

WILDLIFE UNDERCROSSINGS
PERFORMANCE MONITORING REPORT
FOR THE
SAN JOAQUIN HILLS TOLL ROAD



Chambers Group, Inc.

Environmental Consultants ■ Scientists ■ Planners ■ Engineers

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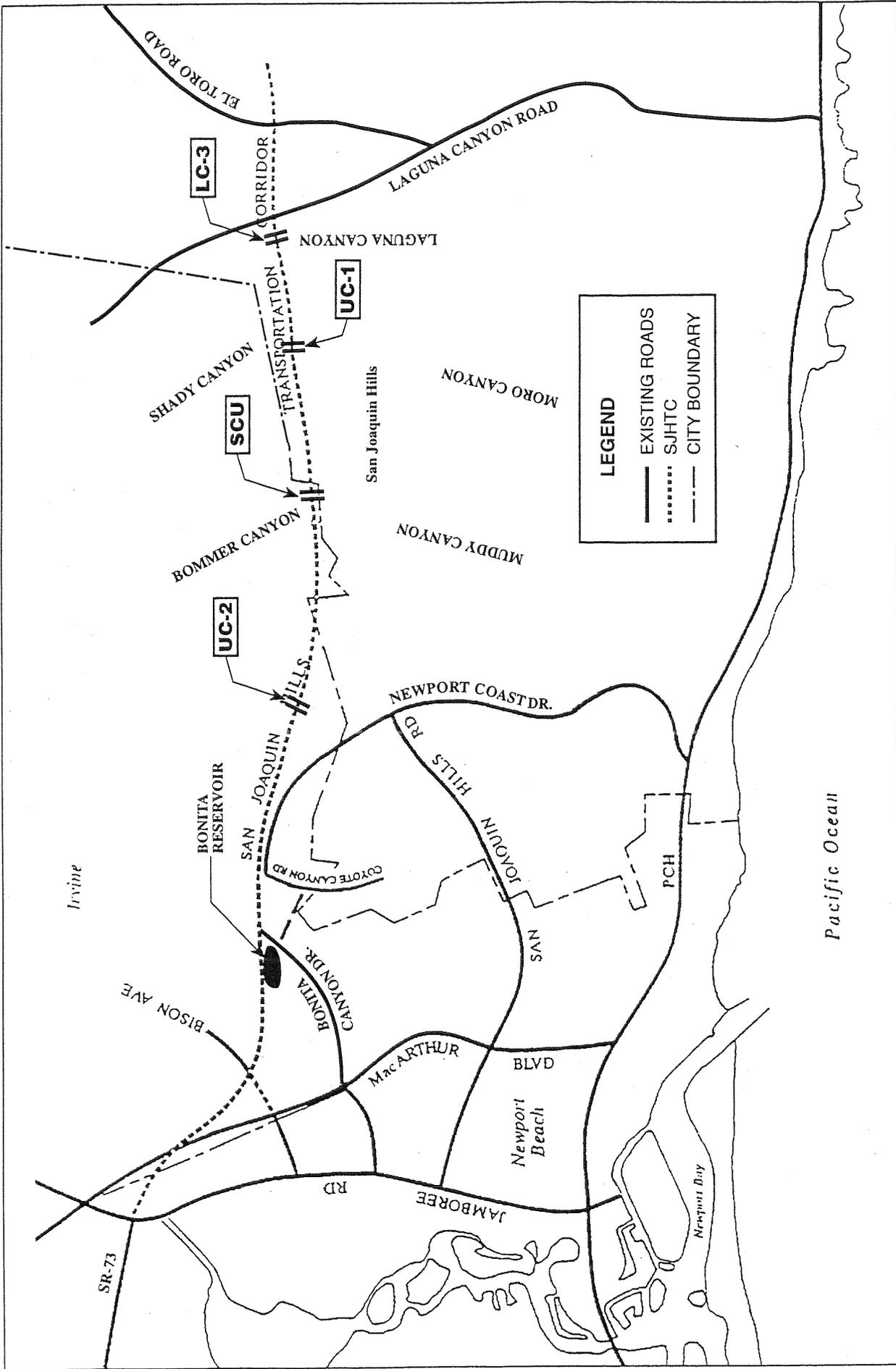
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SECTION 1 INTRODUCTION

The Transportation Corridor Agencies (TCA) was required to design and build four wildlife undercrossings along the San Joaquin Hills Transportation Corridor (SJHTC) to allow for wildlife movement between open space areas on either side of the roadway. The wildlife undercrossings were required to address potential effects of habitat fragmentation on local and regional populations of resident wildlife species as a result of construction of the SJHTC. The principals of island biogeography theory (MacArthur and Wilson 1967) predicts that as habitat patches become more fragmented and smaller in size, animal populations become smaller, some species become locally extinct, remaining populations are more sensitive to stochastic events, recolonization of wildlife from source populations becomes restricted, and gene flow between populations is reduced. To address these predictions, U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG) required TCA to implement measures to minimize habitat fragmentation and ensure wildlife movement corridors were maintained.

Wildlife movement corridors, generally, are narrow connections among habitat areas that are intended to allow for wildlife movement and dispersal. These movement corridors tend to provide the least amount of topographical resistance for animals. Medium-to-large-sized mammals are often the focus of wildlife corridor design because they require relatively large home ranges to maintain viable populations. Species, such as these, are used in developing criteria for the development of wildlife corridors because it is believed that corridors used by them will also be used by numerous other wildlife species. In general, these target species include those that have a range of mobility, require moderate to large areas of habitat in which to forage and breed, and represent the species most likely to occur in the region and use movement corridors. As such, the species targeted for the wildlife undercrossings for the SJHTC included mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), and bobcat (*Lynx rufus*).

Prior to the construction of the SJHTC, wildlife movement within the surrounding open space in the San Joaquin Hills from Laguna Canyon Road to Newport Coast Road, and from the 405 Freeway to Pacific Coast Highway (about 25 square miles of habitat) was relatively unrestricted for wildlife movement. To maintain movement of wildlife in this area, four undercrossings were required to be constructed according to the SJHTC EIR/EIS and the Biological Opinion for the project. Figure 1 shows the SJHTC and the locations of the wildlife undercrossings. The design and placement of the wildlife undercrossings were based in part on locations of known mule deer movement corridors described in a report by PRC Engineers (1988), and locations specified in the Biological Opinion for the project. The 1988 report identified major movement areas for mule deer in the San Joaquin Hills. These movement corridors were determined to be the most appropriate areas to maintain habitat connectivity between open space areas after construction of the roadway. The wildlife undercrossings were designed and built as bridges along the SJHTC under which wildlife may safely pass from one area of open space to another.



**LOCATIONS OF THE WILDLIFE UNDERCROSSINGS
ALONG THE SAN JOAQUIN HILLS TRANSPORTATION CORRIDOR**
Figure 1

Not to Scale



The undercrossings were designed and constructed so that the bridge structures do not intrude into the crossing and the minimum width of the bottom of the undercrossing is 20 feet, with a minimum height of 17 feet. This design was coordinated with USFWS and CDFG. The roadway was designed with an opening between the north and south bound lanes to allow light to enter the undercrossings. The roadway fencing on either side of the undercrossings was designed to minimize the narrowest sections of the crossings, while keeping wildlife away from the roadway. The locations of the four wildlife undercrossings along the SJHTC are described below:

- **Laguna Canyon Road Ramp-3/Laguna Canyon Bridge Wildlife Undercrossing (LC-3)** is located at approximately Station 790. This undercrossing is actually a combination of two separate structures comprised of a bridge under the south-bound Laguna Canyon off-ramp and the Laguna Canyon Bridge. Figure 2 shows the wildlife corridor under the off-ramp and bridges, and the adjacent open space to the north and south of the SJHTC. The wildlife that uses LC-3 likely moves between the south and north sides of the SJHTC from Laurel Canyon and Laguna Canyon on the south, and Laguna Canyon on the north. Laurel Canyon is comprised of oak woodlands and riparian habitat. Laguna Canyon is comprised of a narrow riparian strip south of the roadway and a broader area to the north comprised of riparian, grassland, oak woodland and coastal sage scrub habitat.
- **Wildlife Undercrossing-1 (UC-1)** is located at approximately Station 865. Figure 3 shows the wildlife undercrossing and the adjacent open space to the north and south of the SJHTC. The wildlife that uses UC-1 likely moves between the south and north sides of the SJHTC from Upper Laurel Canyon and Upper Moro on the south, and Shady Canyon on the north. Laurel Canyon is comprised of oak woodlands and riparian habitat that provides food for wildlife while Shady Canyon is heavily vegetated with steeper slopes that provides cover and water (PRC Engineering 1988).
- **Sand Canyon Undercrossing (SCU)** is located at approximately Station 925. Figure 4 shows the wildlife undercrossing and the adjacent open space to the north and south of the SJHTC. The wildlife that uses SCU undercrossing likely moves between the south and the north sides of the roadway from Muddy Canyon on the south, and Bommer Canyon on the north. Both canyons contain oak woodland and coastal sage scrub habitat.
- **Wildlife Undercrossing-2 (UC-2)** is located at approximately Station 995. Figure 5 shows the wildlife crossing and the adjacent open space to the north and the south of the SJHTC. The wildlife that uses UC-2 likely moves between the south and north sides of the roadway from Coyote Canyon on the south, and an unnamed side canyon leading from Bommer Canyon on the north.

This report documents wildlife movement through these undercrossings along the SJHTC. The report was designed to determine if the target wildlife species (mule deer, coyote, and bobcat) use the undercrossings and to quantify overall movement through the undercrossings by wildlife species.



