highest total even though most of the western half of this planning area burned. No occupied sites were recorded in Lomas West (Planning Area G), although one cactus wren was detected incidentally on May 9, 2008 during the habitat mapping phase of the study. There is not a pre-fire estimate of the number of territories for the entire Lomas West Planning Area, but 8 territories were documented on just two sites totaling acres 147 acres in 2004 (Hamilton 2004).

The concentration of cactus resources within the El Modena and Aliso Creek Planning Areas was discussed above. The large amount of the cactus scrub in those areas translated into a high number of occupied sites as well. Seven likely territories were estimated at El Modena and eight likely territories were estimated in Aliso Creek. Together, the two Planning Areas represent only 1.8% of the reserve yet they currently support 22.4% of the estimated territories.

Brown-headed cowbirds were not detected during any of the surveys.

4.0 RECOMMENDATIONS

Management of the resources within the NROC is a complex issue (Hamilton 2008). As it relates to the cactus wren, management activities should be prioritized not only on a reserve wide basis, but within each Planning Area as well. For the Central Reserve as a whole, decisions regarding cactus wren monitoring and management should be made based on the distribution, abundance (extent and concentration), and quality of cactus scrub suitable for nesting. Other factors to be considered include areas where the highest number of wrens currently exist, areas where there is suitable but currently unoccupied cactus scrub nesting habitat, and areas where there is potential for habitat creation and/or restoration that will be necessary for the wren's long-term survival within the reserve system.

Management recommendations that include habitat creation, restoration, enhancement, etc. are well-known and widely used management tools. The following recommendations identify areas that could be used to increase the extent of suitable nesting habitat where it is less likely to be destroyed in wildfires, and aim to decrease the time necessary for existing cactus scrub to grow to a size that could be used by nesting cactus wrens.

Use of fuel modification zones as planting areas for cactus scrub may benefit the cactus wren by providing refugia and nesting habitat during and after wildfires. Because of their high water content, cactus plants are identified as a good native species for planting within all fuel modification wet and dry zones throughout the county (OCFA 2008). In addition, fuel modification zones along developed areas are often sprayed by firefighters as a wildfire approaches to slow the movement of the fire, thus providing some level of protection to the cactus. The result is that cactus within fuel modification zones often goes undamaged or sustains minimal damage compared to cactus scrub in the center of the reserve.

The species of cactus to be used in created or enhanced areas should be given careful consideration. Coastal cholla (*Opuntia prolifera*) seems to be preferred by cactus wrens, although it takes a very long time to achieve the height necessary for nesting. Coastal prickly pear (*Opuntia littoralis*) appears to more widespread than oracle prickly pear (*Opuntia oricola*) in the reserve system; however, the sub-erect or sprawling form of the coastal prickly pear when compared to the more upright form and ultimate height achieved by the oracle prickly pear suggests that the latter might be a better choice for habitat creation and enhancement because cactus wrens nest in plants ≥ 1 m tall.

Although most biologists would agree that preservation of cactus scrub in core areas of the reserve are important in terms of providing nesting habitat that is minimally affected by human disturbance, creation and enhancement of cactus scrub along the perimeter of the reserve in fuel modification zones along the urban-wildlands interface may provide suitable nesting habitat during the post-fire recovery years in addition to suitable nesting habitat on a yearly basis for peripheral pairs. Eleven sites surveyed for cactus wrens in this study were located totally or partially within fuel modification zones. Four of those

eleven sites were found to be occupied by cactus wrens during the focused surveys, and all four sites were adjacent to one of the burn areas. Previous studies have also documented use of habitat near human areas as long as suitable nesting and foraging habitat is present (Eggert 1996, Wheeler 1997), and along edge habitats in the Coastal Reserve south of the transportation corridor (Harmsworth 2001).

