

*FINAL*

**CALIFORNIA GNATCATCHER AND  
COASTAL CACTUS WREN  
MONITORING REPORT FOR THE  
SAN JOAQUIN HILLS BURN AREA  
2001**

**HARMSWORTH ASSOCIATES**

**JANUARY 2002**

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2001**

Prepared for:

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## EXECUTIVE SUMMARY

During 2001, Harmsworth Associates continued conducting focused surveys for the California gnatcatcher (*Polioptila californica californica*) and the cactus wren (*Campylorhynchus brunneicapillus*). Surveys were done in portions of the San Joaquin Hills, within the Nature Reserve of Orange County, that burned in the 1993 Laguna Beach fire. This year's surveys constituted the 7<sup>th</sup> year of post-fire avifaunal monitoring within the burn area.

The total number of gnatcatcher territories detected in the San Joaquin Hills study site in 2001 increased 34% from 32 in 2000 to 79 locations in 2001. The 70 gnatcatcher pairs present in the study area in 2001 represents a 52% increase in the number of gnatcatcher pairs from 2000, and a 11% decrease from 1999. The 35.9% decrease in pairs during 2000 was a substantial fluctuation also reflected in other bird species populations in the area. Fortunately, the gnatcatcher population was large enough to absorb the hit and increase in the number of pairs in 2001.

In contrast, the total number of cactus wren territories detected declined by one location (-3%) from 2000. The number of pairs actually increased by 13% between 2000 and 2001. The number of pairs south of the transportation corridor increased from 4 pairs in 2000 to 9 pairs in 2001. Although there are more wren pairs inland of the corridor, the number of pairs continues to decline from 38 in 1999 to 26 in 2000 to 21 in 2001.

The distribution of gnatcatcher and cactus wren pairs tended towards the outer edges of the reserve.

The gnatcatcher population appears to be recovering from the downward perturbation in numbers observed in 2000. The cactus wren population has not shown signs of recovery other than a slight increase in the proportion of pair locations to single locations. In the burn area, the wren population seems to be more vulnerable to stochastic disturbances with negative impacts than the gnatcatcher population.

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## 1.0 INTRODUCTION

### 1.1 Introduction

The 1993 Laguna Beach Fire burned about 5,200 hectares of natural vegetation in the San Joaquin Hills; this included 2,720 hectares of coastal sage scrub (Bontrager *et al.* 1995a). The fire left only 188 hectares of coastal sage scrub within the burn area unburned or lightly burned (LSA 1994). Prior to the fire an estimated 127 pairs of California gnatcatchers (*Poliopitila californica californica*) and 282 pairs of cactus wrens (*Campylorhynchus brunneicapillus*) occupied the burn area of the San Joaquin Hills (Bontrager *et al.* 1995a, LSA 1994, 1995). The fire resulted in the loss or displacement of many of the resident California gnatcatchers and cactus wrens. (NOTE: The Orange County Central/Coastal Natural Communities Conservation Plan/Habitat Conservation Plan (NCCP/HCP) documented 116 California gnatcatcher sites and 509 cactus wren sites burned by the Laguna Beach Fire [County of Orange 1996]).

In an attempt to characterize the natural recovery of the burn areas as sensitive bird habitat, the U.S. Fish and Wildlife Service (USFWS) required the Transportation Corridor Agencies (TCA) to monitor the burn sites to detect the natural regeneration of the habitat and the return of the gnatcatcher and the cactus wren. This requirement was part of the mitigation measures for the construction of the San Joaquin Hills Transportation Corridor (SJHTC) (Term and Condition #11 of the FWS Biological Opinion (1-6-93-F-98R) and Mitigation Measure FWS 17 of the SJHTC Mitigation Monitoring Program. The monitoring program was initiated in 1993 and continued through 1998 (LSA 1994, 1995; GWB 1996; Harmsworth Associates 1996, 1997, 1998a). In 1998 the TCA, with the cooperation of the USFWS and California Department of Fish and Game (CDFG), transferred the obligation of the terms and conditions of the Biological Opinion to The Nature Reserve of Orange County (NROC). Thereafter, future gnatcatcher/cactus wren studies in the San Joaquin Hills burn area were incorporated into the NROC management program. Under the current program, Harmsworth Associates continued part of the monitoring efforts on behalf of the NROC. This is the third year of monitoring under this contract.

The objectives of this year's surveys included in this report were:

- to accurately assess the abundance and distribution of the California gnatcatcher and cactus wren on NROC lands in the San Joaquin Hills that were burned during the 1993 Laguna Beach fire.

The objectives of this year's surveys to be included in a subsequent report:

- to map potential habitat for the cactus wren within the burn area,
- to characterize the qualitative vegetation cover and structure for potential cactus wren habitat,
- to compare qualitative habitat characteristics between areas occupied by the cactus wren and cactus patches not occupied by cactus wren.

This report documents the results of the 2001 surveys and provides a summary of survey efforts over the last six years (1996 through 2001).

### 1.2 *Target species biology*

The California gnatcatcher is an obligate resident of coastal sage scrub in southern California and northwestern Baja California. This small, non-migratory, insectivorous bird nests and forages in moderately dense stands of coastal sage scrub occurring on arid hillsides, mesas, and in washes. It generally occurs below 250 m in elevation (Atwood and Bolsinger 1992). Coastal sage scrub communities dominated by California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), white sage (*Salvia apiana*), and black sage (*Salvia mellifera*) seem to be preferred by this species. The current population of California gnatcatchers in the United States is estimated to be approximately 2,899 pairs (USFWS 2000). Loss and fragmentation of suitable habitat due to expanding development have been major factors in the declining numbers of this species in southern California. The California gnatcatcher is currently listed as a Threatened Species by the USFWS (USFWS 1991).

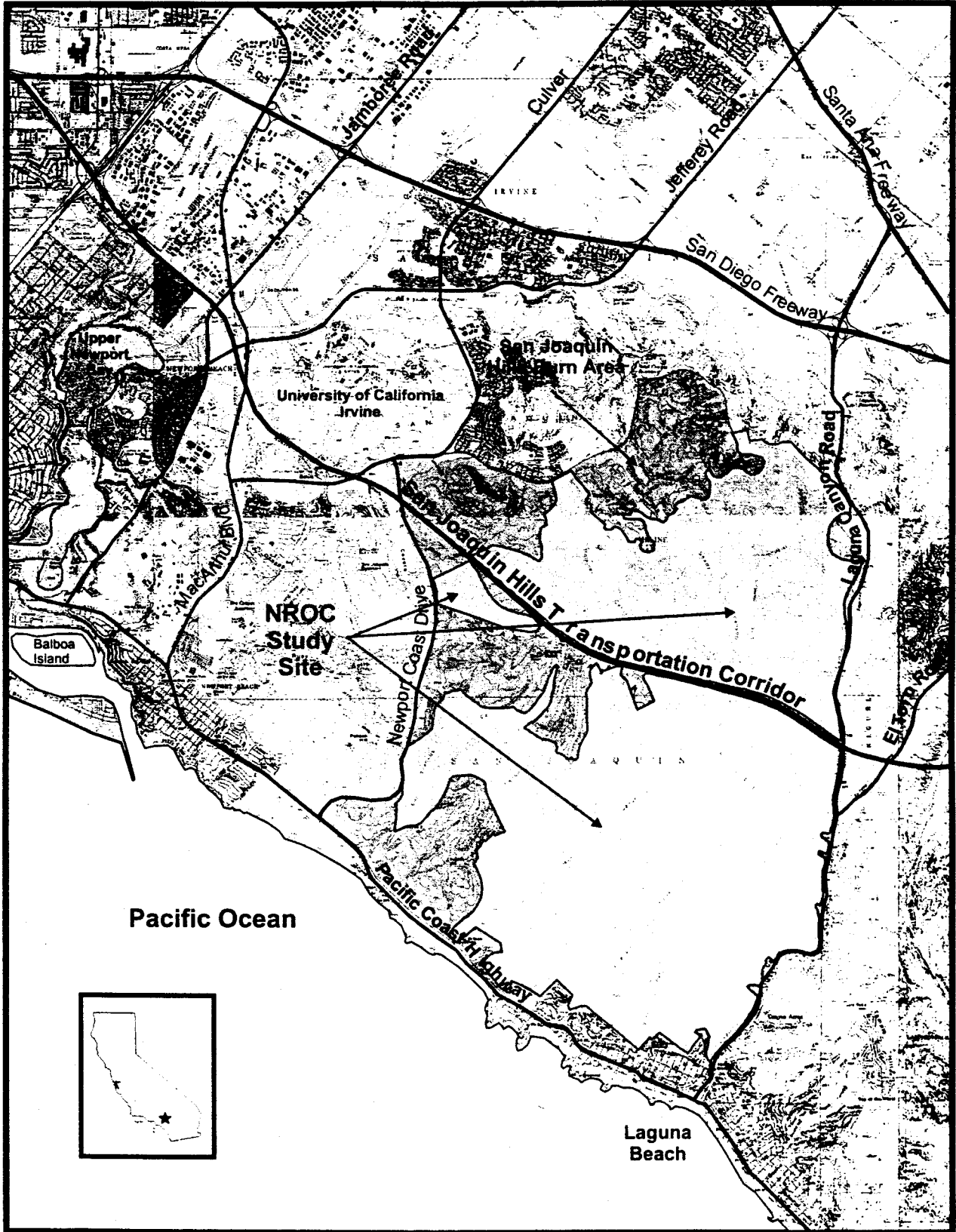
The cactus wren is also an obligate resident of coastal sage scrub but, is further restricted in its distribution to large patches of prickly pear cactus (*Opuntia littoralis* and *O. oricola*) and cholla cactus (*O. prolifera*) within the scrub. The coastal population of cactus wrens are believed to be in decline but, this subspecies currently has no standing on the Endangered Species list primarily due to lack of taxonomic separation from other wren subspecies (Rea and Weaver 1990).

Both the California gnatcatcher and coastal cactus wren were target species around which the Orange County Natural Community Conservation Planning (NCCP) program was designed. Much of the remaining coastal sage scrub habitat in Orange County has been protected through this program.

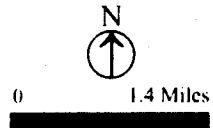
### 1.3 *Study area*

The San Joaquin Hills are located in southwestern Orange County, east of Newport Beach and north of Laguna Beach, and are traversed by the San Joaquin Hills Transportation Corridor (Figure 1). The area encompasses 10,000 hectares of mostly undeveloped land local, regional, and state parks, used historically for cattle ranching. Steep-sided canyons and hillsides dominate the landscape, with elevations ranging from sea level along the Pacific shoreline to 480 meters in the interior. The climate is typically Mediterranean, with warm dry summers and cool wet winters. Early morning coastal fog frequently cloaks the hillsides during spring. Prior to the 1993 Laguna Beach Fire, the San Joaquin Hills were covered by a mosaic of plant communities with chaparral, coastal sage scrub and grassland as the most dominant types. Oak woodland, riparian woodland and marshes were also present. Due to the fire many of these communities are no longer present in their climax form, but are present in various stages of recovery.

The study area included all the burned portions of the San Joaquin Hills designated as NROC lands in the Coastal NCCP Sub-region. The study area is bisected by the San Joaquin Hills Transportation Corridor (SJHTC), forming the inland San Joaquin Hills (inland SJH) north of the SJHTC, and coastal San Joaquin Hills (coastal SJH), south of the SJHTC (Figure 1, 2a and 2b).



**Figure 1**  
Location of Study Site in the San Joaquin Hills Reserve Lands Burn Area.  
Orange County, California



## 2.0 METHODS

### 2.1 *Determination of gnatcatcher and cactus wren distribution and abundance*

Harmsworth Associates conducted presence/absence surveys within the SJH 1993 burn area to determine the distribution and abundance of California gnatcatchers and cactus wrens. Surveys entailed three visits to all suitable and potential habitat during breeding season (February through August 2001). Survey polygons were established based on topographic features (Figures 2a and 2b); survey routes were influenced by suitable habitat patches and the previous year's locality data (Harmsworth Associates 1998a, 1999b). Coastal polygons 4 and 5, which are located in Crystal Cove State Park (CCSP) were not surveyed. Diona Roja of California Department of Parks and Recreation conducted a six-visit sensitive bird species survey in CCSP and generously provided bird location data for this report.

Harmsworth Associates used a survey methodology that followed the guidelines set forth by Mock *et al.* (1990), and by the Southern California Coastal Sage Scrub Scientific Review Panel (Brussard *et al.* 1992). The surveys were conducted during the morning hours (prior to 12:00 a.m.) and when the temperature exceeded 55°F. No more than 100 hectares of habitat were surveyed by each biologist per day, and no surveys were conducted during windy (>15 miles per hour), rainy, or extremely hot (>95°F) conditions. At least 7 days passed between visits to the same monitoring site. If after 5 to 10 minutes no gnatcatcher and cactus wren are observed, taped vocalizations of gnatcatcher and wren calls were used to elicit a response from resident birds.