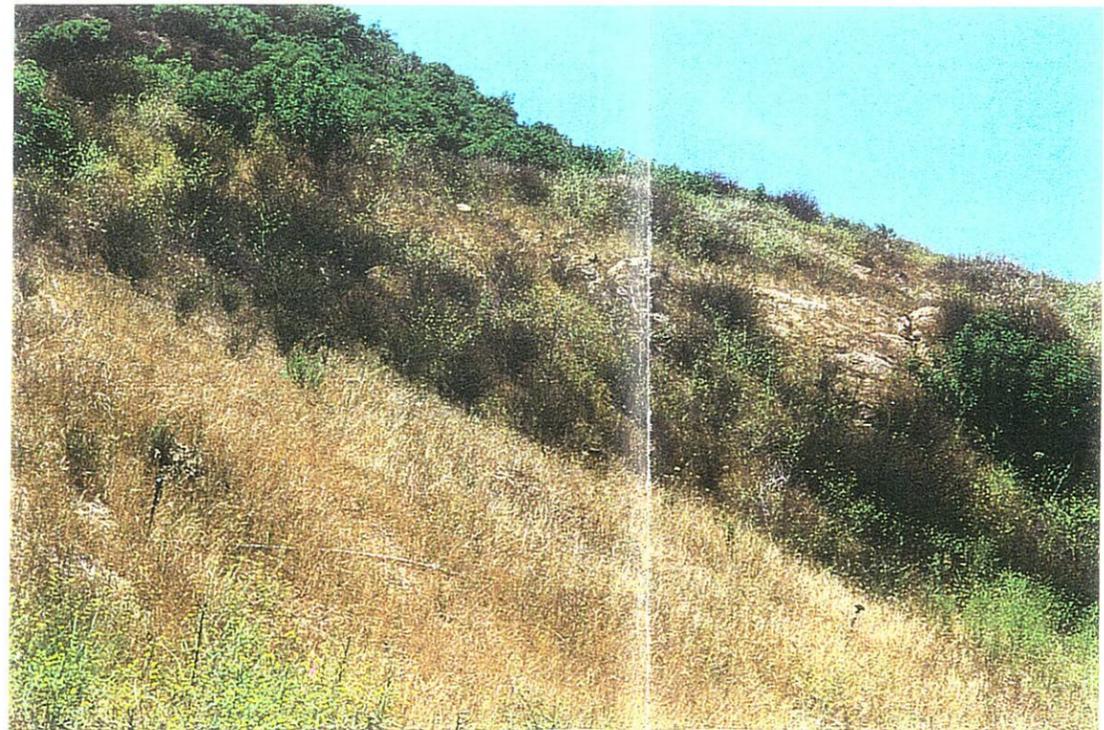
A) LAGUNA CANYON ROAD OFF RAMP-3 UNDERCROSSING (LC-3)



B) LAGUNA CANYON ROAD BRIDGE UNDERCROSSING (LC-3)



C) ADJACENT OPEN SPACE NORTH OF THE SJHTC AT LC-3 UNDERCROSSING



D) ADJACENT OPEN SPACE SOUTH OF THE SJHTC AT THE LC-3 UNDERCROSSING

PHOTOGRAPHS OF LAGUNA CANYON ROAD RAMP-3 WILDLIFE UNDERCROSSING (LC-3) AND ADJACENT OPEN SPACE AREAS
Figure 2



A) WILDLIFE UNDERCROSSING-1 (UC-1)



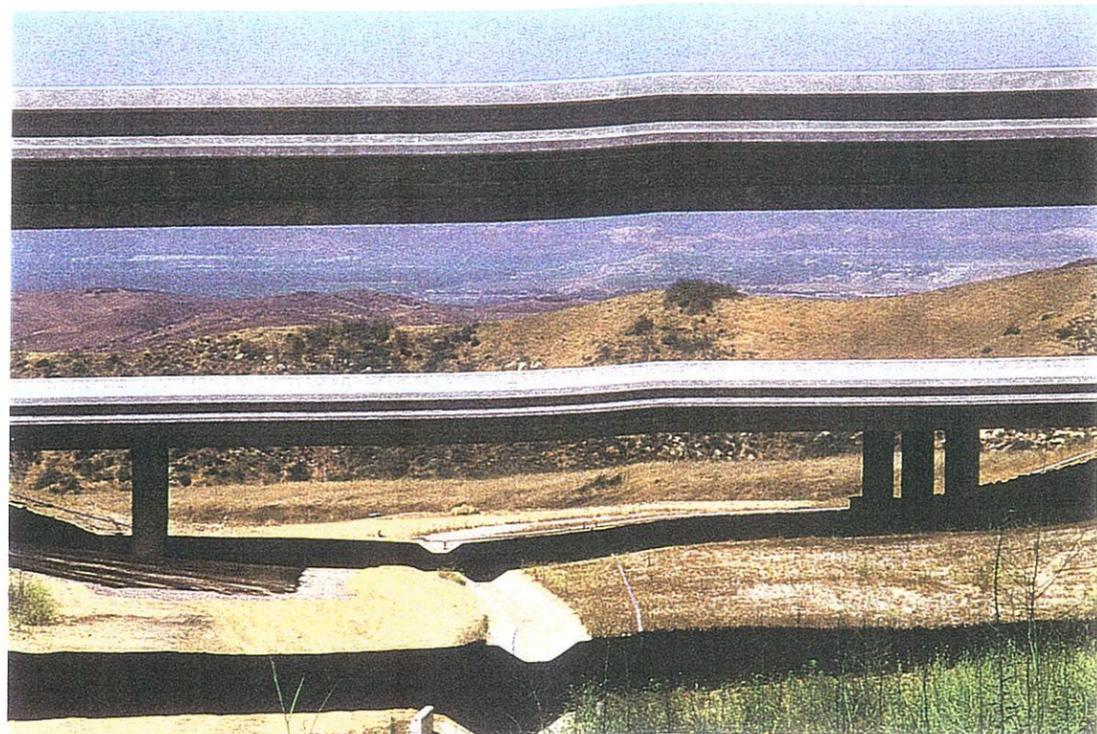
B) ADJACENT OPEN SPACE SOUTH OF THE SJHTC AT THE UC-1 UNDERCROSSING



C) ADJACENT OPEN SPACE NORTH OF THE SJHTC AT THE UC-1 UNDERCROSSING

PHOTOGRAPHS OF WILDLIFE UNDERCROSSING-1 (UC-1)
AND ADJACENT OPEN SPACE AREAS

Figure 3



A) SAND CANYON UNDERCROSSING (SCU)