Maintenance and planting of fuel modification zones may be controlled by local residents or homeowner's associations, so cactus scrub restoration and creation within those areas may be difficult to implement by the NROC. In addition, because the cactus wren is not a listed species, it may be difficult to require mitigation for the bird during the environmental review process, especially because the cactus wren is already supposed to be protected through its inclusion as covered species in the NCCP program. At a minimum, steps should be taken to more thoroughly investigate this as part of a long-term management strategy.

Artificial nesting structures built of PVC and other materials have been assembled and placed in the field to see whether resident wrens will use them in the 2009 nesting season as surrogates for mature cacti, in which they would otherwise nest. While it is acknowledged that this is a desperate measure, it remains to be seen whether cactus wrens will use these structures until cactus in previously burned areas reaches a height suitable for nesting (if at all), and it is not likely that these structures will become part of a long-term management strategy.

An additional concurrent management action that could be taken is to encourage the upright growth of individual cactus plants within patches of proto scrub by pruning prostrate lateral branches. Horticultural literature is replete with information on pruning techniques that could be used to obtain the desired result, and application of those techniques should work for cacti just as well as it does for other plants.

The effectiveness of using this management tool could be studied by selecting control and experimental plants to be pruned within the same patches of proto scrub to document and statistically compare the vertical growth rates of each. Experimental patches could be selected randomly or using a stratified random sampling protocol to ensure that patches in different portions of the reserve or different slope aspects are adequately represented. If budgetary and logistical constraints limit the feasibility of a truly random approach, selection of highly accessible patches along existing access roads in the reserve will still provide useful information. The point is to try to reduce the time it would otherwise take for existing plants to achieve a height of 1 meter thus making natural nesting substrates available.

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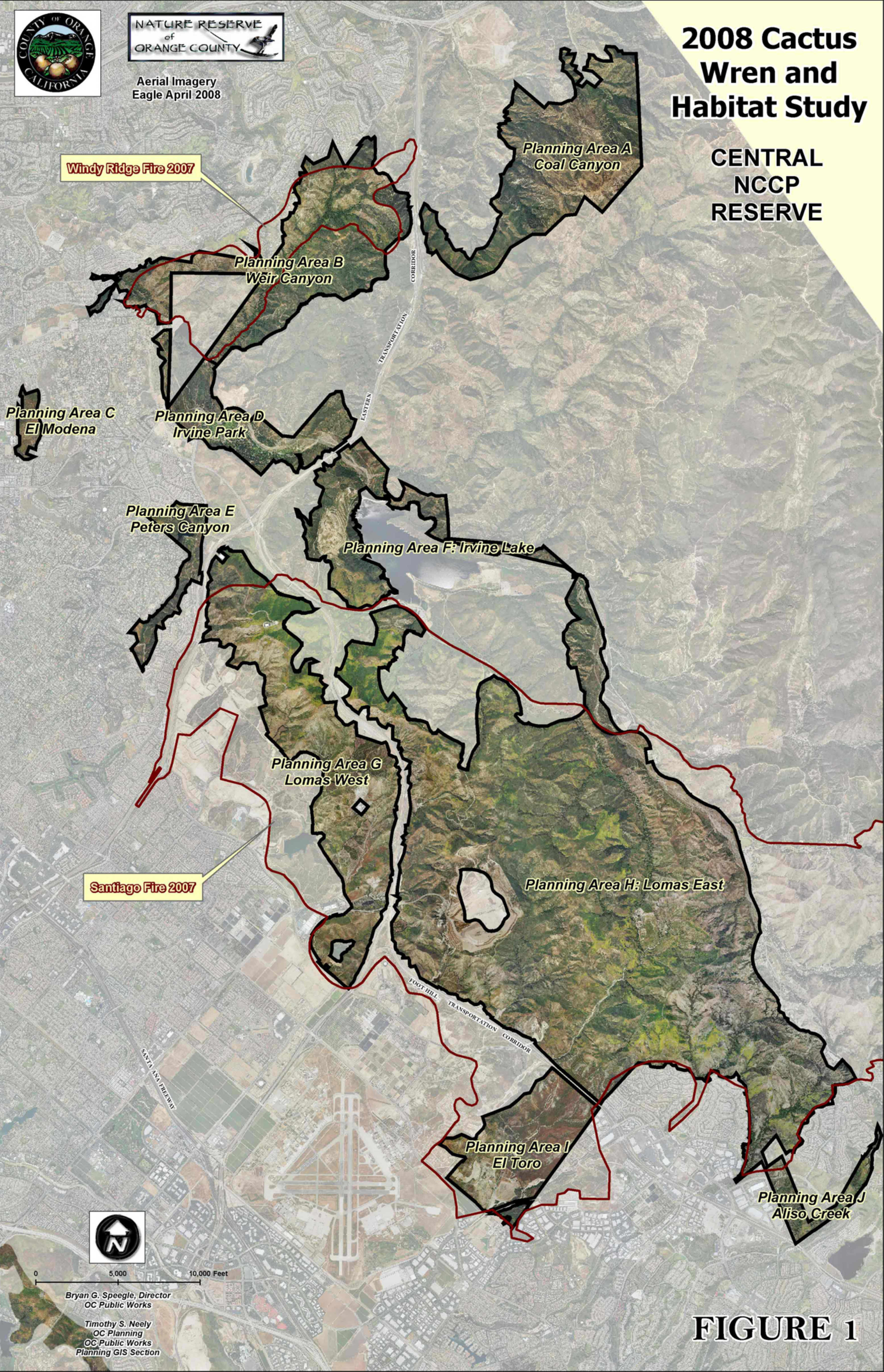