Once a target bird(s) was detected, the biologist observed the bird(s) long enough to determine whether the bird was paired or single. The biologist also checked for leg bands and if present the color combination of the bands were recorded. Incidental observations of nesting and/or unusual behavior were also recorded. Bird locations were mapped on to 7.5-minute USGS topographic maps (Figure 3a, 3b, 4a, 4b; Appendix 8.5 and 8.6). This information shall be incorporated into the County of Orange Geographical Information System (GIS) database.

### 2.2 *Sensitive Species, non-target avifauna and other wildlife*

During each field survey, biologists kept a record of all sensitive plant and wildlife species detected in the study area and of all other wildlife species encountered (Appendix 8.1).

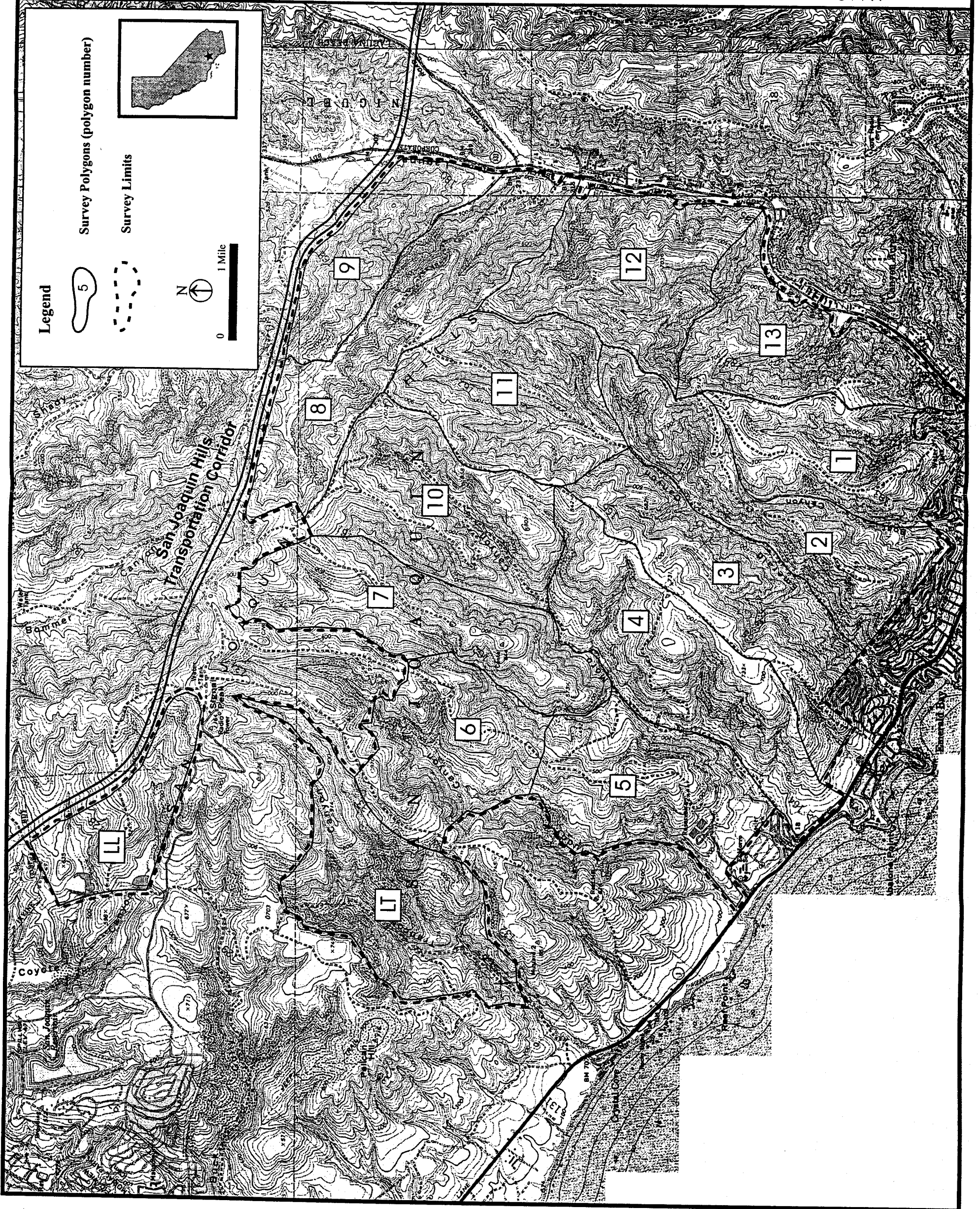


Figure 2a

Survey polygons in the coastal San Joaquin Hills Laguna Beach Burn Area, 2001

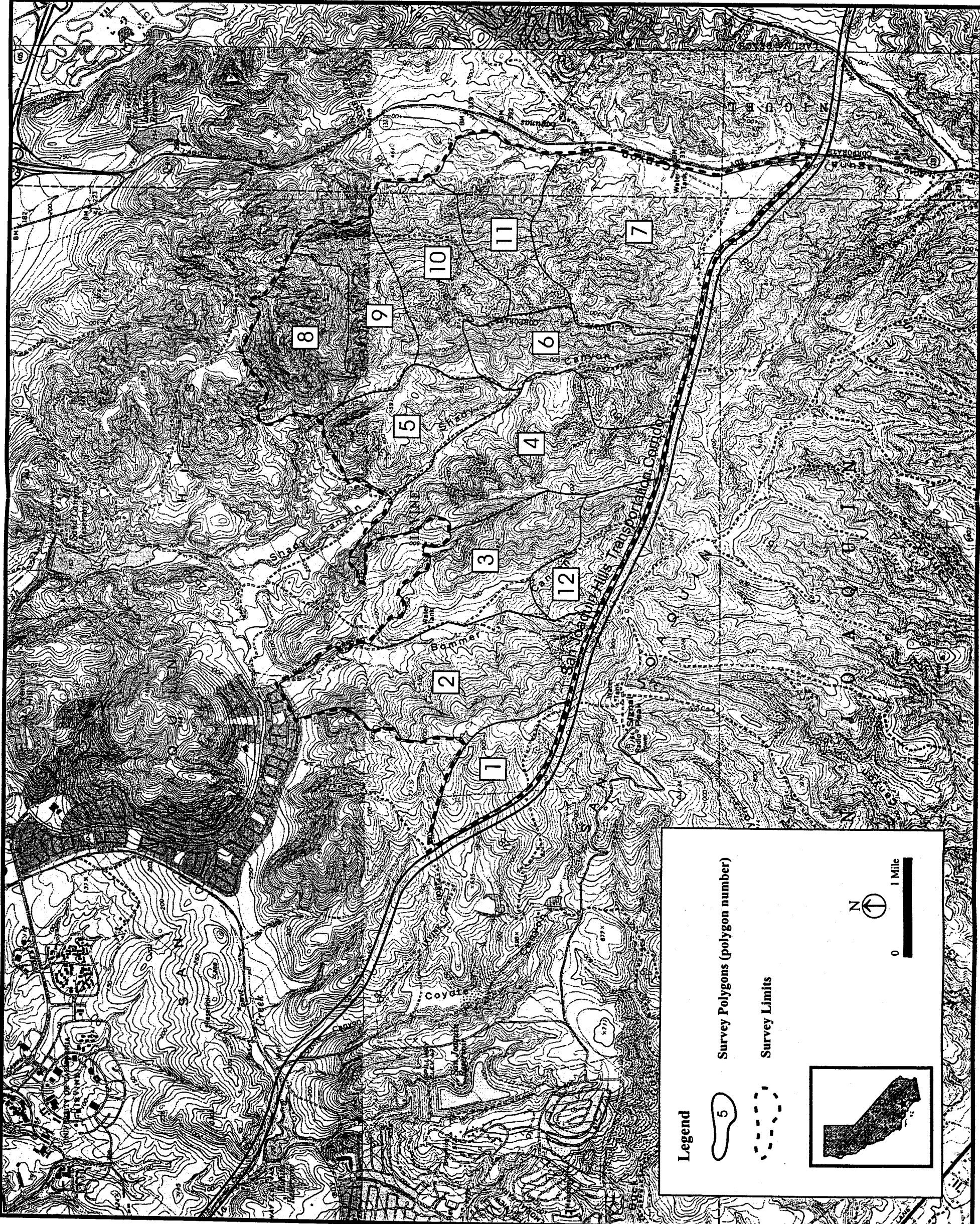


Figure 2b  
Survey polygons in the  
inland San Joaquin Hills  
Laguna Beach Burn Area,  
2001

### 3.0 RESULTS

#### 3.1 *Distribution and abundance of the California gnatcatcher and the cactus wren*

In 2001, surveyors detected 92 California gnatcatcher locations within the coastal and inland San Joaquin Hills study area (Figure 3a, 3b). Seventy of the sightings were recorded as pairs, of which 16 (23%) were confirmed to have bred successfully (determined through incidental observations of one or more adult birds tending at least one fledgling) (Table 1). Single territorial adult gnatcatchers (either unpaired male or female birds holding territories) were recorded at nine locations. Sightings of dispersing juveniles comprised 13 of the 92 locations. Gnatcatcher pairs were located throughout the study area, with the largest number of pairs found in Laguna Canyon (19), Church Canyon (11), and Laidlaw (8) (Table 1, Figure 3a and 3b). Two gnatcatcher pairs and one single territorial adult individual were detected in non-reserve lands or immediately adjacent to the study area, in non-burned areas.

Surveyors detected 31 cactus wren locations in the study area (Figure 4a, 4b). Of these sightings, 26 represented pairs, of which 2 pairs (8%) were confirmed to have successfully reproduced (adult/s observed tending at least one fledgling) and other sightings were five unpaired territorial adult wrens. Wrens were located primarily in Bommer Canyon, Shady Canyon, Church Canyon and the coastal slopes above Laguna Beach (Table 1, Figures 4a, 4b). One pair of cactus wrens was detected outside the survey area in habitat that did not burn in the 1993 Laguna fires (Figure 4b).

**Table 1:** Number of California gnatcatcher and cactus wren pairs and single adults by area in Reserve lands in the San Joaquin Hills burn area, 2001.

LOCATION	CAGN-PAIR	CAGN-SINGLE	CACW-PAIR	CACW-SINGLE
Laidlaw	8 (3)	2	0	0
Church Canyon	11 (3)	0	3	0
Bommer Canyon	7	1	6 (2)	4
Shady Canyon	5 (1)	2	8	0
Laguna Canyon	19 (6)	1	0	0
Upper Little Sycamore	0	0	0	0
Los Trancos Canyon	1	0	0	0
Moro Canyon	6(1)	0	1	0
Emerald Canyon	4(1)	1	3	0
Boat Canyon	6	0	3	0
Muddy Canyon	3(1)	2	2	1
<b>TOTAL</b>	<b>70 (16)</b>	<b>9</b>	<b>26 (2)</b>	<b>5</b>

( ) = Parentheses indicates number of confirmed successful breeding pairs (adults observed tending fledglings).

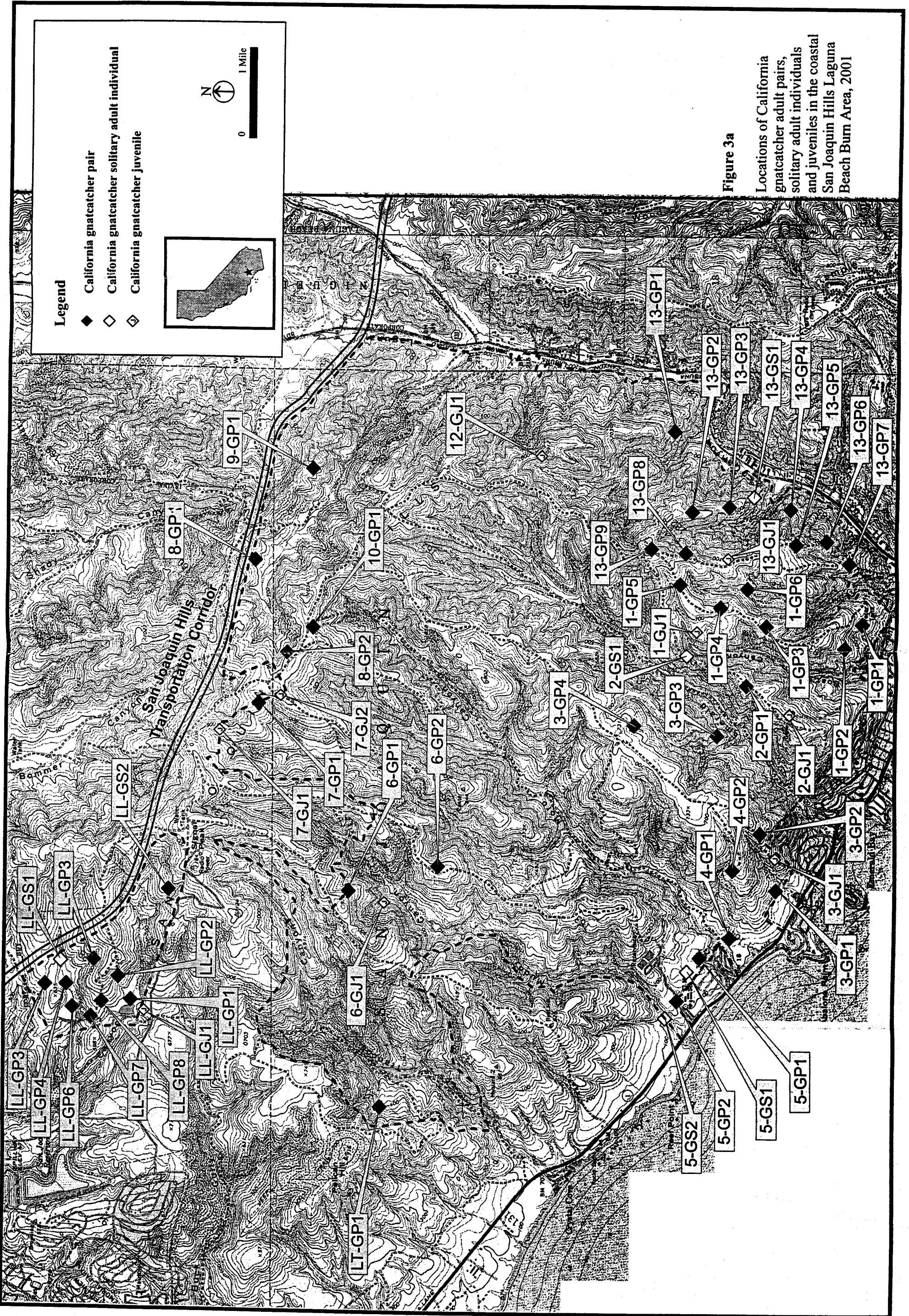


Figure 3a

Locations of California gnatcatcher adult pairs, solitary adult individuals and juveniles in the coastal San Joaquin Hills Laguna Beach Burn Area, 2001