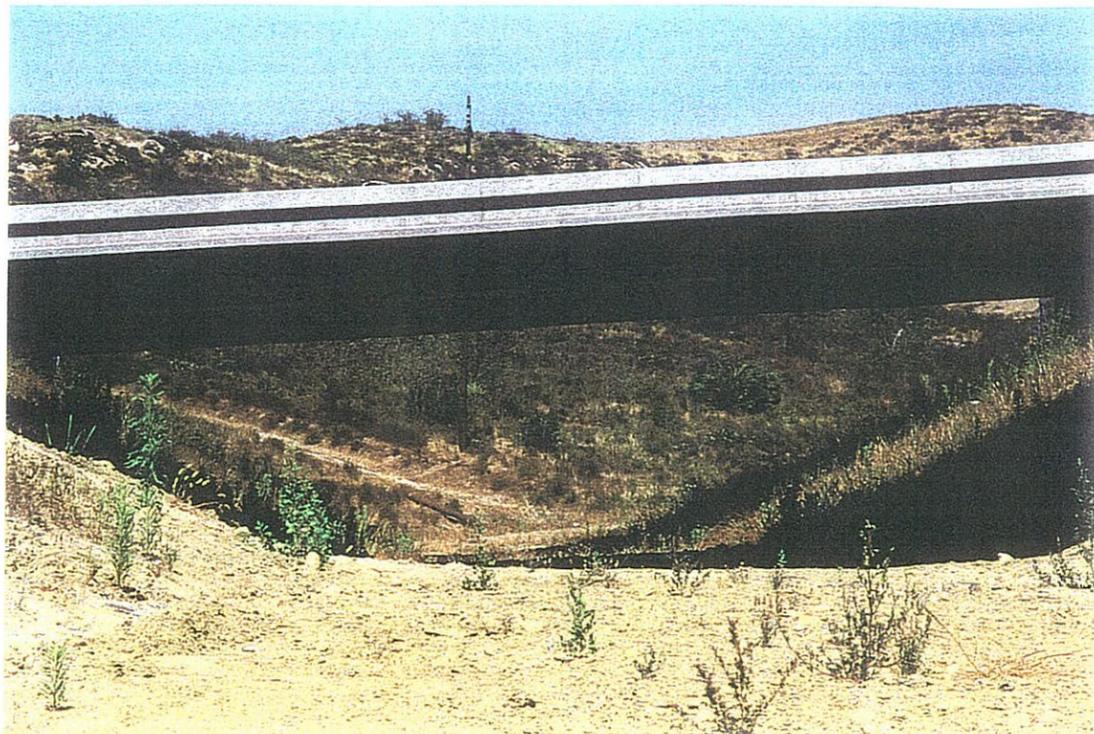
B) ADJACENT OPEN SPACE SOUTH OF THE SJHTC AT THE SCU UNDERCROSSING



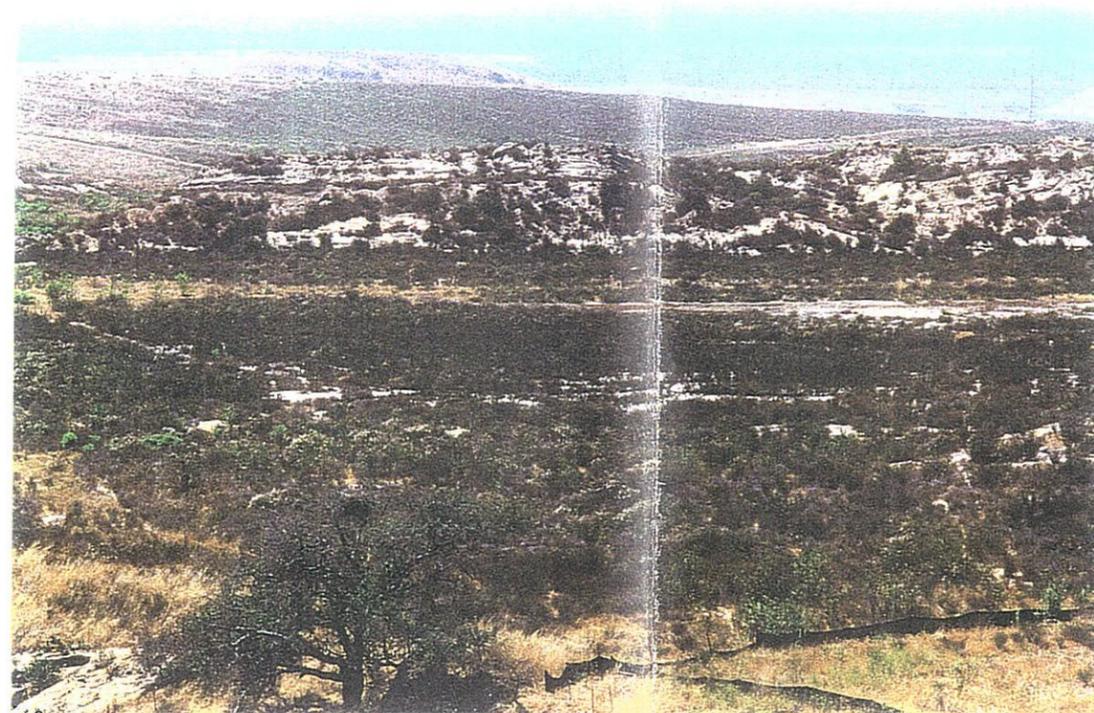
C) ADJACENT OPEN SPACE NORTH OF THE SJHTC AT THE SCU UNDERCROSSING

PHOTOGRAPHS OF SAND CANYON WILDLIFE UNDERCROSSING (SCU)
AND ADJACENT OPEN SPACE AREAS

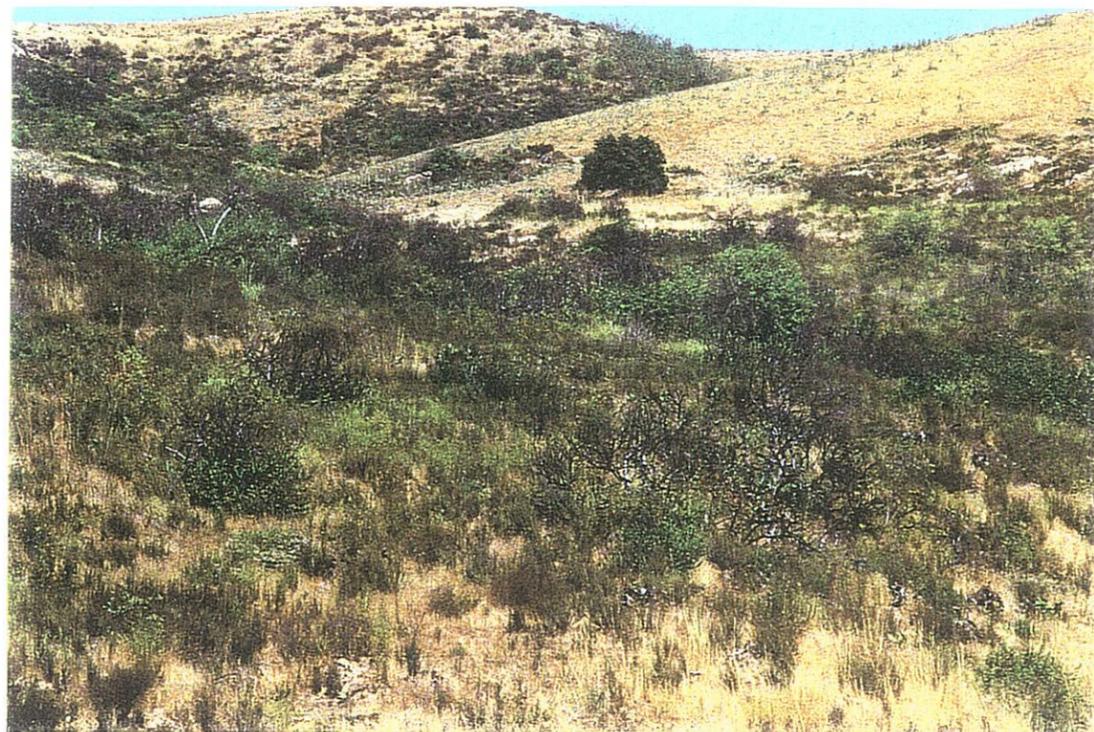
Figure 4



A) WILDLIFE UNDERCROSSING-2 (UC-2)



B) ADJACENT OPEN SPACE SOUTHWEST OF THE SJHTC AT THE UC-2 UNDERCROSSING



C) ADJACENT OPEN SPACE NORTH OF THE SJHTC AT THE UC-2 UNDERCROSSING

**PHOTOGRAPHS OF WILDLIFE UNDERCROSSING-2 (UC-2)
AND ADJACENT OPEN SPACE AREAS**

Figure 5

SECTION 2 METHODS

Two methods were used to characterize and quantify wildlife movement at the undercrossings. These methods included 1) the use of remote movement-triggered cameras (TrailMaster) to photograph species using the corridor; and 2) the use of a swath of dirt parallel to each TrailMaster to record tracks of wildlife. Both methods were used to ensure accurate recording of the presence of target species likely to use the undercrossings. The two techniques are described below.

Each undercrossing was equipped with a TrailMaster TM1500 infrared transmitter, a monitor/receiver, and a weatherproof automatic Olympus camera (loaded with 400 speed film). It was determined prior to the study that 400 speed film would yield higher quality photographs. The transmitters, receivers, and cameras were set up on wood stakes at distances of approximately 6 to 20 m from each other at the stations. Due to the greater width of the undercrossing at SCU and the limits of resolution of nighttime photography, two TrailMasters were required to span the SCU undercrossing. When an animal passed through the infrared light beam between the transmitter and receiver, the broken beam triggered the camera to take a photograph and directed the monitor/receiver to record the "event" specifying the time and date. A camera delay function prevents the camera from taking numerous photographs of a single animal that may move around in the beam for an extended period of time. The camera and monitor/receiver automatically reset after 2 minutes. Each TrailMaster was placed perpendicular to the direction of travel in the middle of the undercrossing. For each survey period (January, February, March, and May), stakes were hammered into place at the beginning of the 5-day survey. Since most of the target species are more likely to be active from dusk to dawn, the TrailMasters were mounted on the stakes each evening, and data was recorded at each site the following morning. The TrailMasters were removed each morning to minimize the chance of theft or vandalism. Data (number of events and time/date for each event) from the receivers were collected daily, and film rolls were replaced as needed.

The second method of monitoring involved smoothing a swath of dirt parallel to each TrailMaster to record tracks of animals passing through the corridor without triggering the camera. This second method proved to be quite successful. It was originally designed as a backup method in case the TrailMaster was inadvertently knocked over by passing wildlife or failed mechanically, or to identify any animals that may have crossed the beam when the camera delay function was operational. In addition, the TrailMasters were set up across the flat expanse under the bridges and not up the slopes to the bridge buttresses. A swath of dirt was smoothed up the slope during the first survey period, however, because tracks were not detected on the slopes during this survey period, the slopes were not smoothed the second or third survey periods. The smoothed swath between the transmitter and receiver was checked, and tracks were identified and documented each morning during the survey to record the number of animal tracks and the direction of travel. The swath was raked smooth each evening when the TrailMasters were set up to ensure that all detected tracks were from the previous survey day.

The track data (number of tracks, direction and date) was recorded on standardized "TrailMaster Event Data Record" forms each morning. The field data sheets are included in Appendix A.

Chambers Group conducted the wildlife movement corridor study in January, February, March, and May of 1997. During the first monitoring period in January, UC-1 and SCU were monitored on the nights of January 28 through 31, and February 1, 1997; UC-2 and LC-3 were monitored on the nights of February 4 through 9, 1997. Monitoring at UC-2 and LC-3 were delayed to the following week because of construction activities to finish-grade the bridge slopes. During the second and third monitoring periods, all four wildlife undercrossings were monitored concurrently. They were monitored on the nights of March 24 through 29, and May 11 through 16, 1997, respectively. Field personnel who participated in the wildlife movement corridor study include Ms. Amy Dickerson, Mr. Brian Leatherman, Mr. Scott Rowland, and Mr. Gabriel Valdes. Resumes for the biologists who performed the study are included in Appendix B.

SECTION 3 RESULTS

Table 3-1 summarizes wildlife diversity and frequency from the photographs taken for all survey periods. Because some of the TrailMasters malfunctioned (primarily due to human error or unknown causes), numerous events were recorded for which no pictures were taken or animals were not observed in the pictures. Some of the multiple event recordings occurring at the undercrossings could possibly be due to swallows nesting in the bridge-crossings tripping the device, or some other unknown cause. A total of 20 photographs of wildlife were taken at the four wildlife undercrossings during the study. Figure 6 shows a representative sample of some of the larger animals that were observed during the study. Figure 7 shows a representative sample of some of the smaller wildlife species that were photographed during the study.

**TABLE 3-1
DIVERSITY OF WILDLIFE SPECIES
PHOTOGRAPHED AT THE UNDERCROSSINGS**

Undercrossing	Mule Deer	Coyote	Bobcat	Raccoon	Rabbit	Bird	Total Occurrences
UC-1 ¹	1	0	0	0	0	1	2
UC-2	1	1	2	0	0	0	4
LC-3	0	2	0	0	0	0	2
SCA	0	5	1	2	3	1	12
Total	2	8	3	2	3	2	20

¹ The photographs for survey period 2 do not include the time from March 26 to 29, 1997 because of the theft of the TrailMaster.

Table 3-2 summarizes wildlife diversity from the tracks observed during the survey periods. Wildlife use was recorded by identifying and counting tracks left in the smoothed areas parallel to each TrailMaster. Thirty-one crossings were by mule deer, 22 by coyote, 5 by bobcat, 3 by raccoon, and 10 by rabbits. Tracks were also recorded from kangaroo rats, birds, and humans. The majority of deer (48%) and coyote (23%) were recorded at UC-1. Forty percent of the bobcat tracks were observed at UC-2. The direction of travel was also recorded for all wildlife, when it could be determined from either the photographs or tracks, (see Table 3-2) to see if there was net movement for some species onto one side of the SJHTC. Twenty-four wildlife tracks headed north while 19 tracks headed south; this data is fairly comparable, however, it does suggest that there was more movement toward the inland area.