Table 1. Acres of Cactus Resources in Central Reserve

	Total Acres of Cactus	Acres of "Cactus Scrub"	Acres of "Proto Scrub"	Acres by Fire Severity		
				Low	Moderate	High
Windy Ridge Fire	80	42	0	12	29	39
Santiago Fire	1,340	279	41	47	273	1,020
Unburned Area	435	362	73	N/A	N/A	N/A
Central Reserve Total	1,855	683	114	59	302	1,059
Within the burn areas, Acres of "Cactus Scrub" + Acres of "Proto Scrub" = Low + Moderate (Acres by Fire Severity) because they are subsets of each other. Those sums, when added to High (Acres by Fire Severity), give the Total Acres of Cactus for that area. Differences are due to rounding.						

Table 2. Acres of Cactus Resources by Planning Area

			% of Planning Area	% of Cactus
	Planning Area Acreage	Acres of Cactus*	Supporting Cactus	within Central Reserve
Planning Area A: Coal Canyon	1,798	0	0	0
Planning Area B: Wier Canyon	1,929	136	7%	7%
Planning Area C: El Modena	107	49	46%	3%
Planning Area D: Irvine Park	766	33	4%	2%
Planning Area E: Peters Canyon	317	15	5%	1%
Planning Area F: Irvine Lake	1,239	126	10%	7%
Planning Area G: Lomas West	2,384	382	16%	21%
Planning Area H: Lomas East	10,156	917	9%	49%
Planning Area I: El Toro	1,001	80	8%	4%
Planning Area J: Aliso Creek	247	117	47%	6%
Total	19,944	1,855		
*Includes all mapped cactus resources in burned and unburned areas.				

Table 3. Summary of the Number and Status of Sites Surveyed for Cactus Wren in Central Reserve*

	No. of Polygons	No. of Sites Surveyed	Fire Severity of Sites		No. of Sites with Resprouting Cactus	No. of Sites with Unburned Vegetation
			Low	Moderate		
Windy Ridge Fire	18	20	7	13	20	8
Santiago Fire	116	123	27	96	121	42
Unburned Area	85	120	N/A	N/A	N/A	N/A
Central Reserve Total	219	263	34	109	141	50
* Cactus designated as "Proto scrub" or in the High fire severity category was not surveyed, so was not considered a polygon (or site) or given an alpha-numeric code.						