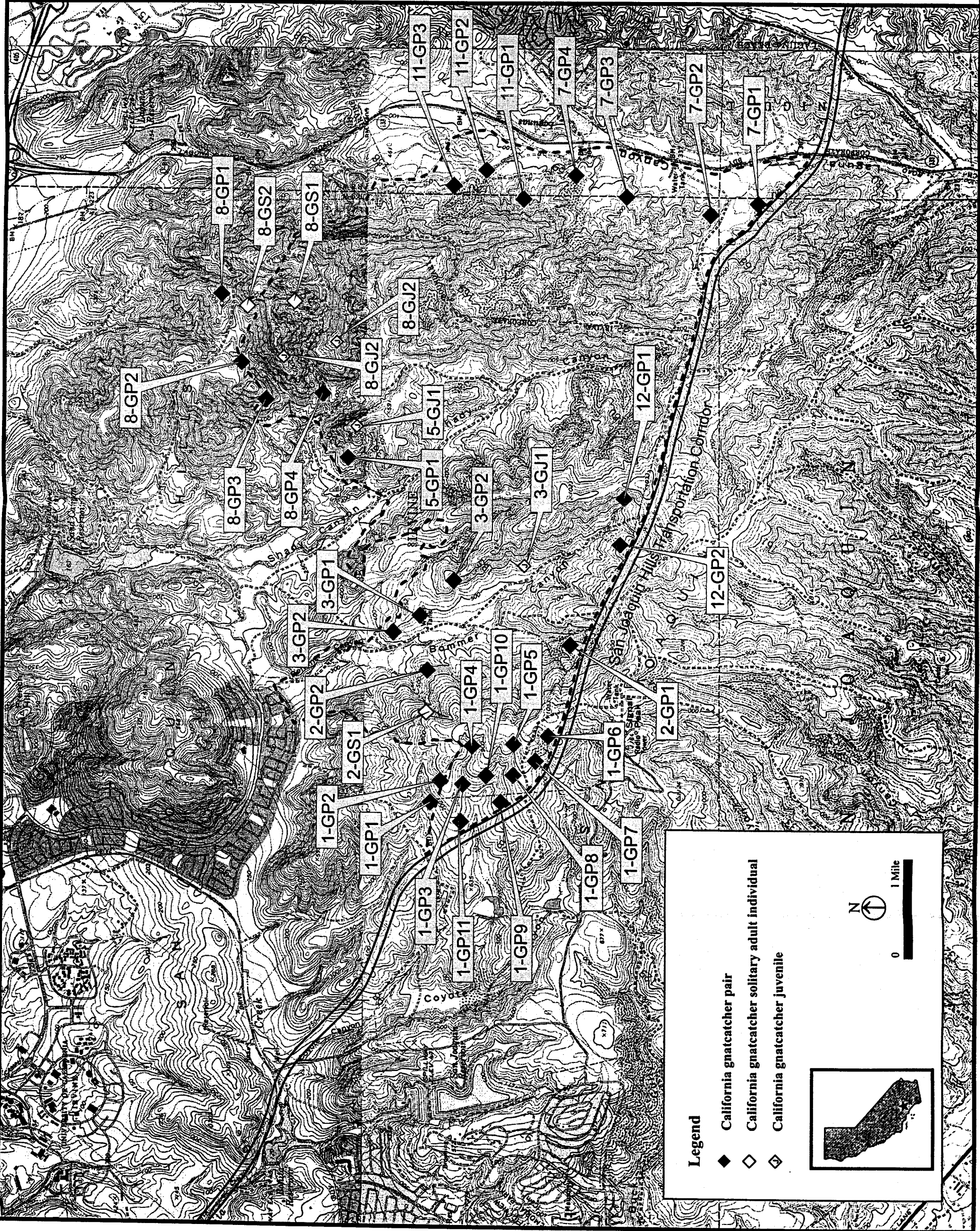


Figure 3b

Locations of California gnatcatcher adult pairs, solitary adult individuals and juveniles in the inland San Joaquin Hills Laguna Beach Burn Area, 2001

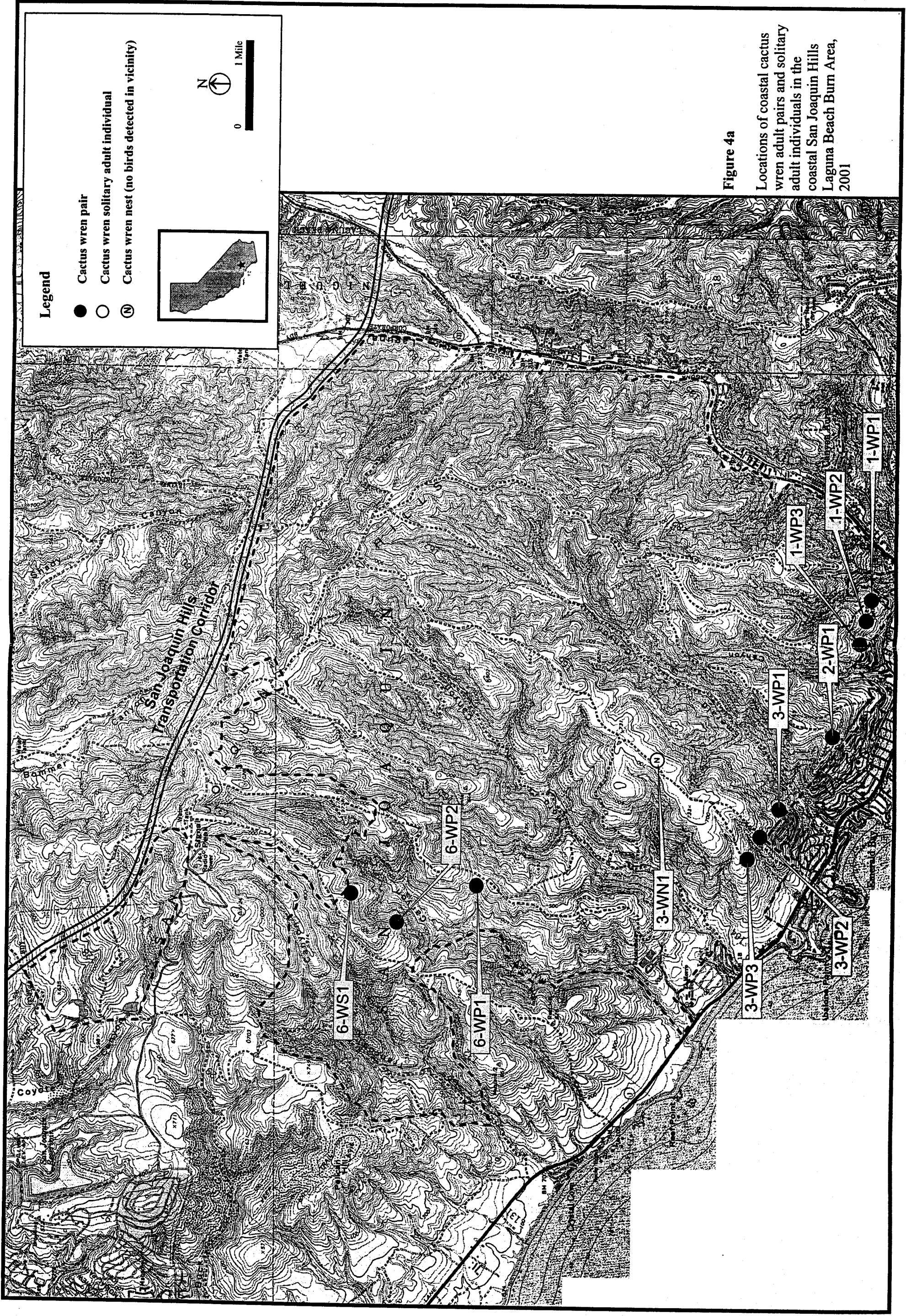


Figure 4a

Locations of coastal cactus wren adult pairs and solitary adult individuals in the coastal San Joaquin Hills Laguna Beach Burn Area, 2001

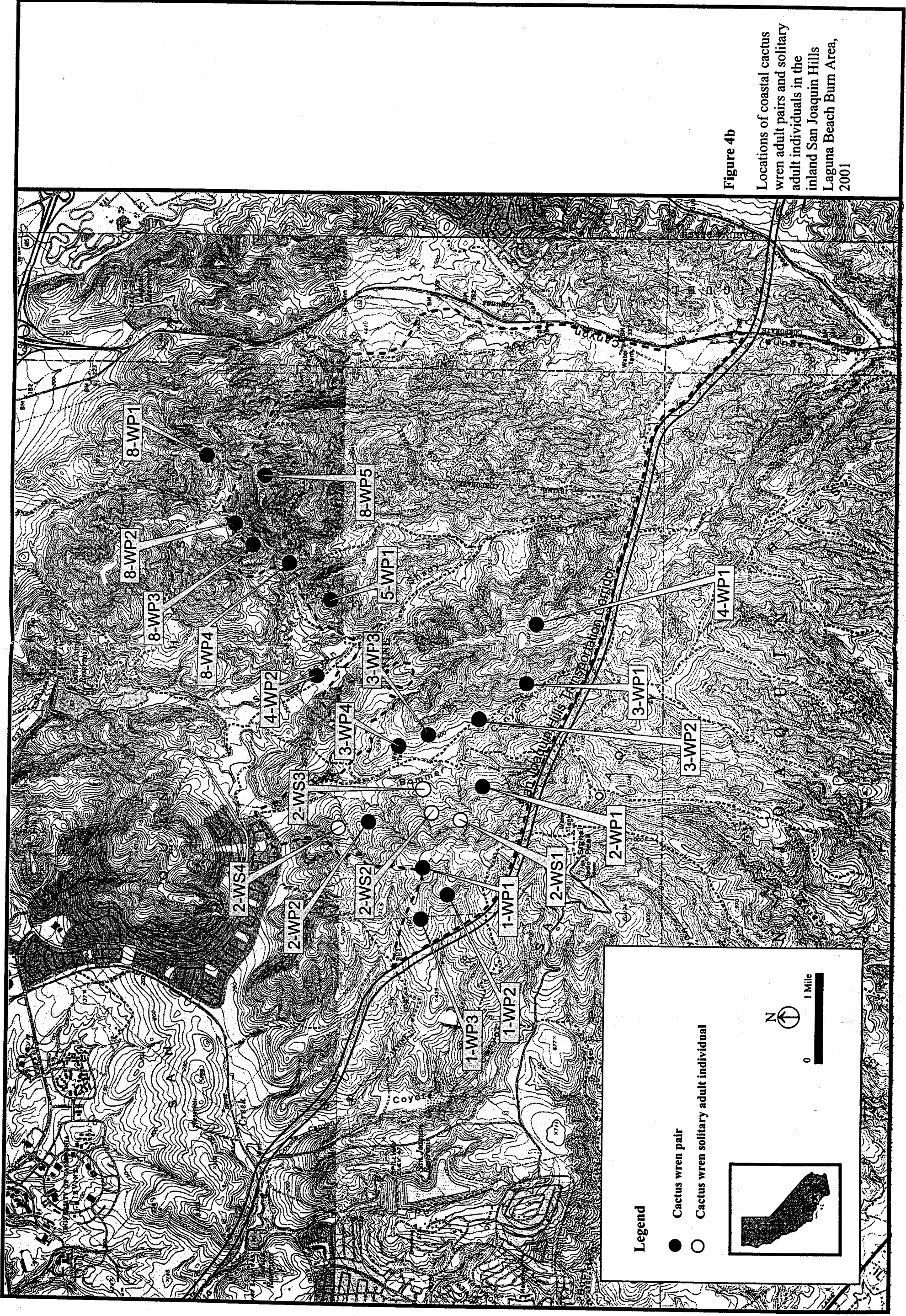


Figure 4b  
Locations of coastal cactus wren adult pairs and solitary adult individuals in the inland San Joaquin Hills Laguna Beach Burn Area, 2001

### 3.2 *Banded birds located*

Five color banded California gnatcatchers were observed in the survey area in 2001 (Appendix 8.2). We re-sighted one banded gnatcatcher that was observed in 2000. Three banded gnatcatchers were banded in refugia adjacent to the study site. Two banded gnatcatchers were banded at the Coyote Canyon Landfill revegetation area. All band combinations were provided to Dave Bontrager to use in his analysis of gnatcatcher movement in the San Joaquin Hills (Atwood *et al.* 1998).