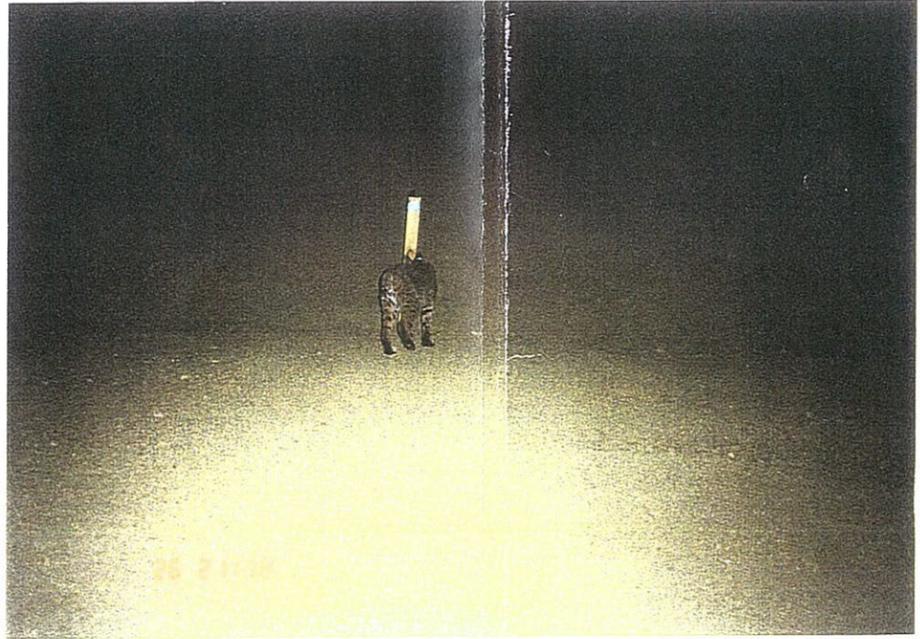
1) MULE DEER AT UC-1



3) BOBCAT AT UC-2



2) COYOTE AT LC-3



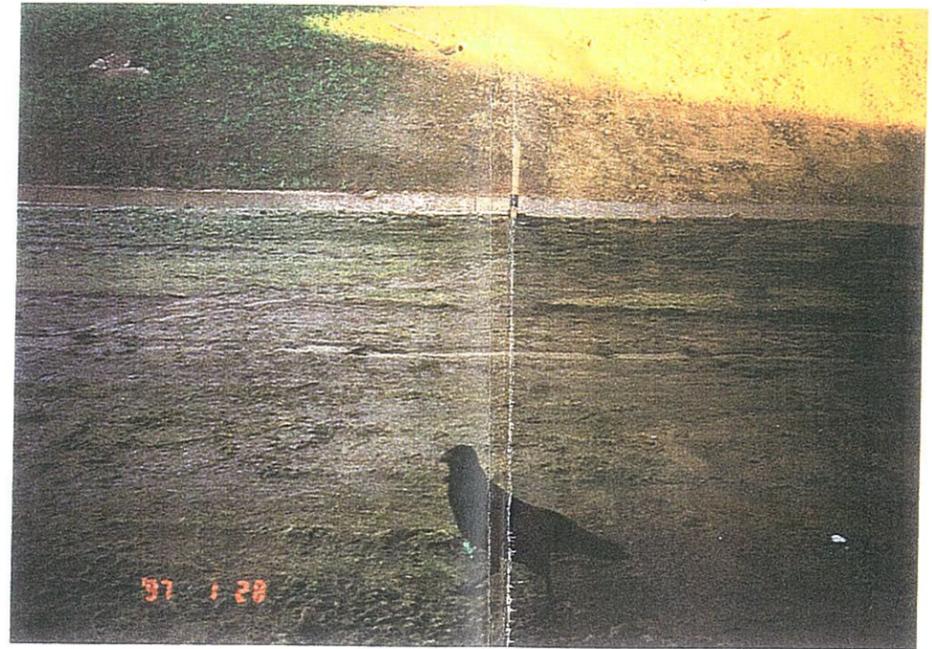
4) BOBCAT AT UC-2

REPRESENTATIVE PHOTOGRAPHS OF LARGE MAMMAL SPECIES FOR SJHTC WILDLIFE UNDERCROSSINGS

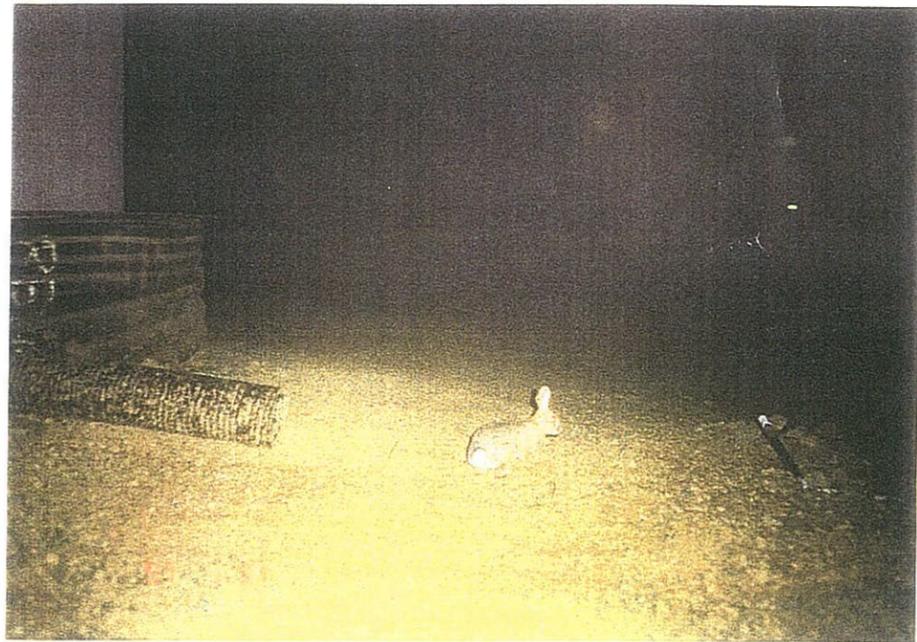
Figure 6



1) RACCOON AT SCU



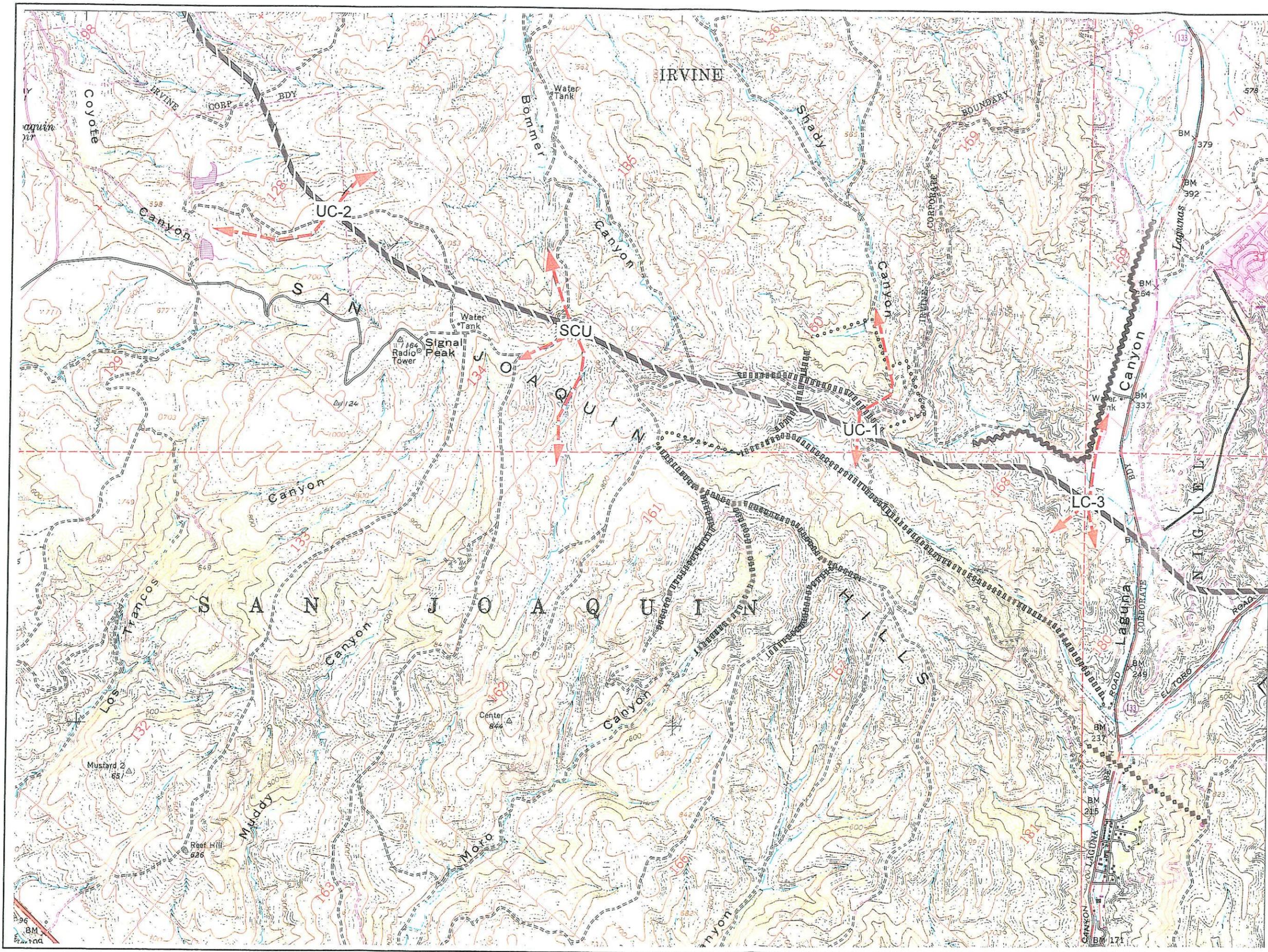
3) BIRD AT UC-1



2) RABBIT AT SCU

REPRESENTATIVE PHOTOGRAPHS OF SMALL WILDLIFE SPECIES FOR SJHTC UNDERCROSSINGS

Figure 7



San Joaquin Hills
Transportation Corridor
(SJHTC) 

SJHTC Wildlife
Undercrossings

- Undercrossing 1 (UC-1)
- Undercrossing 2 (UC-2)
- Laguna Canyon 3 (LC-3)
- Sand Canyon Undercrossing (SCU)

Potential Movement
Corridor 

PRC Engineering
Mule Deer Study (1988)

- Dispersion Corridor 1 
- Dispersion Corridor 2 
- Dispersion Corridor 3 
- Dispersion Corridor 4 
- Dispersion Corridor 5 

San Joaquin Hills
Transportation Corridor
Wildlife Undercrossings
and Potential Movement
Corridors in Relation to
Topography and Known
Mule Deer Dispersion
Corridors

Figure 8

Map Scale - 1:24,000
Source: USGS 7.5 Minute
Topographic Laguna Beach, CA
(1981), PRC Engineering (1988),
Chambers Group (1997)



The lower incidence of TrailMaster and track data at UC-1 for the third survey period suggests that human presence may have created an obstacle or deterrent for wildlife movement.

The open space east of SCU has been fenced by the land owner potentially limiting wildlife use of this corridor. The fence consists of three strand barbed wire strung between steel posts hammered in the ground. Although deer have been known to easily jump over this four foot barrier, there were no observations of deer at the SCU undercrossing during the three survey periods. Coyote were apparently not affected by the fence. However, deer tracks have been observed at this undercrossing on several occasions by the revegetation monitors (M. Griswold, personal communication).

SECTION 5 CONCLUSIONS

- The wildlife undercrossings were installed according to the final design specifications by Chambers Group.
- Data from three monitoring periods show that wildlife species are using the undercrossings after the opening of the SJHTC.
- Based on the data, wildlife are moving both east and west in reasonably close numbers.
- Design and installation of the roadway fencing appears to be effective, as shown by the low incidence of roadkills and the use of the wildlife undercrossings.

SECTION 6 REFERENCES

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1994. Biological Opinion on the San Joaquin Hills Transportation Corridor Project. Orange County, CA (1-6-93-F-19).