Table 4. Summary of Results of Cactus Wren Surveys

	No. of Sites Surveyed	No. of Sites with Adult Cactus Wrens		No. of Sites with California Gnatcatcher	
		Survey No. 1	Survey No. 2	Survey No. 1	Survey No. 2
Windy Ridge Fire	20	6	2	1	0
Santiago Fire	123	26	27	5	3
Unburned Area	120	26	27	24	28
Central Reserve Total	263	58	56	30	31

Table 5. Number of Occupied Sites and Estimated Territories by Planning Area

			No. of Sites with Adult Cactus Wrens		No. of Occupied Sites	No. of Estimated Territories
	Planning Area Acreage	No. of Sites Surveyed	Survey No. 1	Survey No. 2		
Planning Area A: Coal Canyon	1,798	0	0	0	0	0
Planning Area B: Wier Canyon	1,929	42	10	7	14	12
Planning Area C: El Modena	107	11	6	6	8	7
Planning Area D: Irvine Park	766	16	2	1	3	2
Planning Area E: Peters Canyon	317	7	2	2	2	2
Planning Area F: Irvine Lake	1,239	39	7	4	8	7
Planning Area G: Lomas West	2,384	8	0	0	0	0
Planning Area H: Lomas East	10,156	102	21	23	29	24
Planning Area I: El Toro	1,001	16	6	5	7	5
Planning Area J: Aliso Creek	247	22	4	8	9	8
Total	19,944	263	58	56	80	67

APPENDIX A

Survey Instructions and Field Data Sheet

2008 NROC Central Reserve Cactus Wren Study - Habitat Mapping Instructions

Accurate and efficient mapping of cactus resources on the Central Reserve is critical to the success of this Study. The methods described below are based on the work by Hamilton in 2006 but were adapted to allow mapping of unburned and burned cactus resources. Use of different colored pens in unburned areas and burned areas impacted by the fires at different severity levels allows evaluation of those attributes on the County of Orange GIS database without use of a data form. Cactus resources judged to be suitable for supporting nesting Cactus Wrens will be assessed during subsequent focused Cactus Wren surveys.

All cactus resources detected, including isolated plants, shall be mapped in one way or another. First, map the entire polygon perimeter, erring on the side of making larger polygons rather than dividing them into multiple smaller polygons. Polygons shall be evaluated and designated as either "cactus scrub" or "proto scrub" during the mapping process. "Cactus scrub" includes cactus patches judged capable of supporting nesting Cactus Wrens (i.e. stands with cacti ≥ 1 m tall that are expansive enough to protect a nest). Each "cactus scrub" polygon will be assessed (and split into survey sites if necessary) during the first round of focused Cactus Wren surveys. "Proto scrub" includes isolated cactus plants ("satellites") and expanses of cactus that do include any cactus stands capable of supporting a nest (i.e. stands with cacti < 1 m tall that are not expansive enough to protect a nest). No additional data shall be recorded and no focused Cactus Wren surveys shall be completed in these areas. Such areas will be regarded as having essentially no potential for occupancy by Cactus Wrens. Note that even limited coastal cholla patches with plants ≥ 1 m tall may be occupied by nesting Cactus Wrens.

For areas outside a burn footprint, polygons shall be mapped in blue pen. "Proto scrub" shall be labeled as such on the map with a capital "P" and "cactus scrub" shall be left without a label so that additional data can be recorded during the subsequent focused Cactus Wren surveys. Satellite cactus plants shall be marked as an X and labeled "CC" for coastal cholla and "PP" for prickly pear.

For areas within a burn footprint, polygons shall be evaluated for fire severity and mapped accordingly. Fire Severity categories are:

- High: Cactus burned to the point that it is no longer likely to support Cactus Wrens. Nearly complete loss of cactus structure and high cactus mortality.
- Moderate: Damage to cactus and associated vegetation appreciable, but a component of the original patch usually remains that may have potential to support Cactus Wrens. Portions of cactus burned but green cactus remains.
- Low: Cactus falls within burn footprint but the loss of cactus not appreciable and the patch remains largely intact, although the perimeter may be burned. This category would also include cactus resources within a burn footprint in an area untouched by the fire.