The documentation of 44 banded gnatcatchers recorded in the study site between 1996 through 2001 indicates movement into the burn area from surrounding mature scrub (Harmsworth Associates 1996, 1997, 1998, 1999b, 2000). However, migration out of the burn area, productivity and survivorship are not directly known, so it is not certain whether the burn area is functioning as a source site for the gnatcatcher. All of the sighted birds were banded outside of the study area.

During March 2001, seven cactus wrens within the survey area were captured and color banded for reproductive monitoring and survival (Appendix 8.3). The nest monitoring was discontinued in May 2001. Prior to 2001, only eight banded cactus wrens have been recorded in the study area, the last banded bird observed in 1998 (Appendix 8.3, Harmsworth Associates 1996, 1997, 1998, 1999b). This is not surprising since cactus wren banding studies have not been conducted in the study area for several years.

### 3.3 *Sensitive species*

#### 3.3.1 Sensitive wildlife species

A total of 15 sensitive wildlife species were detected during the 2001 surveys (Figure 5a, 5b). One was an amphibian, three were reptiles, and eleven were birds (Table 2).

Western spadefoot toad (*Scaphiopus hammondi*) tadpoles were detected in a tributary to Shady Canyon, in the inland SJH (Figure 5b). The red-diamond rattlesnake (*Crotalus ruber*) was detected in both the inland (East Shady Canyon) and coastal (Laidlaw/Coyote Canyon) study area. The western pond turtle (*Clemmys marmorata*) was detected in the recently created pond in upper Shady Canyon.

Of particular interest were seven San Diego coast horned lizards observed during the 2001 surveys. Two were in upper Muddy Canyon, two in upper and lower Boat Canyon, two in lower Laguna Canyon and one in upper Shady Canyon. During the 2000 surveys, two neonate horned lizards were recorded in one location in the coastal portion of the study area at the head of Boat Canyon. During previous surveys, the horned lizard was detected in Emerald Canyon, El Morro Canyon and upper Laguna Canyon. The horned lizard, a California Species of Concern, inhabits sandy washes and open sandy areas within coastal sage scrub, grassland, chaparral, oak and riparian woodland.

**Table 2: Sensitive Wildlife Species, 2001**

ORDER/FAMILY/SPECIES NAME	COMMON NAME
<b>AMPHIBIA AND REPTILIA</b>	<b>AMPHIBIANS AND REPTILES</b>
<b>PELOBATIDAE</b>	<b>SPADEFoot TOADS</b>
<i>Scaphiopus hammondi</i>	western spadefoot toad
<b>EMYDIDAE</b>	<b>BOX &amp; WATER TURTLES</b>
<i>Clemmys marmorata</i>	western pond turtle
<b>IGUANIDAE</b>	<b>IGUANIDS</b>
<i>Phrynosoma coronatum</i>	coast horned lizard
<b>VIPERIDAE</b>	<b>VIPERS</b>
<i>Crotalus ruber</i>	red diamond rattlesnake
<b>AVES</b>	<b>BIRDS</b>
<b>ACCIPITRIDAE</b>	<b>KITES, HAWKS, EAGLES &amp; VULTURES</b>
<i>Elanus caeruleus</i>	White tailed kite
<i>Circus cyaneus</i>	Northern harrier
<i>Accipiter striatus</i>	Sharp-shinned hawk
<i>Accipiter cooperii</i>	Cooper's hawk
<b>FALCONIDAE</b>	<b>FALCONS</b>
<i>Falco peregrinus</i>	Peregrine falcon
<b>TROGLODYTIDAE</b>	<b>WRENS</b>
<i>Campylorhynchus brunneicapillus</i>	Cactus wren
<b>MUSCICAPIDAE</b>	<b>THRUSHES, OLD WORLD WARBLERS</b>
<i>Polioptila californica</i>	California gnatcatcher
<b>LANIIDAE</b>	<b>SHRIKES</b>
<i>Lanius ludovicianus</i>	Loggerhead shrike
<b>EMBERIZIDAE</b>	<b>WOOD WARBLERS, SPARROWS, NEW WORLD FINCHES &amp; BLACKBIRDS</b>
<i>Icteria virens</i>	Yellow-breasted chat
<i>Aimophila ruficeps</i>	Rufous-crowned sparrow
<i>Ammodramus savannarum</i>	Grasshopper sparrow

The sensitive raptor sightings are depicted in Figures 5a and 5b. Of particular note, there were sightings of northern harrier (*Circus cyaneus*) in both the coastal and inland portions of the survey area, but only one observation at upper Boat canyon confirmed a pair. The northern harrier is a "Species of Special Concern" in California, and on the National Audubon Society's "Blue List" of species showing serious population declines, with only one known breeding territory within the Central Coastal NCCP subregion (Bloom 1999).

A pair of loggerhead shrikes was observed in Muddy Canyons (Figure 5a) and a single individual was observed in Laguna Canyon (Figure 5b). The loggerhead shrike is a common but declining species in Orange County (Gallagher 1997) preferring flat and gently sloping lands with occasional perches, such as fence posts or shrubs. The shrike is declining throughout its range and has been placed on the National Audubon Society's "Blue List" (Gallagher 1997).

Five observations of yellow-breasted chat were recorded within the study area in 2001, as compared to three in 2000 and nine localities in 1999. The yellow-breasted chat localities were in Laguna Canyon, Emerald Canyon, and Los Trancos Canyon and Shady Canyon (Figure 5a and 5b). The yellow-breasted chat breeds in dense riparian woodlands, dense brush, scrub or thickets associated with streams, swamps and ponds. The yellow-breasted chat is listed by the CDFG as a species of special concern, whose decline in California has been attributed to loss and degradation of riparian habitats and possibly brood-parasitism by the brown-headed cowbird.

Southern California rufous-crowned sparrows (*Aimophila ruficeps*) were apparently more abundant in the coastal study area. Grasshopper sparrows (*Ammodramus savannarum*) were rarely detected, although this is likely due to the surveys being restricted to CSS rather than grassland habitats.

### 3.3.2 Sensitive plant species

During the 2001 target bird survey, four sensitive plant species were detected (Table 3). Sighting locations are mapped in Figure 5a and 5b.

**Table 3:** Sensitive Plant Species, 2001

FAMILY/SPECIES NAME	COMMON NAME
<b>ANGIOSPERMAE</b>	<b>FLOWERING PLANTS</b>
<b>DICOTYLEDONES</b>	<b>DICOTS</b>
<b>BORAGINACEAE</b>	<b>BORAGE</b>
<i>Harpagonella palmeri</i>	Palmer's grappling-hook
<b>CRASSULACEAE</b>	<b>STONECROP FAMILY</b>
<i>Dudleya multicaulis</i>	Many-stemmed Dudleya
<b>MONOCOTYLEDONES</b>	<b>MONOCOTS</b>
<b>LILIACEAE</b>	<b>LILY FAMILY</b>
<i>Calochortus weedii</i> var. <i>intermedius</i>	Intermediate mariposa lily
<i>Calochortus catalinae</i>	Catalina mariposa lily

Palmer's grappling-hook (*Harpagonella palmeri*) is a small annual herb that was observed in the extreme lower sections of Boat, Emerald and El Morro Canyons. It is a Federal species of concern (FSC) and California Native Plant Society (CNPS) List 2 species (plant rare, threatened, or endangered in California, but more common elsewhere).

Many-stemmed dudleya (*Dudleya multicaulis*) were detected in 2001 on rocky ridgelines primarily in the vicinity of Shady Canyon, and Laguna Canyon (Figures 5a and 5b). Many-stemmed Dudleya is a perennial herb often found on clay soils in chaparral, coastal scrub and valley and foothill grasslands. It is also an FSC and CNPS 1B species (plants rare, threatened or endangered in California and elsewhere). The small succulent occurred in thin well-drained soils on slopes and ridge tops in coastal sage scrub, chaparral, and native perennial grasslands. Other populations of many-stemmed dudleya are known from the study area including Camarillo ridge and Bommer Canyon (Harmsworth Associates 1999b, 2000).

Intermediate mariposa lily (*Calochortus weedii* var. *intermedius*) was observed in Laguna and upper Emerald Canyons (Figure 5a). In 2000, individuals were detected along Bommer Canyon ridge (Harmsworth Associates 2000). This geophyte is an FSC and a CNPS 1B species, indicating that it is rare, threatened or endangered in California and elsewhere. It is also a "conditionally covered species" under the Central/Coastal NCCP Subregion.

One population of Catalina mariposa lily was observed in lower Boat Canyon. It was observed during the 1999 surveys, but not in 2000 (Harmsworth Associates 1999b, 2000). It is a CNPS 4 species, indicating that it is limited in distribution and specie's vulnerability to threat is currently considered low.

### **3.4 Non-target avifauna and other wildlife**

A total of 133 species of wildlife were noted in the study area during the 2001 survey. This included 24 butterflies, 2 amphibians, 8 reptiles, 93 birds and 6 mammals (Appendix 8.1). This represents a 29% increase in the number of species noted compared to 2000 (Harmsworth Associates 2000a). The increase is due to more recordings noted for butterflies and 22% more bird species observed during the 2001 surveys.

One sighting of a free flying brown-headed cowbird (*Molothrus ater*) was recorded during the surveys in upper Laguna Canyon. The paucity of cowbirds in the study area could be a result of several cowbird-trapping programs conducted within the San Joaquin Hills (Harmsworth Associates 2001a, 2000b, Griffith Wildlife Biology, pers. comm.).

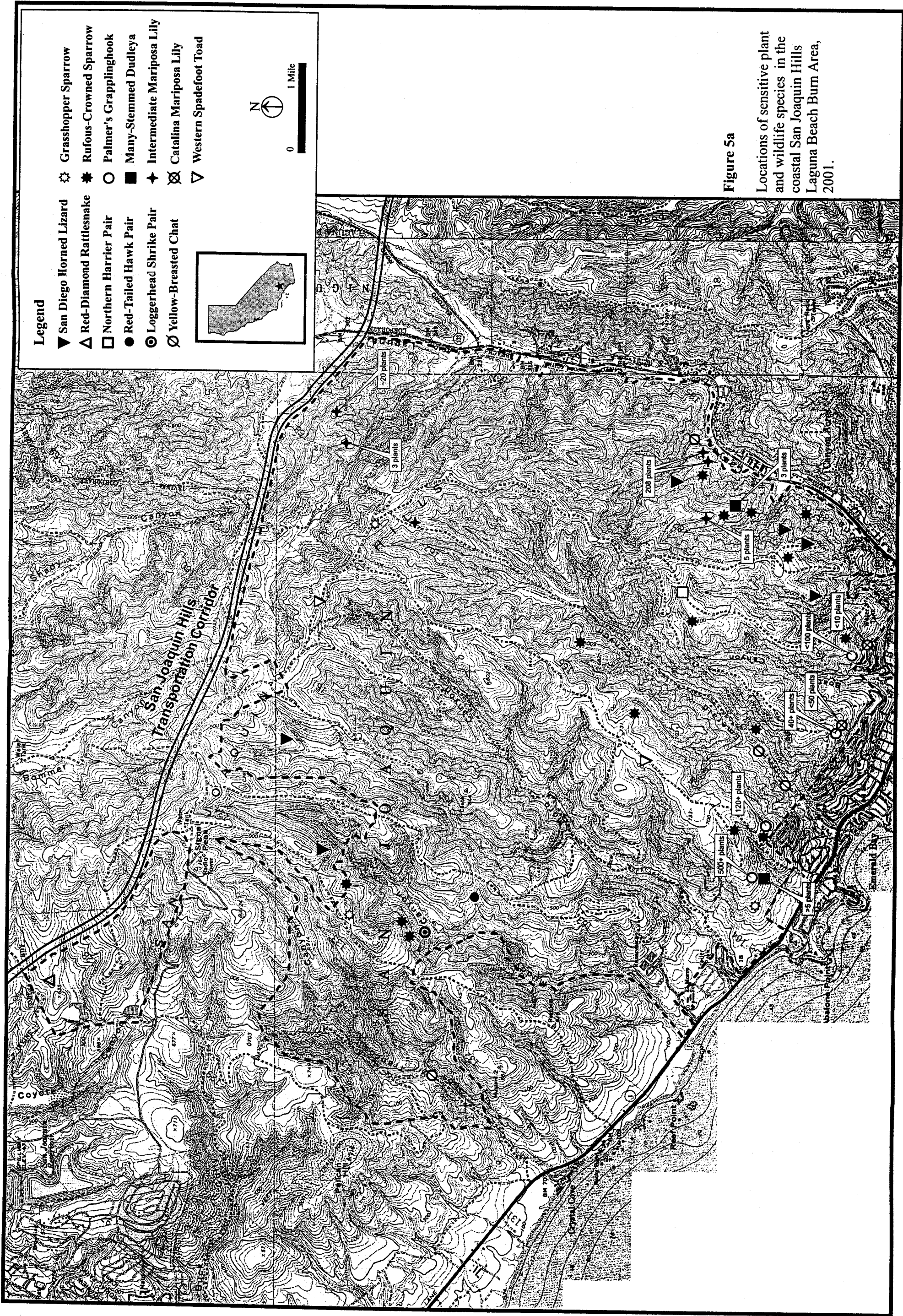


Figure 5a

Locations of sensitive plant and wildlife species in the coastal San Joaquin Hills Laguna Beach Burn Area, 2001.