APPENDIX A

DATA SHEETS

TRAILMASTER EVENT DATA RECORD

LOCATION § Laguna Cyn DATE 2/4/97 PAGE 1 OF

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1+2	2/4	1647	1	Set event gather mode
3	2/5	0716	2	Work crew set off unit
<hr/>				
1+2	2/5	1730	3	Set event gather mode
3	2/6	0743		
<hr/>				
1+2	2/6	1535	4	Set event gather mode
3+4	2/6	1540	5	NO TRACKS BECAUSE OF WORK CREWS
5	2/7	0414	6	"
6-50	2/7	0727		WORK CREWS SET OFF UNIT; THEY TURNED OFF UNIT BECAUSE IT LEFT TAKING PICTURES, ^{BUT ONLY 1} FRAME AD'D.
50	2/7	0820		I ARRIVED AT 0820 - UNIT OFF! NO TRACKS SINCE TRACTOR DROVE OVER RAKED AREA
<hr/>				
1	2/7	1614	6 ^{6,7+8}	SET EVENT - GATH MODE
2	2/8	0825	26	No events but numerous pictures
<hr/>				
1+2	2/8	1704	1	Set event gather mode
3	2/9	0735	2	Picked up unit
<hr/>				

TRAILMASTER EVENT DATA RECORD

LOCATION Lag. Cyn DATE 3/24/27 PAGE 1 OF 1

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1+2	3/24	1412	3	Set event-gath. mode
3	3/25	0738	4	Pick up
1+2	3/25	1822	5	Set event gathering
3	3/25	2242	6	coyote tracks south
4		2243		coyote tracks north
5		2243		coyote tracks north
6		2244		coyote tracks north
7		2244		coyote tracks north
8	3/26	0830	7	Pick up unit
1+2	3/26	0724	8	Set up unit
3	3/27	0841	9	pick up unit
4		0841		
1	3/27	1737	10	set up unit
2	3/28	0823	11	pick up unit
1+2	3/28	1800	12+13	set up unit
3	3/29	0403	14	coyote north
4		0403		
5		0425	15	nothing in picture
6		0425		deer tracks (SE)
7		0426		coyote NW
8		0426		
9		0427		
10		0427		did not show up in photos
11		0952	16	pick up units
12		0952		

coyote tracks
 in
 circle

nothing in picture
 deer tracks
 (SE)
 coyote NW
 did not show up
 in photos

TRAILMASTER EVENT DATA RECORD

LOCATION Laguna Canyon DATE 5/11/97 PAGE 1 OF 2

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	5/11	1810	1	Set up, rake, deer
2	5/12	0723	2	tracks present at
3		0725	3	time of set up / south
4		0725		Pick up unit
<hr/>				
	5/12			possible gopher track
1	5/12	0709	4	Set up unit
2	5/13	0751	5	pick up unit
<hr/>				
1	5/13	0922	6	
2	5/14	0729		} Pick up unit
3		0729		
4		0731		
<hr/>				
1	5/13	1817	7	} set up unit
2		1817		
3		1818		
4	5/14	0747	8	} pick up unit
5		0747		
<hr/>				
1	5/14	0731	9	set up unit
2		0738	10	
3	5/15	0135	11	
4		0731		pick up unit

TRAILMASTER EVENT DATA RECORD

LOCATION Sand Cyn DATE 1/29/97 PAGE 1 OF

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
South Camera				
1	1/29	1701	1	Set event-gath. mode
North Camera				
1	1/29	1705	4	Set event-gath mode
2	1/30	0928	5	Picking up unit - no events last night
South Camera				
2	1/30	0411	2	1 set of coyote tracks heading East.
3	1/30	0940		Picking up unit
1	1/30	1635	3	Set event-gath mode
North Camera				
1	1/30	1640	6	Set event-gath mode
South Camera				
2	1/31	0447	4	Two sets of tracks were observed in smoothed area. One is a coyote heading East, the other is a rabbit heading East. One did not trigger an event; likely the smaller rabbit.
3	1/31	0927	5	

TRAILMASTER EVENT DATA RECORD

LOCATION Sand Cyn DATE 1/31/97 PAGE OF

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
<u>North Camera</u>				
2	1/31	0924	718	Picking up unit; Krat tracks observed in fine soils moving East. unlikely that Krat is using corridor probably foraging.
=				
<u>South Camera</u>				
1	1/31	1630	6	Set event-gath. mode
2	2/1	0240	7	1 set of rabbit tracks heading East
3	2/1	0635	8	Origin unknown
4	2/1	0910		Picking up unit
<u>North Camera</u>				
1	1/31	1634	9	Set event-gath mode
2	1/31	1911	10	Origin unknown
3	2/1	0830	-	Picked up unit
=				
1	2/1	1655	11	Set event-gath mode
<u>South Camera</u>				
1	2/1	1700	10	Set event-gath mode
2	2/2	0552	11	Found rabbit tracks
3	2/2	0552	-	again
4	2/2	0715	12	Picking up unit
<u>North Camera</u>				

TRAILMASTER EVENT DATA RECORD

Need to come battery

LOCATION Sand Cyn N DATE 3/24/97 PAGE 1 OF 1

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	3/24	.1522	3	Set Event 6. th road
2		.1533	4	Bird tracks (raven)
3		1534		
4	3/25	.0349	5	tracks raccoon tracks west
5		.0717	6	People tracks - construction
6		0718		
7		.0750	7	pick up unit
18	3/25	.1644	8	set event gathering
2	3/26	.0844	9	picked up unit no events last night
1	3/26	.1750	10	Set up unit
2		1750		
3	3/27	.0853	11	Pick up unit
1	3/27	.1800	12	set up unit
2	3/27	0730	13	pick up unit
1	3/28	.1928	14	set up unit
2		1928		
3		1928		
4	3/29	.0844	15	pick up unit
The end of survey on 3/29/97				

TRAILMASTER EVENT DATA RECORD

LOCATION Sand Cyn 5 DATE 3/24/97 PAGE 1 OF 3

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	3/24	1500	-	Set event gath. mode - Forget camera cord : will check for tracks and use cord tomorrow discarded data - receiver @ max capacity → set up unit
1	3/25	1858	1	
2		1941		
3		2001	2	nothing in photo
4	3/26	0107	3	heavy fog in photo
5		0107		young animal
6		0107		
7		0107		coyote tracks
8		0125	4	bird tracks (fog)
9		0253	5	
10		0326	6	coyote heading west
11		0326		
12		0947	7	Pick up unit
<hr/>				
1	3/26	1746	8	Set up unit
2		1836	9	
3		1921	10	
4		1937	11	
5		1952	12	coyote heading west
6		2021	13	
7		2023		
8		2027	14	
9	3/27	0059	15	coyote heading west
10		0226	16	

TRAILMASTER EVENT DATA RECORD

LOCATION Sand Canyon S DATE 3/27/97 PAGE 2 OF 3

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
11		0226		
12		0239	17	
13		0600	18	coyote heading west
14		0600		
15		0601		
16		0714	19	
17		0857	20	pick up unit
18		0857		Pick up unit coyote tracks Bobcat tracks
1	3/27	1804	21	setup unit
2		1820	22	22
3		1827	23	
4		1827		
5		1848	24	nothing in photos maybe swallows?
6		1942	25	
7		2112	26	
8		2202	27	film ran out
9		2224	28	
10		2253	29	
11		2310	30	
12		2329	31	
13	3/28	0005	32	
14		0734	33	Pick up unit
15		0734		human foot prints

*
need
new
film

new
film

TRAILMASTER EVENT DATA RECORD

LOCATION San Canyon ^{South} DATE 3/28/97 PAGE 3 OF 3

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
<i>new film</i> 1	3/28	1831	1	set up unit
2		1848	2	
3		1855	3	coyote tracks (w) 1 set nothing photos
4		1856		
5		1913	4	
6		1956	5	
7		2013	6	
8	3/29	0644	7	
9		0707	8	
10		0730	9	
11		0744	10	
12		0748	11	
13		0818	12	
14		0849		pickup unit
15		0849		
16		050		
collected film				
The end of survey on 3/29/97				

TRAILMASTER EVENT DATA RECORD

LOCATION Sand Canyon N DATE 5/11/97 PAGE 1 OF 1

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	5/11	.1950	1	Set up, rake
2		.2237	2	
3	5/12	.0142	3	
4		.0738	4	Pick up unit
				rabbit track (1) east
	5/12			rabbit track east
1	5/12	.1726	5	set up unit
2	5/13	.0802	6	pick up unit
1	5/13	.1837	7	set up unit
2	5/14	.0800	8	pick up unit
3		0800		
1	5/14	.1820	9	setup unit
2	5/15	.0742	10	pick up unit
1	5/15	.1852	11	set up unit
2	5/16	.0635	12	pick up unit

TRAILMASTER EVENT DATA RECORD

LOCATION Sand Canyon 5 DATE 5/11/97 PAGE 1 OF 2

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	5/11	.1959	1	Setup, rake
2	5/12	.0428	2	Pick up unit
3		.0745	3	
//				
	5/12			rabbit
				cowie
				cowie (in ditch)
1	5/12	.1732	4	Setup unit
2		.2236	5	
3	5/13	.0323	6	
4		.0334	7	
5		.0809	8	pick up unit
//				
1	5/13	.1847	9	Setup unit
2	5/14	.0805		Pick up unit
3		0806		
4		0806		
5		0806		
6		0906		
7		0807		
8		0807		
9		.0907		
10		0807		
11				
12		0807		

TRAILMASTER EVENT DATA RECORD

LOCATION Wild w/c 1 DATE 1/29 PAGE 1 OF

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	1/29	1550	1	Set event gath mode
2	1/29	1723	2?	} Mountain bikers
3	1/29	1724		
4-11	1/29	1724		
12	1/30	0559	2?	Deer
13	1/30	0554	2?	Picking up unit At some point Frame #2 went off but I don't know for which event. 2 sets of deer tracks heading West.
1	1/30	1542	3	Set event-gath mode
2	1/30	1754		Seven deer tracks
3	1/30	1801		were observed; 3
4	1/30	1902		head West and 4
5	1/31	0520		head East.
6	1/31	0523		→ No pictures were
7	1/31	0523		taken, something is
8	1/31	0616		wrong with camera or
9	1/31	0616		unit.
10	1/31	0737		
11	1/31	0737		
12	1/31	0901		Picking up unit
1	2/1	1600	1	Set event gath. mode
2	2/1	0154	2?	K-rat tracks observed
3	2/1	0154		at top of slope

TRAILMASTER EVENT DATA RECORD

LOCATION w/u - 1 DATE 3/24/87 PAGE 1 OF 2

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	3/24	1339	2	Set event gate mode
2	3/24	1858	3	2 sets of coyote ^E tracks
3	3/25	0722	3	Pickup unit not in photos
1-14	3/25	1805	4	Set event gate mode
20	3/26	0202	5	
28		0213	6	
31		0218	7	
32		0225	8	890 0317
37		0230	9	895 0326
62		0235	10	900 0327
82		0247	11	912
102		0239	12	7120
155		0241	13	923 0638
202		243	14	924 0639
271		245	15	937 0642
300		249	16	944 0815 - used all photos
325		251	17	
387		253	18	
443		255	19	
515		257	20	
549		259	21	
624		0203	22	nothing in
662		0305	23	these pictures;
705		0308	24	strap was loose,
759		310	25	and blur in front
815		312		of receiver
878		314		

TRAILMASTER EVENT DATA RECORD

LOCATION W/U -1 DATE 3/26/97 PAGE 2 OF 2

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	3/26	1705	1	set up unit
2		1936	2	
3		1936		deer tracks heading
4		1936		west
5		2248	3	
6	3/27	0746	4	
7		0746		
8		0746		
9		0822	5	pick up unit
10		0822		
<hr/>				
1	3/27	1718	6 ⁵ 7	set up unit
	3/28			Went to check unit at and the transmitter, receiver, camera, and stakes were all gone. A lot of mountain bike tracks were present within the survey area. There was only a note posted in the dirt that said 'F--- You'.