Burned cactus resources in the High category shall be mapped with black pen. No additional data shall be taken down and no survey shall be completed. Satellite cactus plants shall be marked as an X and labeled "CC" for coastal cholla and "PP" for prickly pear.

Burned cactus resources in the Moderate category shall be mapped with red pen. Polygons shall be labeled proto scrub or left without a label so that additional data can be recorded during the focused Cactus Wren surveys. Satellite cactus plants shall be marked as an X and labeled "CC" for coastal cholla and "PP" for prickly pear.

Burned cactus resources in the Low category shall be mapped with green pen. Polygons shall be labeled proto scrub or left without a label so that additional data can be recorded during the focused Cactus Wren surveys. Satellite cactus plants shall be marked as an X and labeled "CC" for coastal cholla and "PP" for prickly pear.

All polygons of burned cactus scrub shall be mapped. In instances when burned cactus scrub surrounds or adjoins intact scrub meeting the criteria for Cactus Wren surveys, two polygons shall be delineated; one delineating the burned perimeter and the second delineating the intact cactus scrub perimeter.

The locations of all coastal cholla shall be mapped whether they occur within polygons or exist as isolated satellites. Coastal cholla shall be mapped as an X and labeled "CC".

2008 NROC Central Reserve Cactus Wren Study - Focused Survey Instructions

All cactus resources were mapped during the first phase of this Study. Cactus resources judged to be capable of supporting a Cactus Wren nest, termed “cactus scrub,” shall be assessed and surveyed according to the following instructions, based on the work by Hamilton in 2006.

Each Planning Area has been given an uppercase Alpha ID (A, B, C, etc.). Scrub that includes cactus patches judged capable of supporting nesting Cactus Wrens (i.e. stands ≥ 1 m tall that are expansive enough to protect a nest) shall be (1) considered a “polygon,” (b) given a numeric ID (1, 2, 3 etc), and (3) surveyed for Cactus Wrens. Numbering of polygons restarts at “1” for each Planning Area.

Each polygon shall include at least one “site,” which shall be given a lowercase alpha ID (a, b, c, etc.). Thus, a given site shall have a unique “Alpha-Numeric-alpha” code, such as “D03a.” Large polygons that cannot be surveyed adequately from a single point shall be divided into multiple sites (i.e. D03a, D03b, D03c...).

A polygon shall be divided into as many sites as are needed to effectively survey the entire polygon. In some cases, the break between sites in a single polygon will have to be somewhat arbitrary. Within a given polygon, ridges, other topographic features, and/or breaks in cactus scrub habitat should usually be used to delineate one survey site from another. Each survey site should be independent (wrens should not be able to readily move between sites), and **the survey point for each site should be chosen so that the Cactus Wren vocalizations played by the surveyor cannot be heard from one site to the next.**

Whether a survey site is within a burn footprint shall be determined using the overview reference map of the Planning Area. Data to be evaluated and recorded for each site within a burn footprint shall include fire severity, evidence of re-sprout, and presence of unburned vegetation within cactus scrub. Fire severity was evaluated during the mapping process and mapped accordingly using black, red, or green pens, so this information only needs to be transferred to the data form.

Cactus Scrub Types

- Cactus Scrub Type 1: Highest quality. Site includes at least 1.0 contiguous acre with $\geq 20\%$ estimated aerial cover of mature cactus (generally ≥ 1 m tall). Site may also include habitat with sparser cactus cover. May or may not have coastal cholla.
- Cactus Scrub Type 2: Site covers ≥ 1.0 acre. Well developed cactus patches may be present, but site does not include 1.0 contiguous acre with $\geq 20\%$ estimated aerial cover of mature cactus (generally ≥ 1 m tall). May or may not have coastal cholla.
- Cactus Scrub Type 3: Small isolated stands of mature cactus with coastal cholla. Polygon (a) covers less than 1.0 acre, and (b) includes at least one coastal cholla plant ≥ 1 m tall. Density of cactus within the polygon is irrelevant.
- Cactus Scrub Type 4: Small isolated stands of mature cactus without coastal cholla. Polygon (a) covers less than an acre, and (b) does not include at least one coastal cholla plant ≥ 1 m tall. Density of cactus within the polygon is irrelevant.