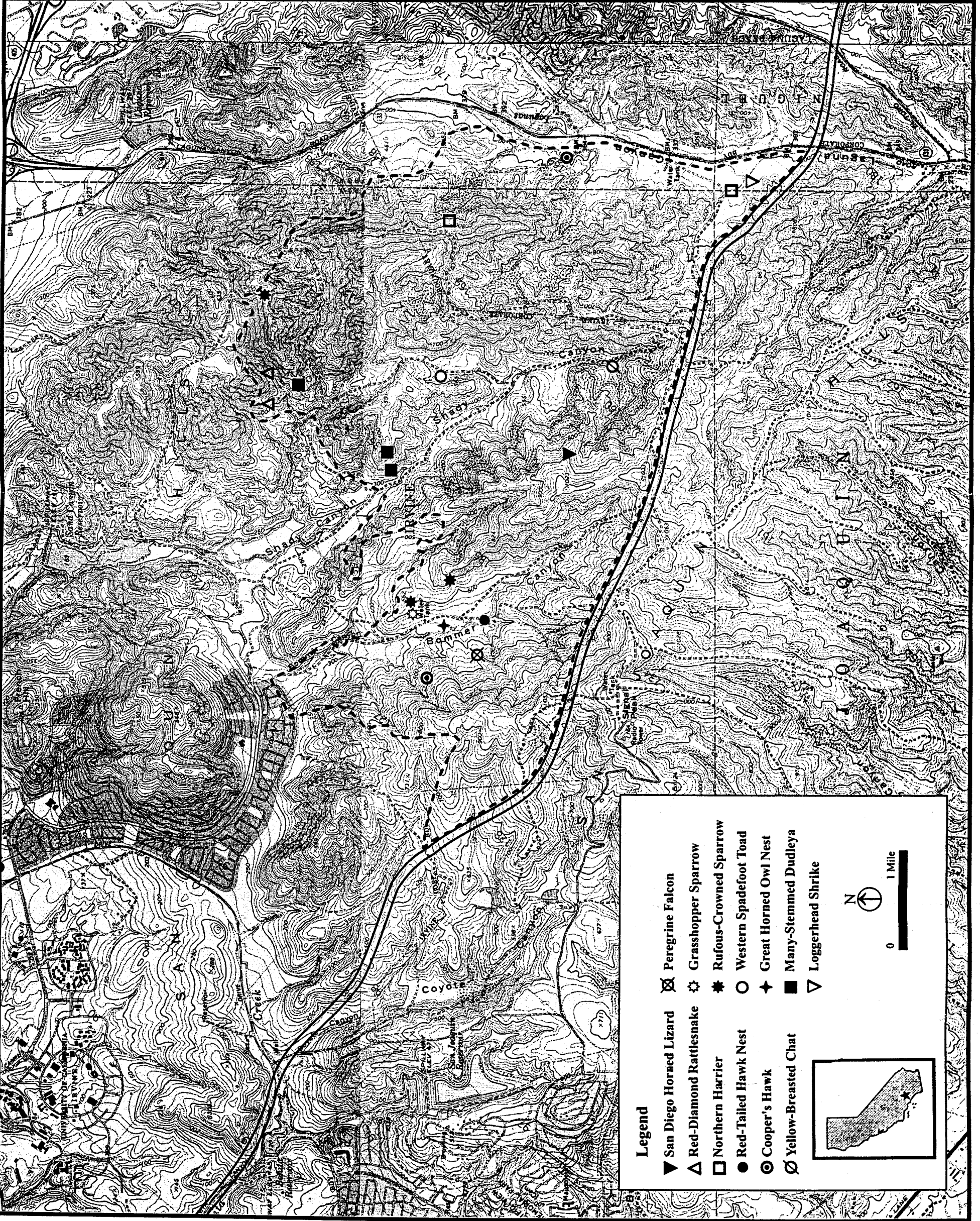


Figure 5b

Locations of sensitive plant and wildlife species in the inland San Joaquin Hills Laguna Beach Burn Area, 2001.

## 4.0 DISCUSSION

### 4.1 *California gnatcatcher*

In 2001, there was an increase in the number of gnatcatcher locations in the San Joaquin Hills burn area from the 35.9% decline that occurred between 1999 and 2000 (Figure 6). The total number of gnatcatcher locations, including paired and unpaired territorial individuals, detected in 2001 increased 33.9% to 79 localities in 2001 from 59 in 2000 (Table 4). However, this is still 14% (13 locations) fewer locations than the 92 observed during the 1999 survey and 37% (43 locations) fewer locations than the 115 locations observed prior to the 1993 Laguna fire (Figure 6).

In 1999, gnatcatcher locations in the inland SJH (51) were more numerous than coastal locations (41). This was inverted in 2000 with the number of inland locations (25) being less than coastal locations (34)(Harmsworth Associates 2000). During 2001, the increase in locations in the coastal study area (35.3%) was similar to the increase in the inland study area (32.0%)(Table 4).

**Table 4:** Number of gnatcatcher and cactus wren territories, 2000 – 2001\*.

Study Area	Gnatcatcher territories			Cactus wren territories		
	2000	2001	% change	2000	2001	% change
Coastal SJH	34	46	35.3%	6	10	66.7%
Inland SJH	25	33	32.0%	26	21	-19.2%
<b>Total</b>	<b>59</b>	<b>79</b>	<b>33.9%</b>	<b>32</b>	<b>31</b>	<b>-3.1%</b>

\* Territorial gnatcatcher and cactus wrens include paired and single unpaired individuals.

Since 1996, the gnatcatcher population in the SJH burn area has been generally increasing (Figure 6). The decline in gnatcatcher locations during 2000 corresponds with the 35.1% decline in adult landbird populations in this area (DeSante *et al.*, 2001). Fluctuations in landbird populations are attributed to demographic and climatic factors (DeSante *et al.*, 2001). Apparently, gnatcatchers are responding similarly to demographic and climatic factors as other landbird species in the area. Gnatcatcher reproductive success (number of fledglings/pair) in adjacent areas was high in 2000 (Harmsworth Associates 2001b) and appears to have been high in 2001 (Erickson, R.A., pers. comm.). This suggests an expected increase in the number of locations for 2002, given there is unoccupied suitable habitat in the burn area and mild weather.

The ratio of territories detected with single individuals to territories with pairs was relatively high in 2000 (0.28) indicating that many post-breeding dispersing individuals failed to find mates and get recruited into the 2000 breeding population (Table 5). Low productivity in landbirds (DeSante, *et al.* 2001) and gnatcatchers (Harmsworth Associates 1999a) in 1999 may have attributed to decreases in the breeding population in 2000 resulting in a lower chance of single birds encountering potential mates. The ratio of single to pair locations detected in 2001 (0.13) returned to a level comparable to 1999 (0.16) suggesting an increased in the likelihood of recruitment of birds into the breeding population. This along with the apparent high 2001 productivity indicates a potential for an upward trend in next year's gnatcatcher numbers.

**Table 5:** Ratio of gnatcatcher territories detected with single individuals to territories with pairs.

Year	Ratio of Single to Paired Locations
1996	0.63
1997	0.12
1998	0.07
1999	0.16
2000	0.28
2001	0.13

Detected California gnatcatcher pairs were primarily distributed along the outer edges of the study area, as opposed to the interior of the study area (Figures 3a, 3b, and 8). Fifty-nine percent of the pairs were located within 400 meters of the study area boundary. The general distribution of gnatcatchers within the study area appears to be relatively consistent with pre-fire conditions. Hamilton (2001, in prep.) suggests that the degree to which gnatcatcher pairs were associated with edges was inversely correlated with the length of time since a catastrophic fire.

#### 4.2 *Cactus wren*

In total, there was one less cactus wren territory detected in 2001 than in 2000 (Table 4). However, the 2001 surveys documented a 13% increase (23 in 2000 to 26 in 2001) in the number of wren pairs. The number of single adult wren locations declined 44% (9 in 2000 to 5 in 2001).

During the 2001 surveys, four more wren locations (9 pairs and 1 single) were observed in the coastal area than during 2000 surveys (4 pair and 2 singles). This represents a 33% increase in the number of wren locations on the coastal SJH (Table 4). Three pairs, not observed during the 2000 surveys, were observed in Boat Canyon, two in Emerald Canyon and one in El Moro Canyon in 2001. One "single" location in lower Laguna Canyon that was sighted in 2000 was not detected during the 2001 surveys.

Although the number of wren locations north of the SJHTC represents 68% of the mapped locations, the inland wrens population continued to decline by 19.2% (Table 4). There were 38 locations in 1999, 26 in 2000, and 21 in 2001. There was one fewer wren pair location in Church Canyon, 4 fewer pair locations in Bommer Canyon, and 3 more pair locations in Shady Canyon detected in 2001 than in 2000. There were three fewer "single" wren locations observed in Shady Canyon in 2001 than in 2000.

In 2001, the proportion of incidental observations of successfully breeding cactus wrens (an adult bird with at least one fledgling or juvenile) continued to decline to 8% (2 of the 26 pairs seen with fledged young). In 1999 the proportion of observed successful breeders was 70% (24 of 38) and in 2000 it was 20% (5 of 24). The decline in the number of chance encounters with a wren family group has declined in both the coastal and inland areas (Figure 8). These anecdotal notations should not be considered an estimate or index of breeding success.

Detected cactus wren pairs were primarily distributed along the outer edges of the study area, as opposed to the interior of the study area (Figure 7). Seventy-three percent of the pairs were

located within 400 meters of the study area boundary. One of 26 territories was located immediately adjacent to the burn area.

There were fewer wren pair locations in the study area than the gnatcatcher (Table 6) and a greater proportion of the wren pairs were near the reserve boundaries (Figure 7). There seems to be more available gnatcatcher habitat than wren habitat and gnatcatcher habitat appears to recover more quickly from burning than wren habitat.

**Table 6:** Percent of pairs encountered with fledglings, number of pair locations, and number of unpaired adult locations for the California gnatcatcher and cactus wren detected in the SJH survey area.

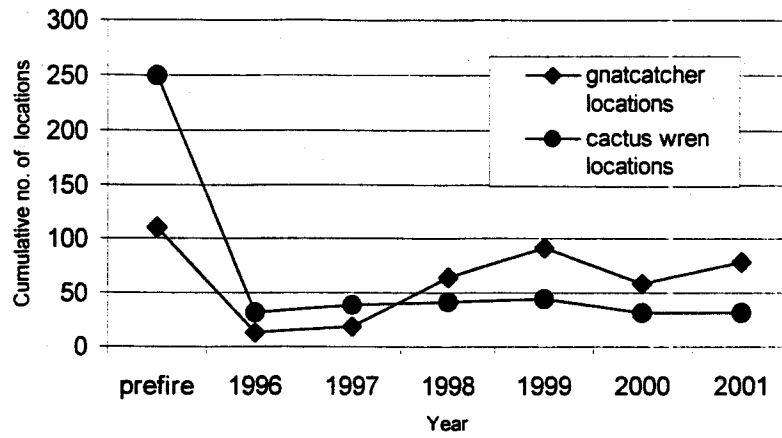
Year	California gnatcatcher			Cactus wren		
	% of pairs with fledglings	Total no. of pairs	Total no. of singles	% of pairs with fledglings	Total no. of pairs	Total no. of singles
1999	49%	79	13	63%	38	7
2000	39%	46	13	22%	23	9
2001	23%	70	9	8%	26	5

A factor that may contribute to the stability of the wren population in the study area is the abundance of “floaters” in the area. Floaters are unpaired adults without an apparent territory. The presence of floaters when a pair loses a mate would allow the remaining individual to acquire a new mate sooner and remain as breeder in the area. A small population of floaters would make it less likely that an individual would acquire a new mate and the location would drop out as wren breeding sight.