TRAILMASTER EVENT DATA RECORD

LOCATION W/O #1

DATE 5-11-97 PAGE 1 OF 2

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	5/11	1945	1	set up unit, rake
2		1949	2	mountain bike tracks
3		1949		
4	5/12	0708	3	pick up unit
<hr/>				
	5/12	2 sets human		
<hr/>				
1	5/12	1806	4	set up unit
2	5/13	0719	5	} the construction workers in photo
3		0719		
4		0721		
5		0721		
6		0721		
7		0721		
8		0737	6	Pick up unit
9		0737		
<hr/>				
1	5/13	1922		set up unit
	5/14			Pick up 2
4/21		7:20	3	2 coyote tracks - west
Lag Cyn		7:40	8	No tracks
SC N		7:50	9	No tracks
SC S		7:55	?	Camera off / 5 Xings on sensor
w/L 2		8:10	7	Cam. battery low 2 coyote tracks - east
1	5/14	0729		pick up unit
2				

TRAILMASTER EVENT DATA RECORD

LOCATION wildlife a/c 2 DATE 2/4/97 PAGE 1 OF

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	2/4	1610	1	Set event-gath. mode
2	2/4	2237	2	Coyote tracks heading East.
3	2/5	0935	-	Picked up unit. Event recorded but no picture taken?
			3	Manually took Frame #3.
1	2/5	1654	4	Set event-gath mode
3	2/5	2300		No picture - Coyote
4	2/6	0805		track heading West.
1	2/6	1538	5	Set event gath. mode
2	2/7	0848	-	PICKED UP UNIT - NO PICTURE TAKEN WHEN TRAPPED.
3		0849	-	NO PICTURE AGAIN
			6	MANUALLY TOOK #6
1	2/7	1642	17*	SET EVENT - GATE MODE * DON'T ASK - CAMERA KEPT SHOOTING FRAMES!
2	2/7	2322	E	- E showing on camera suggesting it
3	2/8	0800		was rewound all the way
				Bobcat track → heading East.
1	2/8	1217	1	Set event gath. mode
2	2/8	2235		No picture to trails.

TRAILMASTER EVENT DATA RECORD

LOCATION W/U-2 DATE 3/24/97 PAGE 1 OF 3

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	3/24	1545	1	Set event gathering
2				made several deer tracks (8) visible across raked marks from before
3	3/25	0128	2	nothing in picture
4	3/25	0909	3	pick up unit
1	3/25	1856	4	set up unit
2		1935	5	deer heading east
		1940	6 & 7	nothing in picture
		1942	8	nothing in picture
		1948	9	nothing in picture
621	3/26	0107	10	nothing in picture log heavy and maybe tripped camera
724		0109	11	
837		0112	12	
966		0118	13	
1020		0120	15	picked up unit
		0122	16	
1	3/26	1802	17	set up unit
2		2118	18	Bobcat by post
3	3/27	0914	19	pick up unit
4		0914	20	pick up unit
1	3/27	1831	20	set up unit
2		1831		
3		1832		
4		1832		

TRAILMASTER EVENT DATA RECORD

LOCATION w/c - 2 DATE 3/27 PAGE 2 OF 3

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
5	1'	1832		
6		1832		
7		1832	21	
8	3/28	0237	21	Bobcat heading east
9		0237		
10		0751	22	Pickup unit
11		0751		

new film

1	3/28	1843	1	set up unit
2		1843		
3		1902	2	nothing in picture
4		1930	3	"
5		1931		
6		1931		
7		1931		
8		1931		
9		1931		
10		1931		
11		1931		
12		1931		
13		1931		
14		1931		
15		1931		
16		1931		
17		1931		
18		1931		
19		1931		

TRAILMASTER EVENT DATA RECORD

LOCATION U/c # 2 DATE 5/11/97 PAGE 1 OF 1

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
1	5/11	.1913	1	Set up, rake, deer tracks present before set up - 2 sets W
2	5/12	.0758	2	Pick up unit
3		.0758		
//				
	5/12			maybe faint track no tracks but deer around end passing on slope behind camera (south end)
1	5/12	.1742	3	set up unit
//				
1	5/13	.1901	4	set up unit
2		.1901		
3	5/14	.0615	35	
4		.0818	6	} pick up unit
5		.0818	7	
//				
1	5/14	.1941	8	set up
2	5/15	.0801	9	pick up
//				
1	5/15	.1913	10	set up unit
2	5/16	.0658	11	pick up unit

TRAILMASTER EVENT DATA RECORD

LOCATION 5/15 Pickup DATE _____ PAGE _____ OF _____

EVENT #	DATE	TIME	FRAME # photo taken	COMMENTS
	5/15			Pick up
○ WL2		7:10	6	Deer tracks - east (~ 3 deer)
Luo. Cam		7:20	12	No tracks
Snd Cyn N		7:35	11	No tracks
Snd Cyn S		7:40	11	No tracks / Camera did not go off when passed thru sensor.
WL #1		8:00	9	No tracks
5-116 pickup				
○ WL1		6:00	8	no tracks
LC		6:20	14	No tracks
Snd Cyn N		6:35	13	(1) Rabbit West tracks (1) Rabbit East tracks
Snd Cyn S			14	Rabbit tracks North within roled area
WL2		7:00	11	(1) Coyote east tracks
1 dead pocket gopher ~ 10 feet east of roled area				
○				

APPENDIX B

RESUMES

AMY B. DICKERSON
Biological Resources

EDUCATION

B.S., Wildlife and Fisheries Science, University of Arizona, 1991

REGISTRATIONS, CERTIFICATIONS, AND AFFILIATIONS

- USFWS California gnatcatcher permit No. PRT-786511
- Desert Tortoise Workshop, The Desert Tortoise Council, 1994
- Southwestern Willow Flycatcher Workshop, San Diego Natural History Museum, 1995
- 24-hour HAZWOPER Certification, 1996
- CEQA Workshop, Association of Environmental Professionals, 1997
- Society for the Study of Amphibians and Reptiles
- The Wildlife Society
- Desert Tortoise Council
- California Native Plant Society
- Association of Environmental Professionals

AREAS OF EXPERTISE

Ms. Dickerson has 7 years of experience as a wildlife biologist with expertise in sensitive plant and animal species within California, Arizona, and Nevada. She has conducted numerous surveys for the arroyo southwestern toad, orange-throated whiptail, and California gnatcatcher in southern California. She has also conducted numerous biological assessments for threatened and endangered wildlife and plant species and sensitive habitats within southern California. Ms. Dickerson has been conducting desert tortoise surveys since 1992 and is experienced in identifying desert tortoises, sign, and their habitat. Ms. Dickerson has attended desert tortoise workshops and conferences and is trained in tortoise relocation, tortoise handling, mark and recapture techniques with the use of PIT tags, egg relocation, and artificial burrow construction. Ms. Dickerson joined Chambers Group's staff in mid-1996.

REPRESENTATIVE PROJECT EXPERIENCE

- **Focused Desert Tortoise Survey - Southwestern Industrial Park, City of Victorville.** Served as project manager and lead biologist for desert tortoise/Mohave ground squirrel surveys and preconstruction clearance surveys in compliance with an existing Biological Opinion issued by the U.S. Fish and Wildlife Service. Monitored the clearing and grading

phases of construction throughout the project. This also included preparing an educational packet on the desert tortoise for distribution to the construction crew.

- **Environmental Compliance Monitor - MCI Telecommunications Corporation.** Assessed and documented the potential presence of sensitive plants and wildlife, including the Mohave ground squirrel and the desert tortoise along the MCI floor optic cable diversity reroutes in Palmdale, California. Served as Lead Environmental Monitor for the potential presence of the Mohave ground squirrel during the 3-week construction phase. This also included preparing an educational packet on the Mohave ground squirrel for distribution to the construction crew.
- **EIS Tucson Arroyo/Arroyo Chico Watershed - Los Angeles District Corps of Engineers.** Conducted biological surveys for sensitive species in the Arroyo Chico Watershed, authored the biological resources section of the EIS , and performed an incremental cost analysis to determine the habitat value of the restoration sites of the project for mitigation flood control improvements to the Arroyo Chico Watershed.
- **Focused Alkali Mariposa Lily Survey - Los Angeles County Sanitation District.** Assessed a 2,400-acre potential evaporation pond site on Edwards Air Force Base for potential habitat for the alkali mariposa lily.
- **Focused Desert Tortoise Survey - City of Barstow.** Conducted desert tortoise surveys for a water pipeline route in the Mojave Desert. The pipeline and settling basins involved 50 miles of transects from Barstow to Yermo.
- **Biological Studies - Arizona Game and Fish Department.** Assisted in preparation of site specific records of special status species for inclusion into Nongame Data Management System. Plotted localities of desert tortoise and sensitive fish species on topographic maps. Assisted in the field survey of a rare fish species determine its distribution and abundance in northern Arizona.
- **EIS for Expansion of Fort Irwin Training Center, San Bernardino County - Los Angeles District Corps of Engineers.** Performed desert tortoise surveys using established Bureau of Land Management standard survey protocol. Recorded locations of all desert tortoise signs using a Global Positioning System. Performed mark/recapture surveys of desert tortoise to estimate relative abundance of desert tortoise in the region.
- **Desert Tortoise Monitoring Project at Las Vegas Wash, Nevada - Los Angeles District Corps of Engineers.** Monitored the survey and geotechnical crews activity in known desert tortoise occupied habitat. Surveyed the selected work areas and access roads for

presence of desert tortoise and signs. Directed crews to use alternate routes in order to minimize potential impacts to the desert tortoise and its habitat.