Coastal Cholla Types

- Coastal Cholla Type 1: High quality. At least one cluster is fully developed, standing ≥ 1.3 m tall and in good health with extensive branching.
- Coastal Cholla Type 2: Medium quality. At least one plant/cluster is ≥ 1.0 m tall, in good health, with branching extensive enough to readily hold nest(s).
- Coastal Cholla Type 3: Poor quality. No plants/clusters appear to have branching extensive enough to readily hold nest(s).

Each site shall be surveyed from a single, strategically located vantage point. GPS the point (using NAD 83) and note it clearly on the field map. The waypoint should be saved using the site’s unique Alpha-Numeric-alpha code to allow download into a spreadsheet.

Surveyors shall survey for Cactus Wrens for a 6 minute period. Surveyor shall play a recording of Cactus Wren vocalizations for one minute and listen and watch for a response in silence for two minutes, then repeat the process to complete the 6 minute period. Vocalizations shall not be played once a Cactus Wren is detected. Cactus wrens shall not be recorded outside the 6 minute period (except to verify presence if a bird may have been heard or detected). **If an adult Cactus Wren is observed moving between sites during the survey, the Cactus Wren’s presence should be recorded in the data column for the site being surveyed and noted in the comments section of the other site.**

Surveys should be conducted primarily during the morning hours but may extend to early afternoon (2 p.m.). Surveys should be suspended in periods of rain or drizzle, and not be conducted when temperatures exceed 85°F or when winds exceed 8 mph.

The surveyor must watch and listen for California Gnatcatchers and Brown-headed Cowbirds at each site. These species shall be counted if the birds are detected within the 6-minute survey period and are within or near the site.

2008 NROC Central Reserve Cactus Wren Study Field Data Form

Investigator(s): _____ Date (mmddyy): _____
 Planning Area Alpha Code (UpperCase): _____
 Polygon Numeric ID: _____
 Site Alpha Code (LowerCase): _____
 Polygon Grid Number (grid mapped on): _____
 Survey Point GPS Coordinates (NAD 83): mE _____ mN _____

Windy Ridge Fire Area Yes No
 Santiago Fire Area Yes No
 Fire Severity High Moderate Low
 Evidence of Resprout Yes No
 Unburned Associated Vegetation Yes No

Prickly-Pear > 1m Tall at Site Yes No
 Cactus Scrub Type Type 1 Type 2 Type 3 Type 4
 Coastal Cholla > 1 m tall at site Yes No
 Coastal Cholla Type Type 1 Type 2 Type 3
Rhus integrifolia at Site Yes No
Sambucus mexicana at Site Yes No
 Site Within Fuel Modification Zone Yes No Partially

List up to four Dominant Overstory Plants in Descending Order of Abundance

1 _____ 3 _____
 2 _____ 4 _____

Survey Number 1 Date (mmddyy): _____

Adult Cactus Wren Detected Yes No
 Specify # of Adults and Juv's Adults _____ Juv's _____
 Brown-headed Cowbird Detected (how many) On/Near Site _____ Flyover _____
 California Gnatcatcher Detected On/Near Site Yes No

Comments for Survey #1 _____

Survey Number 2 Date (mmddyy): _____

Adult Cactus Wren Detected Yes No
 Specify # of Adults and Juv's Adults _____ Juv's _____
 Brown-headed Cowbird Detected (how many) On/Near Site _____ Flyover _____
 California Gnatcatcher Detected On/Near Site Yes No

Comments for Survey #2 _____