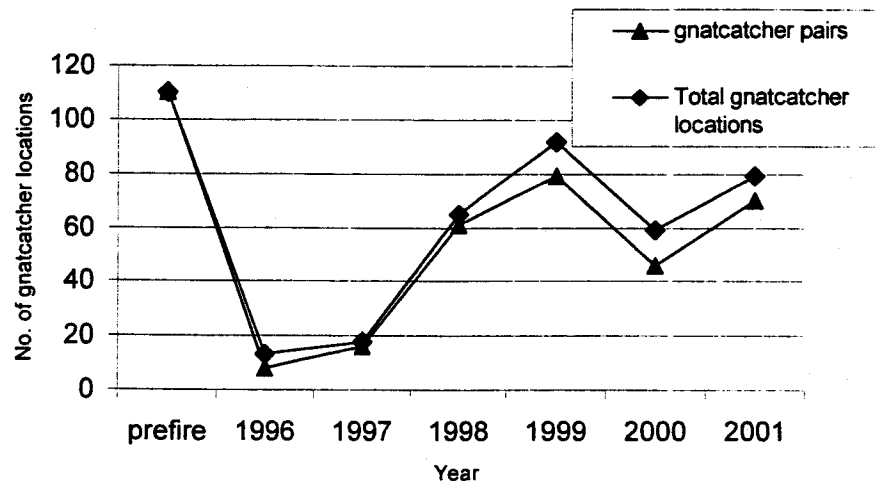
The cactus wren population is not recovering from the fire as compared to the gnatcatcher population (Figure 6). The cactus wren population remains approximately 12% (rough calculation only) of the pre-fire population, however the population has remained more or less stable since 1996. In comparison, the gnatcatcher population has increased every year, except 2000 (Figure 6), and is currently 70% of the pre-fire population (rough calculation only). This is consistent with Crooks *et al* (2001) who suggested that cactus wrens have a higher proportion of extinctions from habitat fragments and are less likely to re-colonize the fragments than gnatcatchers.

The slow recovery of cactus habitat is one reasonable assumption that may account for the decreased recolonization rates for the cactus wren. The decline of the cactus wren could also be a result of low fecundity, high mortality, low immigration and /or high emigration which are influenced by a number of factors including habitat quality (or quantity), food availability, predation, parasites/pathogens, or barriers to dispersal. To assess what vegetation and habitat parameters may account for the slow recovery of the cactus wren population, a cactus wren habitat study is being prepared under separate cover. This study will attempt to determine which habitat/vegetation criteria are important for the cactus wrens and which habitat criteria may be hindering the wrens from recolonizing the burn area. Following this analysis, we can address the cactus wren population status and discuss the necessity of management activities or further studies.

Total California gnatcatcher and cactus wren locations pre-fire to 2001



California gnatcatcher locations, pre-fire to 2001



Cactus wren locations Pre-fire to 2001

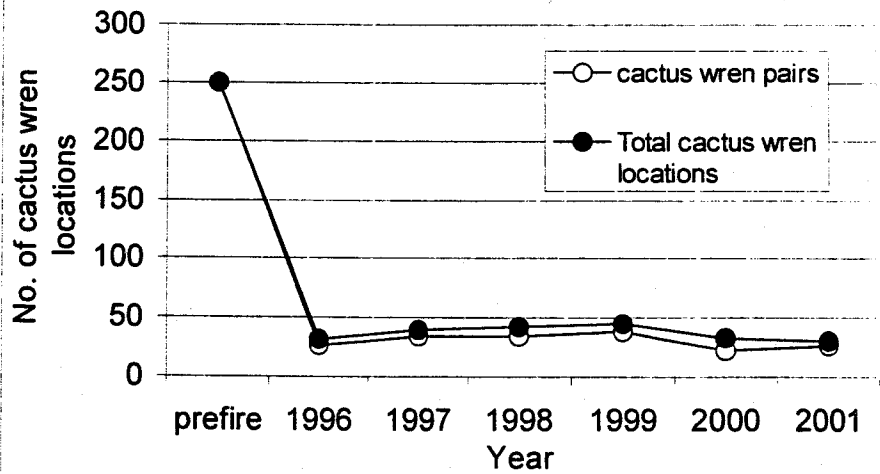
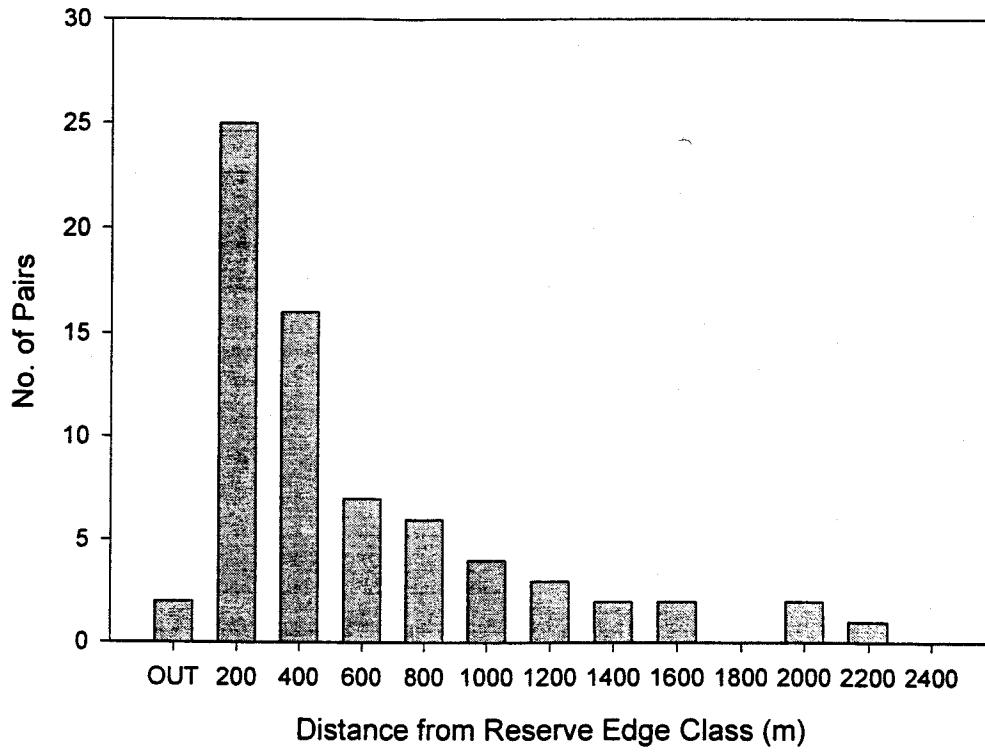
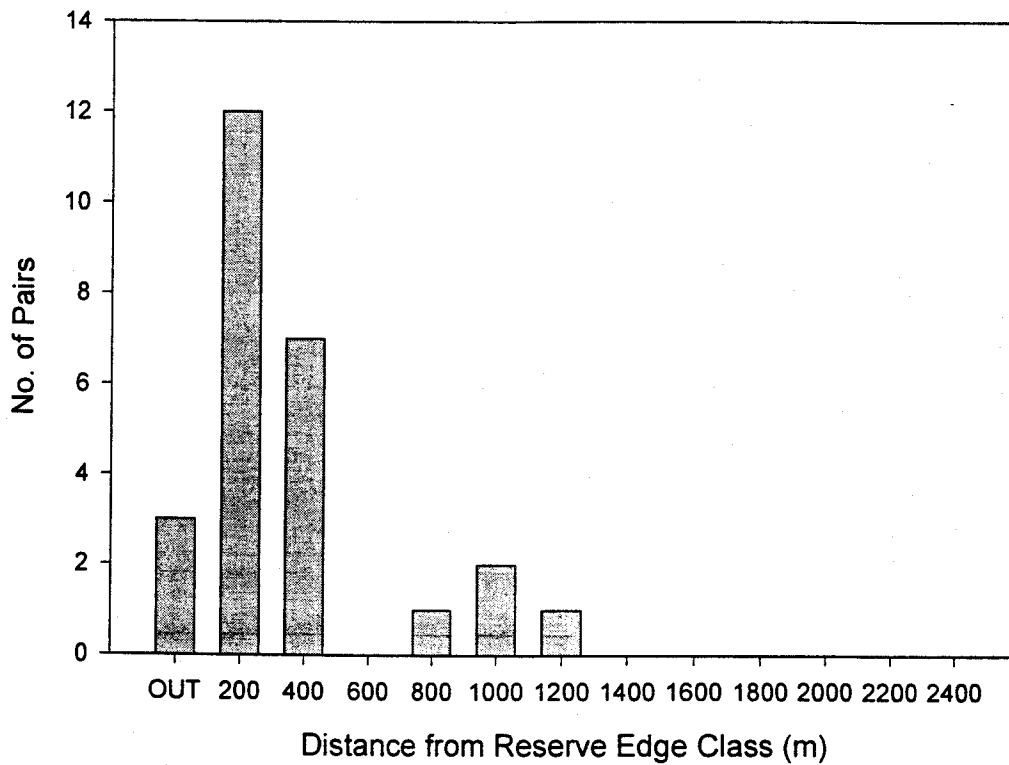


Figure 6: Number of California gnatcatcher and cactus wren localities recorded in the San Joaquin Hills burn area since the 1993 Laguna Beach Wildfire

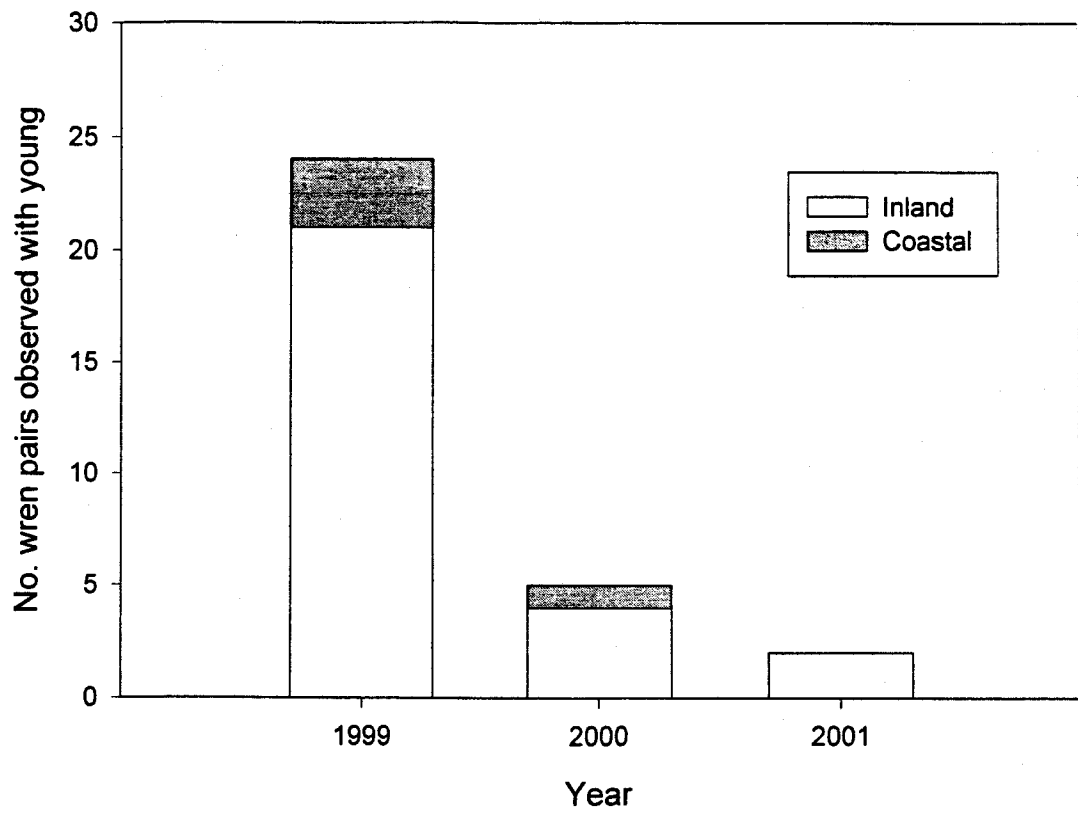
### California gnatcatcher



### Cactus Wren



**Figure 7:** Frequency of California gnatcatcher pairs (n=70) and cactus wren pairs (n=26) at 200 meter intervals from the reserve boundary, 2001.



**Figure 8:** Number of wren pairs observed tending at least one fledgling during 1999 to 2001 burn area surveys.

## 5.0 RECOMMENDATIONS

The Nature Reserve of Orange County is obligated to continue studies within the San Joaquin Hills burn area to document the recovery of California gnatcatchers and cactus wrens. It is important to continue documenting changes in populations over time, especially during periodic perturbations (such as wildfire) (County of Orange NCCP/HCP, Section 5.4.4, II-290). Therefore, it is recommended to continue the gnatcatcher and cactus wren census within the San Joaquin Hills burn area, as specified in the mitigation-monitoring program.

To continue the census, all suitable and potential habitat for the two target species in the burn area should be surveyed three times, beginning in early February. In addition, we recommend nest-monitoring and color-banding studies of a subset of gnatcatcher and cactus wren breeding pairs to document reproductive success and dispersal patterns within the burn area. These studies could determine what management activities, if any, should be employed to facilitate the recovery of these target species within the burn area, and thus improve reserve functions (County of Orange NCCP/HCP, Section 5.4.6, II-294).