- **EIS for Silver Bells Training Complex - Los Angeles District Corps of Engineers.** Conducted focused surveys for presence of relative abundance of desert tortoise and its sign at the Barry M. Goldwater Air Force Range in the Sonoran Desert of central Arizona. Recorded locations of desert tortoise signs using Global Positioning System. Conducted surveys for wildlife and habitat variation within the proposed helicopter gunnery range project area. Conducted assessment by helicopter for wildlife habitat suitability, wildlife movement corridors, and sensitive water resources.
- **Natural Resources Property Assessments - Kaiser Permanente.** Managed and conducted natural resources property assessments, analyzed the findings, served as principal author for the property assessments, and advised the client as to prudent management strategies to comply with federal, state, and local natural resources regulations on 28 properties located throughout southern California.
- **Mitigation Plan for the Arroyo Southwestern Toad - County of Orange.** Authored an arroyo southwestern toad relocation/mitigation avoidance plan approved by the U.S. Fish and Wildlife Service for the Antonio Parkway project in San Juan Creek.
- **Biological Monitor for the Arroyo Southwestern Toad - County of Orange.** Conducted focused surveys for the arroyo southwestern toad and served as lead biological monitor for geotechnical investigations conducted in San Juan Creek for the Antonio Parkway project.
- **Focused Surveys for the Arroyo Southwestern Toad - Santa Margarita Company.** Conducted focused surveys for the arroyo southwestern toad in San Juan Creek for the CalMat Lake project.
- **Focused Surveys for the Arroyo Southwestern Toad - Santa Margarita Company.** Conducted focused surveys for the arroyo southwestern toad for mitigation compliance for the Ladera Planned Community in Arroyo Trabuco.
- **Focused Surveys for the Arroyo Southwestern Toad - Cucamonga County Water District.** Conducted focused surveys for the arroyo southwestern toad in Cucamonga Canyon.
- **EIR for Tentative Tract 47850 - City of Diamond Bar.** Served as primary author and biologist for the biological resources section. Conducted raptor nest surveys in compliance with the mitigation measures outlined in the EIR.

- **Biological Studies - Lewis Homes Enterprises.** Served as project manager and lead biologist for over 20 biological constraints analyses in Orange, Los Angeles, Riverside, and San Bernardino counties.
- **Focused Survey for the Delhi Sands Flower-Loving Fly - Angelus Block Company.** Served as project manager and lead biologist for a habitat evaluation and focused survey for the Delhi fly in Rialto.
- **Focused Survey for the Delhi Sands Flower-Loving Fly - Alper Development.** Served as project manager and lead biologist for a habitat evaluation and focused survey for the Delhi fly in Fontana.
- **Focused Survey for the Delhi Sands Flower-Loving Fly - Hewitt and McGuire.** Served as project manager and lead biologist for a habitat evaluation and focused survey for the Delhi fly in Colton.
- **California Gnatcatcher Territory Studies in Rancho Palos Verdes - CCL Development.** Served as project manager and lead biologist for focused surveys and territory mapping for the California gnatcatcher for the Tramonto project.
- **Stephens' Kangaroo Rat (SKR) Habitat Evaluation - Lewis Homes Enterprises.** Served as project manager and lead biologist for an evaluation of SKR presence and biological constraints analysis at Corona Ranch.
- **Oak Tree Surveys Moraga, California.** Conducted oak tree surveys for the Palos Colorados EIR in the Town of Moraga.
- **Environmental Compliance Monitoring for the Foothill Transportation Corridor - Transportation Corridor Agencies.** Conducted mitigation compliance monitoring during bridge construction on Aliso Creek.
- **Biological Studies for the Foothill Transportation Corridor South - Transportation Corridor Agencies.** Conducted focused trapping for the Pacific pocket mouse throughout the entire study area. The trapping effort included identification of all small mammals observed.
- **Biological Studies in Tonner Canyon - Levinson Estate.** Conducted focused surveys for the Catalina mariposa lily, California gnatcatcher, orange-throated whiptail, and San Diego horned lizard.

- **Biological Studies in Lytle Creek - Lytle Creek Land Resources.** Conducted sensitive plant surveys, California gnatcatcher surveys, and Bell's sage sparrow surveys for the 3,600-acre site. Species of plants surveyed and mapped include slender-horned spinyflower, Santa Ana River woolly star, Parry's spinyflower, and Plummer's mariposa lily.
- **Focused Slender-Horned Spinyflower Survey in Bee Canyon Wash.** Conducted sensitive plant surveys for the slender-horned spinyflower and Pierson's morning glory for the improvement of Soledad Canyon Road.
- **Biological Studies - California Department of Corrections.** Conducted habitat evaluations and surveys for sensitive wildlife and plants at prisons in the Central Valley to determine impacts of installing lethal electrified fences at high security prisons. Conducted surveys for the San Joaquin kit fox, burrowing owl, and Tipton's kangaroo rat.
- **Biological Studies for the Foothill Transportation Corridor South - Transportation Corridor Agencies.** Conducted focused surveys for the California gnatcatcher, arroyo southwestern toad, orange-throated whiptail, and San Diego horned lizard in Orange and San Diego Counties.
- **Wildlife Movement Corridor Study for the Foothill Transportation Corridor South - Transportation Corridor Agencies.** Conducted a wildlife movement corridor study using infrared stations with cameras to determine large mammal movement through designated canyons within the study area. Authored wildlife movement corridor section for inclusion into the Natural Environmental Study.
- **Barn Owl Pellet Analysis for the Foothill Transportation Corridor South - Transportation Corridor Agencies.** Authored and served as lead biologist for a barn owl pellet analysis in order to determine small mammal species (specifically, the Pacific pocket mouse) distribution in the study area.
- **Focused California Gnatcatcher Survey - Camp Pendleton Marine Corps Base.** Conducted a presence/absence survey and habitat evaluation for the California gnatcatcher. Assisted field supervisor in coordinating activities with Marine Corps personnel.
- **Environmental Compliance Monitor - Pacific Gas Transmission/Pacific Gas and Electric.** Conducted environmental monitoring of construction activity to ensure compliance with federal, state, and local regulations and mitigation measures for the natural gas pipeline expansion project. This required specific knowledge of the burrowing

owl and San Joaquin kit fox. Position also required familiarity with and monitoring of a range of environmental resources and concerns, including streams, wetlands, vernal pools, air quality, hazardous materials handling, and public safety. The project area extended from the eastern end of the California-Oregon border in Modoc County to central Fresno County in the Central Valley.

- **Southwest Natural Gas Pipeline Project - City of Los Angeles Department of Water and Power.** Conducted biological and vegetation assessments for several proposed pipeline routes throughout Southern California from the Mojave Desert to the Santa Ana Mountains.
- **Biological Studies - Colorado State University.** Conducted small mammal surveys (including Mohave ground squirrel) using sherman-live traps, reptile surveys using pitfall traps, and bird censusing using a modified point-count transect technique. Conducted plant size and diversity surveys using belt and line transect methods and sensitive plant surveys on Fort Irwin Nation Training Center.
- **City of Los Angeles CEQA Manual - PCR Consultants.** Coauthored the biotic resources section of the CEQA Manual.
- **EA for Fort Huachuca Tank Range, Fort Huachuca, Arizona - Los Angeles District Corps of Engineers.** Conducted reconnaissance surveys for habitat evaluation for potential sensitive wildlife species, wildlife movement corridors, and sensitive water resources.

BRIAN LEATHERMAN
Senior Wildlife Biologist

EDUCATION

M.A., Biology, California State University, Fullerton, 1993
B.A., Biological Science, California State University, Fullerton, 1990

REGISTRATIONS, CERTIFICATIONS, AND AFFILIATIONS

- Society for the Study of Amphibians and Reptiles
- Desert Tortoise Council
- Southern California Botanists
- California Native Plant Society
- Trapping/Scientific Collecting Permit from California Department of Fish and Game #1509
- Biology and Management of Sensitive Amphibians and Reptiles of Central and Southern California, Central and Southern California Chapter of the Wildlife Society, 1993, 1994
- Desert Tortoise Survey/Handling Techniques Workshop, Desert Tortoise Council, 1993, 1996
- Cumulative Human Impact Evaluation Format for Mohave Ground Squirrel, California Department of Fish and Game, 1992
- Southwestern Willow Flycatcher Field Workshop, U. S. Fish and Wildlife Service and U. S. Forest Service, June 1996
- 24-Hour Hazardous Waste Operations Training, November 1996

AREAS OF EXPERTISE

Mr. Leatherman has 7 years of experience as a professional biologist conducting general and focused avian, herpetological, mammalian, and sensitive species surveys, and writing appropriate sections of environmental documents. His expertise lies in evaluating and documenting wildlife use and diversity, and evaluating sites for their potential to support rare, threatened, and endangered wildlife species. He designs and implements studies to monitor wildlife use of potential and actual wildlife corridors and restoration sites. He has conducted surveys for numerous rare, threatened, and endangered species including the California gnatcatcher, least Bell's vireo, southwestern willow flycatcher, southwestern arroyo toad, orange-throated whiptail, San Diego coast horned lizard, southwestern pond turtle, two-striped garter snake, burrowing owl, and others.

REPRESENTATIVE PROJECT EXPERIENCE

- **Focused California Gnatcatcher Survey - County of Ventura.** Conducted presence absence survey for California gnatcatcher for a proposed sand and gravel operation in Grimes Canyon near Moorpark, Ventura County, California.
- **Santa Fe Road Realignment Project - City of Oceanside.** Lead Wildlife Biologist for conducting general wildlife surveys along road segment to be widened and realigned in Oceanside. Vegetation at the site consisted of willow riparian woodland. Focused surveys for presence of least Bell's vireo were conducted. Wrote Biological Technical Report and letter summarizing results of the least Bell's vireo survey.
- **Biological Studies to Support EIR - City of Rancho Palos Verdes.** Lead Wildlife Biologist for conducting general and sensitive wildlife surveys and assisting in California gnatcatcher surveys on the 427-acre project site. Wrote wildlife sections of Biological Technical Report and EIR.
- **Focused Burrowing Owl and California Gnatcatcher Surveys - Odle and Associates.** Lead Wildlife Biologist for focused burrowing owl surveys conducted in accordance with California Department of Fish and Game guidelines. Conducted survey to address CDFG concerns about the potential presence of burrowing owls on the 1,012-acre Chapman Heights development in the City of Yucaipa. Conducted focused surveys for California gnatcatchers. Also conducted general wildlife survey to update existing biological information. Wrote the associated Biological Technical Report.
- **Natural Gas Pipeline Annual Restoration Compliance Inspections - Federal Energy Regulatory Commission.** Member of field monitoring team for annual restoration compliance inspection support for the FERC Office of Pipeline Regulation on natural gas pipeline projects throughout the United States. The purpose of the annual inspections is to evaluate compliance with the Upland Erosion Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures set forth by the FERC. Annual inspections are also intended to monitor the progress of pipeline project restoration efforts. Restoration is required of pipeline companies for a period of 3 to 5 years after pipeline construction. Annual restoration inspections have been conducted by Chambers Group personnel in over 20 states.
- **Habitat Assessment for Sensitive Wildlife Species - CalMat Company.** Conducted a reconnaissance-level survey to assess potential of existing habitat to support the following sensitive wildlife species: least Bell's vireo, southwestern willow flycatcher, red-legged frog, arroyo southwestern toad, southwestern pond turtle, and two-striped garter snake. Also conducted focused surveys for least Bell's vireo, southwestern willow flycatcher, and southwestern pond turtle.
- **Foothill Ranch Tentative Tract No. 11919 Development- Rancho Palos Verdes Landholding Company, Inc.** Lead Wildlife Biologist for conducting general wildlife survey and assessing potential of existing habitat to support sensitive species that may occur on the project site. Conducted focused surveys for California gnatcatchers. The site

is located along Santiago Canyon and Live Oak Canyon Roads in Orange County, California. Wrote wildlife section of associated Resource Management Plan.