In addition to monitoring the recolonization of the two identified species mentioned above, the census and nest monitoring data would also contribute information for the following:

- Documenting large scale changes in population status for the gnatcatcher and cactus wren, contributing to basic knowledge of the Reserve's biodiversity, dispersal and demography of the target species,
- Documenting the level of recovery after fire, which will be useful in fire management strategies provided for in NCCP/HCP documents; and
- Monitoring the recovery of other "identified species" to demonstrate their viability within the San Joaquin Hills.

Harmsworth Associates recommends the following studies in 2002:

- Continue gnatcatcher and cactus wren census in the San Joaquin Hills burn area,
- Upon completion of the cactus wren habitat study (prepared under separate cover), the cactus wren population status and the necessity of management activities or further studies can be addressed. Future studies could include the following:
  - Expanded and comprehensive cactus wren habitat study that includes both occupied and unoccupied habitats within the burn area and compares burn area cactus sites with occupied non-burn reference sites;
  - Implement a full nest-monitoring and color-banding program for a subset of cactus wren breeding pairs within the coastal and inland SJH. However, limited resources limit the amount effort that can be expended on monitoring and banding programs. Alternative methods of monitoring can include:

- 1) Monitor a subset of cactus wren breeding pairs for the presence of fledglings. This would require fewer and less frequent territory visits than nest monitoring, but could determine breeding success and possibly the minimum number of fledglings. With this level of effort, the number of nesting attempts and nest failures or the exact number of fledglings could not be determined.
  - 2) Color-band a subset of cactus wren pairs and determine the color band status with site visits and recaptures on an annual basis. This would provide an estimate of the turn over rate in the breeding population.
- Nest-monitoring and color-banding program for California gnatcatcher breeding pairs in adjacent unburned refugia (Atwood *et al.* 1998).

In addition, we recommend that the NROC Technical Advisory Committee (TAC) consider the low numbers of cactus wren sites within the coastal and inland SJH, and address potential management strategies that may reverse or slow the decline. Both passive and active management considerations include enhancement of cactus wren habitat in the coastal SJH, and nest-monitoring studies.

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## **7.0 ACKNOWLEDGMENTS**

The surveys and report were conducted/prepared by Harmsworth Associates biologists:

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**8.0 APPENDICES**

**Appendix 1: Fauna recorded in the San Joaquin Hills burn area, 2001.**

<b>ORDER/FAMILY/SPECIES NAME</b>	<b>COMMON NAME</b>
<b>LEPIDOPTERA</b>	<b>BUTTERFLIES AND MOTHS</b>
<b>Papilionidae</b>	<b>Swallowtails</b>
<i>Papilio eurymedon</i>	pale swallowtail
<i>Papilio zelicaon</i>	anise swallowtail
<i>Papilio rutulus</i>	western tiger swallowtail
<b>Pieridae</b>	<b>Whites and Orangetips</b>
<i>Anthocharis sara</i>	Sara orangetip
<i>Artogeia rapae</i>	cabbage white
<i>Pontia protodice</i>	checkered (common) white
<b>Satyridae</b>	<b>Satyrids</b>
<i>Coenonympha californica</i>	California ringlet
<b>Danaidae</b>	<b>Milkweed Butterflies</b>
<i>Danaus gilippus</i>	queen
<b>Nymphalidae</b>	<b>Brush Footed Butterflies</b>
<i>Speyeria callippe comstocki</i>	Comstock's fritillary
<i>Euphydryas chalcedona chalcedona</i>	Chalcedon checkerspot
<i>Vanessa cardui</i>	painted lady
<i>Vanessa annabella</i>	west coast lady
<i>Basilarchia lorquinii</i>	Lorquin's admiral
<i>Nymphalis antiopa</i>	mourning cloak
<b>Lycaenidae</b>	<b>Blues</b>
<i>Glaucopsyche lygdamus australis</i>	southern blue
<i>Icaricia acmon</i>	Acmon blue
<b>Theclinae</b>	<b>Hairstreaks</b>
<i>Strymon melinus</i>	gray hairstreak
<i>Incisalia augustinus</i>	brown elfin
<i>Callophrys perplexa</i>	perplexing hairstreak
<i>Callophrys dumetorum</i>	bramble hairstreak
<b>Riodininae</b>	<b>Metalmarks</b>
<i>Apodemia mormo virgulti</i>	Behr's metalmark
<b>Hesperiidae</b>	<b>Duskywings</b>
<i>Erynnis funeralis</i>	funeral duskywing
<i>Pyrgus albescens</i>	checkered skipper
<i>Hylephila phyleus</i>	fiery skipper
<b>AMPHIBIA AND REPTILIA</b>	<b>AMPHIBIANS AND REPTILES</b>
<b>PELOBATIDAE</b>	<b>SPADEFoot TOADS</b>
<i>Scaphiopus hammondi</i>	western spadefoot toad
<b>HYLIDAE</b>	<b>TREEFROGS</b>
<i>Hyla regilla</i>	Pacific treefrog
<b>EMYDIDAE</b>	<b>BOX &amp; WATER TURTLES</b>

ORDER/FAMILY/SPECIES NAME	COMMON NAME
<i>Clemmys marmorata</i>	western pond turtle
<b>IGUANIDAE</b>	<b>IGUANIDS</b>
<i>Sceloporus occidentalis</i>	western fence lizard
<i>Phrynosoma coronatum</i>	coast horned lizard
<b>TEIIDAE</b>	<b>WHIPTAILS</b>
<i>Cnemidophorus tigris</i>	western whiptail
<b>COLUBRIDAE</b>	<b>COLUBRIDS</b>
<i>Masticophis lateralis</i>	California racer
<i>Pituophis melanoleucus</i>	gopher snake
<b>VIPERIDAE</b>	<b>VIPERS</b>
<i>Crotalus ruber</i>	red diamond rattlesnake
<i>Crotalus viridis</i>	western rattlesnake
<b>AVES</b>	<b>BIRDS</b>
<b>CATHARTIDAE</b>	<b>AMERICAN VULTURES</b>
<i>Cathartes aura</i>	turkey vulture
<b>ACCIPITRIDAE</b>	<b>KITES, HAWKS, EAGLES &amp; VULTURES</b>
<i>Elanus caeruleus</i>	black-shouldered kite
<i>Circus cyaneus</i>	northern harrier
<i>Accipiter striatus</i>	sharp-shinned hawk
<i>Accipiter cooperii</i>	Cooper's hawk
<i>Buteo jamaicensis</i>	red-tailed hawk
<i>Buteo lineatus</i>	red-shouldered hawk
<b>FALCONIDAE</b>	<b>FALCONS</b>
<i>Falco sparverius</i>	American kestrel
<i>Falco peregrinus</i>	peregrine falcon
<b>PHASIANIDAE</b>	<b>PHEASANTS, PARTRIDGES &amp; QUAIL</b>
<i>Callipepla californica</i>	California quail
<b>CHARADRIIDAE</b>	<b>PLOVERS</b>
<i>Charadrius vociferus</i>	killdeer
<b>RECURVIROSTRIDAE</b>	<b>AVOCETS &amp; STILTS</b>
<i>Tringa melanoleuca</i>	greater yellowlegs
<b>COLUMBIDAE</b>	<b>PIGEONS &amp; DOVES</b>
<i>Zenaida macroura</i>	mourning dove
<i>Columba livia</i>	rock dove
<b>CUCULIDAE</b>	<b>CUCKOOS &amp; ROADRUNNERS</b>
<i>Geococcyx californianus</i>	greater roadrunner
<b>STRIGIDAE</b>	<b>TYPICAL OWLS</b>
<i>Bubo virginianus</i>	great horned owl
<b>CAPRIMULGIDAE</b>	<b>NIGHTJARS</b>
<i>Chordeles acutipennis</i>	lesser nighthawk
<i>Phalaenoptilus nuttallii</i>	common poor-will
<b>APODIDAE</b>	<b>SWIFTS</b>
<i>Aeronautes saxatalis</i>	white-throated swift
<b>TROCHILIDAE</b>	<b>HUMMINGBIRDS</b>
<i>Calypte anna</i>	Anna's hummingbird

ORDER/FAMILY/SPECIES NAME	COMMON NAME
<i>Selasphorus sasin</i>	Allen's hummingbird
<i>Selasphorus rufus</i>	rufous hummingbird
<i>Calypte costae</i>	Costa's hummingbird
<i>Archilochus alexandri</i>	black-chinned hummingbird
<b>PICIDAE</b>	<b>WOODPECKERS</b>
<i>Melanerpes formicivorus</i>	acorn woodpecker
<i>Colaptes auratus</i>	northern flicker
<i>Picoides nuttallii</i>	Nuttall's woodpecker
<b>TYRANNIDAE</b>	<b>TYRANT FLYCATCHERS</b>
<i>Tyrannus verticalis</i>	western kingbird
<i>Tyrannus vociferans</i>	Cassin's kingbird
<i>Myiarchus cinerascens</i>	ash-throated flycatcher
<i>Sayornis nigricans</i>	black phoebe
<i>Sayornis saya</i>	Say's Phoebe
<i>Empidonax wrightii</i>	gray flycatcher
<i>Empidonax difficilis</i>	pacific-slope flycatcher
<b>HIRUNDINIDAE</b>	<b>SWALLOWS</b>
<i>Hirundo rustica</i>	barn swallow, swallow
<i>Hirundo pyrrhonota</i>	cliff swallow
<i>Stelgidopteryx serripennis</i>	northern rough-winged swallow
<b>CORVIDAE</b>	<b>CROWS, JAYS</b>
<i>Corvus brachyrhynchos</i>	American crow
<i>Corvus corax</i>	raven
<i>Aphelocoma coerulescens</i>	scrub jay
<b>AEGITHALIDAE</b>	<b>BUSHTIT</b>
<i>Psaltriparus minimus</i>	common bushtit
<b>TROGLODYTIDAE</b>	<b>WRENS</b>
<i>Troglodytes aedon</i>	house wren
<i>Thryomanes bewickii</i>	Bewick's wren
<i>Catherpes mexicanus</i>	canyon wren
<i>Campylorhynchus brunneicapillus</i>	cactus wren
<b>MUSCICAPIDAE</b>	<b>THRUSHES, OLD WORLD WARBLERS</b>
<i>Turdus migratorius</i>	American robin
<i>Catharus guttatus</i>	hermit thrush
<i>Catharus ustulatus</i>	Swainson's thrush
<i>Sialia mexicana</i>	western bluebird
<i>Regulus calendula</i>	ruby-crowned kinglet
<i>Polioptila caerulea</i>	blue-gray gnatcatcher
<i>Polioptila californica</i>	California gnatcatcher
<i>Chamaea fasciata</i>	wrentit
<b>MIMIDAE</b>	<b>MOCKINGBIRDS &amp; THRASHERS</b>
<i>Mimus polyglottos</i>	northern mockingbird
<i>Toxostoma crissale</i>	California thrasher
<b>PTILOGONATIDAE</b>	<b>SILKY-FLYCATCHERS</b>
<i>Phainopepla nitens</i>	phainopepla
<b>LANIIDAE</b>	<b>SHRIKES</b>

ORDER/FAMILY/SPECIES NAME	COMMON NAME
<i>Lanius ludovicianus</i>	loggerhead shrike
<b>STURNIDAE</b>	<b>STARLINGS</b>
<i>Sturnus vulgaris</i>	European starling
<b>VIREONIDAE</b>	<b>VIREOS</b>
<i>Vireo solitarius</i>	Solitary vireo
<i>Vireo gilvus</i>	warbling vireo
<b>EMBERIZIDAE</b>	<b>WOOD WARBLERS, SPARROWS, NEW WORLD FINCHES &amp; BLACKBIRDS</b>
<i>Dendroica coronata</i>	yellow-rumped warbler
<i>Dendroica townsendi</i>	Townsend's warbler
<i>Dendroica occidentalis</i>	hermit warbler
<i>Vermivora celata</i>	orange-crowned warbler
<i>Icteria virens</i>	yellow-breasted chat
<i>Geothlypis trichas</i>	common yellowthroat
<i>Wilsonia pusilla</i>	Wilson's warbler
<i>Piranga ludoviciana</i>	western tanager
<i>Pheucticus melanocephalus</i>	black-headed grosbeak
<i>Guiraca caerulea</i>	blue grosebeak
<i>Passerina ciris</i>	lazuli bunting
<i>Zonotricha leucophrys</i>	white-crowned sparrow
<i>Zonotrichia atricapilla</i>	golden-crowned sparrow
<i>Chondestes grammacus</i>	lark sparrow
<i>Spizella passerina</i>	chipping sparrow
<i>Aimophila ruficeps</i>	rufous-crowned sparrow
<i>Ammodramus savannarum</i>	grasshopper sparrow
<i>Melospiza melodia</i>	song sparrow
<i>Passerculus sandwichensis</i>	savannah sparrow
<i>Pipilo erythrophthalmus</i>	spotted towhee
<i>Pipilo crissalis</i>	California towhee
<i>Junco hyemalis</i>	dark-eyed junco
<i>Euphagus cyanocephalus</i>	Brewer's blackbird
<i>Agelaius phoeniceus</i>	red-winged blackbird
<i>Sturnella neglecta</i>	western meadowlark
<i>Molothrus ater</i>	brown headed cowbird
<i>Icterus galbula bullocki</i>	northern/bullocks oriole
<i>Icterus cucullatus</i>	hooded oriole
<b>FRINGILLIDAE</b>	<b>OLD WORLD FINCHES</b>
<i>Carpodacus mexicanus</i>	house finch
<i>Carduelis psaltria</i>	lesser goldfinch
<i>Carduelis tristis</i>	American goldfinch
<i>Carduelis lawrencei</i>	Lawrence's goldfinch
<b>PASSERIDAE</b>	<b>OLD WORLD SPARROWS</b>
<i>Passer domesticus</i>	house sparrow
<b>MAMMALIA</b>	<b>MAMMALS</b>
<b>CANIDAE</b>	<b>DOGS, WOLVES, AND FOXES</b>

ORDER/FAMILY/SPECIES NAME	COMMON NAME
<i>Canis latrans</i>	coyote
<b>FELIDAE</b>	<b>CATS</b>
<i>Lynx rufus</i>	bobcat
<b>SCIURIDAE</b>	<b>SQUIRRELS</b>
<i>Citellus beecheyi</i>	California ground squirrel
<b>CRICETIDAE</b>	<b>MICE, RATS, LEMMINGS, VOLES</b>
<i>Peromyscus maniculatus</i>	deer mouse
<b>LEPORIDAE</b>	<b>HARES, RABBITS</b>
<i>Sylvilagus auduboni</i>	desert cottontail
<b>CERVIDAE</b>	<b>DEER</b>
<i>Odocoileus hemionus</i>	mule deer

**Appendix 2: Band Combinations of California gnatcatchers detected in the San Joaquin Hills study area, 2000 and 2001.**

Band Combo.	Sex	Observation Location	Observation Date	Breeding Status	Date banded	Banding Location	Dispersal Distance
M-DGDB	Male	Laidlaw - south canyon	6/14/00	Breeding Adult	5/15/00	Laidlaw	0
M-W/RB	Female	Laidlaw- south canyon	6/14/00	Breeding Adult	5/15/00	Laidlaw	0
MLG/Y-DG	Juvenile	Church Canyon, UTM coordinate = 11S, 4 24 481mE, 37 19 908 mN, Elevation = 270m; detected 7/21/00 0.5 km west of 7/20/00 sighting.	7/20/00, 7/21/00	Juvenile	5/3/00	Laidlaw	1.22km (across or under SJHTC)
LG/YY/LG-M	Male	Church Canyon: UTM coordinate = 11S, 4 24 426mE, 37 20 274mN, Elevation = 216m, detected 06/14/2000 with unbanded female, feeding fledglings in <i>Rhus integrifolia</i> ; detected 7/21/00 with unbanded female feeding 3+ fledglings.	6/14/00, 7/21/00	Breeding Adult	6/13/98	Laguna Canyon (Pump House near Laguna Lake) Territory = SH 1/31	5.57km
LG/YY/LG-M	Male	Church Canyon: UTM WGS84 coordinate = 11S, 4 24 349mE, 37 20 168mN, Elevation = 216m, Female unbanded.	3/20/01, 5/21/01	Breeding Adult	6/13/98	Laguna Canyon (Pump House near Laguna Lake) Territory = SH 1/31	5.6km
MIR/W-Y/LG	Male	Laguna Canyon: Inland Polygon 7 Pair GP2; UTM WGS84 coordinate = 11S, 4 29 077mE, 37 17 954mN, Elevation = 103m, ca. 100 m north of SJHTC. Pair nest building 3/26/01, Female unbanded.	3/26/01	Breeding Adult	5/2/00	Coyote Canyon Landfill 8 (WGS84, 11S 4 23 013mE, 37 20 639mN)	5.3km
W/R-RM	Female	Laguna Canyon: Inland Polygon 8 Pair GP1; UTM WGS84 coordinate = 11S 4 28 355mE, 37 22 018mN, Elevation = 184m, adjacent to agricultural fields.	3/16/01	Breeding Adult	5/17/98	North Laguna Laurel <sup>2</sup>	0.65km
P-MLG or P-WM	Male	Emerald Canyon: Coastal Polygon 3, Pair GP2; UTM WGS84 coordinate = 11S, 4 25 069mE, 37 13 347mN, Elevation = 137m; Located in CCSP, adjacent to housing, on ridge between Emerald and El Morro Canyon, Female unbanded.	5/16/01, 6/22/01	Breeding Adult	?	Crystal Cove Bluffs 1 or 9	ca. 5.5 km
O-MR	Unk.	Recovered by Julie Camp at NROC MAPS station in Upper Emerald Canyon.	6/20/01	Juvenile	5/3/01	Coyote Canyon Landfill 16 (11S422466mE, 3721248mN)	ca. 6.3km

**Key to color-band combinations:**

In the field, band combinations are read left to right with the bird facing the observer. Therefore, a bird with a red band on its right tarsus and a yellow band above a USFWS metal band on the left tarsus is read as R-YM: D = dark green; LG = light green; DB = dark blue; M = USFWS metal band; B = black; W = white; LG/Y = light green over yellow split band; Y/LG = yellow over light green split band; W/R = white over red split band.

**Appendix 3: Band Combinations of Cactus wrens detected between 1996 and 2001 in NROC Lands burned by the 1993 Laguna Canyon Fire, San Joaquin Hills, Orange County California.**

Band Combo.	Sex	Observation Location	Observation Date	Breeding Status	Date banded	Banding Location	Dispersal Distance (km)
UK	?	Bommer Canyon	Numerous times in 1998	Breeding Adult	UK	UK	UK
UK	?	Church Canyon	2/7/98	Breeding Adult	UK	UK	UK
O-M	?	Los Trancos	2/16/98	Breeding Adult	UK	UK	UK
LGM-YY	?	Shady Canyon	2/17/98, 3/3/98	Breeding Adult	UK	UK	UK
LBM-YY	F	Shady Canyon	2/97, 3/97	Breeding Adult	6/6/95	Laguna Laurel	1.71
YM-LB	?	Church Canyon	5/96, 6/96	Breeding Adult	7/29/93	Ridgeline	3.17
LBM-Y	?	Shady Canyon	2/96, 5/96	Breeding Adult	7/25/92	Laguna Laurel	2.07
M?-DG	?	Bommer Canyon	4/96	Breeding Adult	UK	UK	UK
OM-R	M	Laguna Canyon: 8-WP1, UTM, WGS84, 11S 4 28 300mE, 37 21 949mN, Elev. = 201m	3/23/01, 5/17/01	Breeding Adult	3/24/01	Same	0
MY-W	M	Shady Canyon: 8-WP2, UTM, WGS84, 11S 4 27 751mE, 37 21 792mN, Elev. = 182m	3/23/01, 5/17/01	Breeding Adult	3/24/01	Same	0
MLG-O	F	Shady Canyon: 8-WP2, UTM, WGS84, 11S 4 27 751mE, 37 21 792mN, Elev. = 182m	3/23/01, 5/17/01	Breeding Adult	3/24/01	Same	0
M-YO	M	Shady Canyon: 8-WP3, UTM, WGS84, 11S 4 27 467mE, 37 21 654mN, Elev. = 159m	3/23/01, 5/17/01	Breeding Adult	3/24/01	Same	0
DBM-R	F	Shady Canyon: 8-WP3, UTM, WGS84, 11S 4 27 467mE, 37 21 654mN, Elev. = 159m	3/23/01, 5/17/01	Breeding Adult	3/24/01	Same	0
WM-DB	M	El Morro/Emerald Canyon Ridge: 3-WP3, UTM, WGS84, 11S 4 24 415mE, 37 13 604mN, Elev. = 132m	5/16/01, 5/30/01	Breeding Adult	3/27/01	Same	0
MO-DG	F	El Morro/Emerald Canyon Ridge: 3-WP3, UTM, WGS84, 11S 4 24 415mE, 37 13 604mN, Elev. = 132m	5/16/01, 5/30/01	Breeding Adult	3/27/01	Same	0

**Key to color-band combinations:**  
In the field, band combinations are read left to right with the bird facing the observer. Therefore, a bird with a red band on its right tarsus and a yellow band above a USFWS metal band on the left tarsus is read as R-YM; M = USFWS metal band; R = Red; O = orange; Y = Yellow; LG = light green; LB = light blue; DB = dark blue; DG = dark green; W = White; UK = unknown or inaccurate/incomplete band combination.

**Appendix 4:** Summary Tables of California gnatcatcher and cactus wren locations in the San Joaquin Hills burn area 1996 through 1999.

**1996**

LOCATION	CAGN-PAIR	CAGN-SINGLE	CACW-PAIR	CACW-SINGLE
Laidlaw	5	1	0	0
Church Canyon	1	1	4	1
Bommer Canyon	0	1	7	0
Shady Canyon	1	1	6	0
Laguna Canyon	0	0	2	0
Upper Little Sycamore	0	0	0	0
Los Trancos Canyon	0	0	2	2
Muddy Canyon	0	0	1	0
Moro Canyon	1	0	0	1
Emerald Canyon	0	1	2	0
Boat Canyon	0	0	3	1
<b>TOTAL</b>	<b>8</b>	<b>5</b>	<b>27</b>	<b>5</b>

**1997**

LOCATION	CAGN-PAIR	CAGN-SINGLE	CACW-PAIR	CACW-SINGLE
Laidlaw	5	0	0	0
Church Canyon	0	0	3	1
Bommer Canyon	1	1	9	2
Shady Canyon	3	0	7	0
Laguna Canyon	4	1	3	0
Upper Little Sycamore	0	0	0	0
Los Trancos Canyon	0	0	4	0
Muddy Canyon	0	0	4	1
Moro Canyon	2	0	1	0
Emerald Canyon	0	0	3	0
Boat Canyon	1	0	1	0
<b>TOTAL</b>	<b>16</b>	<b>2</b>	<b>35</b>	<b>4</b>

1998

LOCATION	CAGN-PAIR	CAGN-SINGLE	CACW-PAIR	CACW-SINGLE
Laidlaw	11	1	0	0
Church Canyon	6	0	3	3
Bommer Canyon	4	1	14	0
Shady Canyon	9	0	6	1
Laguna Canyon	9	1	1	1
Upper Little Sycamore	0	0	0	0
Los Trancos Canyon	5	0	1	2
Muddy Canyon	1	0	2	0
Moro Canyon	10	1	2	1
Emerald Canyon	2	0	2	0
Boat Canyon	4	0	3	0
<b>TOTAL</b>	<b>61</b>	<b>4</b>	<b>34</b>	<b>8</b>

1999

LOCATION	CAGN-PAIR	CAGN-SINGLE	CACW-PAIR	CACW-SINGLE
Laidlaw	15 (9)	0	0	0
Church Canyon	5 (3)	2	4 (3)	0
Bommer Canyon	8 (6)	1	16 (11)	2
Shady Canyon	13 (8)	5	10 (4)	1
Laguna Canyon	19 (8)	3	3 (3)	2
Upper Little Sycamore	3 (2)	0	0	0
Los Trancos Canyon	6 (3)*	1	1 (1)	0
Moro Canyon	6	0	0	2
Emerald Canyon	4	1	2 (2)	0
<b>TOTAL</b>	<b>79 (39)*</b>	<b>13</b>	<b>38 (24)</b>	<b>7</b>

\* = includes three pairs located in revegetation sites in Los Trancos Canyon.  
 () = Parentheses indicates number of confirmed successful breeding pairs (adults tending fledglings).

2000

LOCATION	CAGN-PAIR	CAGN-SINGLE	CACW-PAIR	CACW-SINGLE
Laidlaw	10 (5)	0	0	0
Church Canyon	8 (6)	0	4 (1)	0
Bommer Canyon	6 (1)	0	10 (1)	4
Shady Canyon	3 (2)	3	5 (2)	3
Laguna Canyon	9 (2)	4	0	1
Upper Little Sycamore	0	0	0	0
Los Trancos Canyon	1	0	0	0
Moro Canyon	2	4	0	1
Emerald Canyon	2 (1)	2	2	0
Boat Canyon	1	0	0	0
Muddy Canyon	4 (1)	0	2 (1)	0
<b>TOTAL</b>	<b>46 (18)</b>	<b>13</b>	<b>23 (5)</b>	<b>9</b>

( ) = Parentheses indicates number of confirmed successful breeding pairs (adults observed tending fledglings).

2001

LOCATION	CAGN-PAIR	CAGN-SINGLE	CACW-PAIR	CACW-SINGLE
Laidlaw	8 (3)	2	0	0
Church Canyon	11 (3)	0	3	0
Bommer Canyon	7	1	6 (2)	4
Shady Canyon	5 (1)	2	8	0
Laguna Canyon	19 (6)	1	0	0
Upper Little Sycamore	0	0	0	0
Los Trancos Canyon	1	0	0	0
Moro Canyon	6(1)	0	1	0
Emerald Canyon	4(1)	1	3	0
Boat Canyon	6	0	3	0
Muddy Canyon	3(1)	2	2	1
<b>TOTAL</b>	<b>70 (16)</b>	<b>9</b>	<b>26 (2)</b>	<b>5</b>

( ) = Parentheses indicates number of confirmed successful breeding pairs (adults observed tending fledglings).