- **Focused California Gnatcatcher Survey - Transit Mixed Concrete.** Conducted focused California gnatcatcher survey for proposed mining expansion near the City of Moorpark, Ventura County.
- **Biological Resources Survey Report for Community Center Development Project - City of Laguna Hills Department of Parks and Recreation.** Lead Wildlife Biologist for general and sensitive wildlife surveys on the project site. Assessed potential of existing habitat to support sensitive wildlife species. Conducted presence/absence surveys for the federally endangered least Bell's vireo in remnant riparian woodland.
- **Biological Surveys Along San Juan Creek - Cathcart, Garcia, and von Langen Engineers.** Lead Wildlife Biologist for general and sensitive wildlife surveys on the project site. Assessed potential of existing habitat to support sensitive species. Conducted focused surveys for the federally endangered arroyo southwestern toad.
- **Environmental Monitoring for the San Joaquin Hills Transportation Corridor, Orange County - Sverdrup Corporation.** Conducted presence/absence surveys and nest monitoring for California gnatcatcher along the corridor and for least Bell's vireo in Bonita Reservoir. Monitoring consisted of weekly visits to the project throughout the breeding season to determine the status of breeding gnatcatchers and vireos and locate nests.
- **Environmental Monitoring for the Ford Road Extension, Orange County - Sverdrup Corporation.** Designed and implemented study to document the progressive use of revegetation plots by wildlife as mitigation for the Ford Road extension. Methodology included establishment of test plots in adjacent undisturbed areas to obtain baseline data against which wildlife use of revegetation plots will be measured.
- **Wildlife Biologist - Dames & Moore.** Biological and Environmental Compliance Manager/Monitor for construction of the State Route 79 Improvement Project between Gilman Springs Road and First Street for the Riverside County Transportation Commission and California Department of Transportation. Conducted preconstruction surveys for sensitive species, including plants, reptiles, amphibians and birds, along the entire corridor. Work included onsite revegetation of Lamb Canyon Wash as mitigation for impacted riparian areas.

Assisted with monitoring construction activities for compliance with CDFG 1601 and ACOE 404 Permits for the Metropolitan Transit Development Board Light Rail Transit Project along and over the San Diego River.

Wrote Administrative Draft Multispecies Habitat Management Plan and coordinated data collection efforts from literature sources for GIS analysis and development of a habitat evaluation model for the Naval Air Station, Miramar in San Diego, California.

Task manager for collecting biological resources baseline information for an environmental report for a proposed Union Pacific/Southern Pacific merger at 20 abandonment sites and

Brian Leatherman (Continued)

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over 200 construction sites along the respective railroads. Mobilized biologists at seven local offices to collect data in 14 states west of the Mississippi River and organized data collection logistics.

Performed preconstruction surveys and monitored for desert tortoise for LADWP during construction of a 200-mile power line in the Mojave Desert through portions of Nevada and California. Tagged and processed desert tortoise, removed tortoises from construction zones, and excavated and constructed tortoise burrows.

Wrote Conservation Area Management Plan for Marine Corps Air Station, El Toro. Conducted small mammal trapping surveys, herpetological and avian surveys, and mapped vegetation communities for GIS analysis.

Performed numerous tasks on Nellis Air Force Base, Nevada: conducted revegetation of restored sewage ponds created for migrating waterfowl; monitored activities during fence construction to exclude desert tortoise from training areas; and monitored Air Force personnel during firing/bombing range cleanup sweeps to ensure that the "no effect" clause of the federal Endangered Species Act was not violated for desert tortoise.

Under permit from the USFWS and Nevada Department of Wildlife, collected three fish species and one amphibian species for establishing natural populations at the Nellis sewage ponds. Species collected included larval northern leopard frog and adult speckled dace, desert sucker, and tui chub.

Conducted surveys for several threatened and endangered species (San Joaquin kit fox, San Joaquin antelope squirrel, giant kangaroo rat) for Mobil, Exxon, and Chevron oil companies in the San Joaquin Valley, California.

Conducted numerous surveys for the All Mission Indian Housing Authority for federally threatened and endangered species on the Soboba and Morongo Indian Reservations in Riverside County and on Borona, Pala, Pauma, Rincon, and Viejas Indian Reservations in San Diego County, California.

Mapped vegetation communities and compiled a database of the distribution of sensitive and wildlife species throughout Orange County for the Orange County Environmental Management Agency. Obtained data for sensitive species from several sources, including the California Natural Diversity Database, museum records, previous environmental documents, and published accounts of species of concern in the area.

Directed and participated in several desert tortoise surveys and wrote associated Biological Assessments in California and Nevada.

- **Consulting Biologist.** Worked as an independent consultant or part-time employee for a number of clients from 1990 to 1993. Participated in numerous desert tortoise surveys on Fort Irwin and in the adjacent Silurian Valley; monitored installation of monuments by the Army Corps of Engineers in desert tortoise habitat at Red Rock Detention Basin in Las Vegas, Nevada; conducted Mohave ground squirrel surveys following CHIEF guidelines; conducted

coast live oak tree surveys in Trabuco Canyon; and participated in California gnatcatcher surveys on Rancho Santa Margarita.

- **Research Assistant, California State University, Fullerton.** Worked under contract from CDFG for Bayard H. Brattstrom to direct field studies to determine the current distribution and habitat requirements for the orange-throated whiptail and San Diego coast horned lizard, two candidate species. Included surveys on NAS Miramar, Camp Pendleton, and Fallbrook Naval Weapons Annex. Determined abundance and distribution of the deer mouse (*Peromyscus maniculatus catalinae*) in the Two Harbors region of Santa Catalina Island for a habitat conservation plan of island endemics for Dr. Barry Thomas for the Nature Conservancy. Collected and prepared tree sections from forests in Baja California, Mexico, for dendritic study on fire frequencies in the region for Dr. Jack Burk. Taught Elements of Biology and Ornithology Laboratories.

PUBLICATIONS

Leatherman, Brian M. 1996. San Diego Horned Lizard (*Phrynosoma coronatum blainvillei*): Conservation. *Herpetological Review* 27(2):80.

Leatherman, Brian M. 1996. Fluctuations of the prey species taken by barn owls through time in Owens Valley, California. *Southwestern Naturalist* (in review).

Leatherman, Brian M. 1993. Impacts of habitat changes on prey species taken by barn owls (*Tyto alba*) in Owens Valley, California. Unpublished Master's Thesis, California State University, Fullerton.

Strong, D. J., Brian M. Leatherman and Bayard H. Brattstrom. 1993. Two new simple methods for catching small fast lizards. *Herpetological Review* 24(1): 23.

SCOTT ROWLAND
Senior Wildlife Biologist

EDUCATION

M.A., Biological Science/Vertebrate Ecology, California State University, Fullerton, 1992
B.A., Biological Science, California State University, Fullerton, 1988

REGISTRATIONS, CERTIFICATIONS, AND AFFILIATIONS

- Biology and Management of Rodents in Southern California, the Wildlife Society
- USFWS California gnatcatcher permit #PRT-781217
- CDFG scientific collection permit #1044
- CDFG Memorandum of Understanding for survey and trapping the orange-throated whiptail lizard, coastal western whiptail, and San Diego coast horned lizard for scientific purposes
- Attendee, Federal Energy and Regulatory Commission, Office of Pipeline Regulation, Environmental Report Preparation Training Course, Salt Lake City, Utah, June 1995
- Attendee, Federal Energy and Regulatory Commission, Office of Pipeline Regulation, Environmental Compliance Training Course, Salt Lake City, Utah, June 1995
- American Society of Mammalogists
- The American Ornithologists Union
- The Desert Tortoise Council
- PADI Open Water SCUBA Diver Certification #88139752
- FAA Private Pilot - Airman Certification #565712411

AREAS OF EXPERTISE

Mr. Rowland has 9 years of experience as a Wildlife Biologist/Ecologist. He conducts biological assessments, evaluates endangered species and endangered habitats, and prepares EIR sections for biological resources, including design of mitigation measures and management plans. Mr. Rowland has over 1,000 hours of experience in identifying and handling desert tortoise and tortoise sign, and has been permitted for desert tortoise studies on numerous occasions by the USFWS. As Project Manager for numerous projects for military and private companies, his duties included biological monitoring, presence/absence surveys, habitat evaluation and impact analysis. He has contributed biological resource sections to numerous EAs and EIRs/EISs and has served as Field Coordinator for a variety of research projects. His field experience includes numerous focused surveys for sensitive reptiles, particularly the desert tortoise, orange-throated whiptail lizard, and San Diego coast horned lizard. Mr. Rowland also holds appropriate permits for the California gnatcatcher and has surveyed throughout this species' range in California.

REPRESENTATIVE PROJECT EXPERIENCE

- **Integrated Natural Resources Management Plan, Fort Irwin - Corps of Engineers, Los Angeles District.** Project Manager to review and provide recommendations for managing existing biological, cultural, and recreational resources on the National Training Center, Fort Irwin. Chambers Group is developing an Integrated Natural Resources Management Plan for all natural, cultural, and recreational resources at Fort Irwin. This plan will provide recommendations for managing each of resource and integrate all managed resources with the current military mission on Fort Irwin.
- **Programmatic Management Plan for the Desert Tortoise, National Training Center, Fort Irwin - Corps of Engineers, Los Angeles District.** Project Manager of a comprehensive Programmatic Management Plan that enables the Environmental Division staff at the National Training Center to manage existing subpopulations of the federally and state threatened desert tortoise at Fort Irwin. This document provides the current distribution of populations within Fort Irwin, conservation requirements of federal agencies such as the USFWS, recommendations for management of the desert tortoise, and a guide to the implementation of these recommendations for future biological studies at the NTC.
- **Billy Creek-Sheridan Replacement Project - FERC.** Produced Wildlife and Threatened/Endangered Species Sections for the Billy Creek-Sheridan Replacement Project proposed by Williston Basin Interstate Pipeline Company. The EA addressed the replacement of 13.4 miles of natural gas pipeline in Sheridan and Johnson Counties, Wyoming. The EA addressed the potential environmental impacts of the construction and operation of the pipeline on biological and cultural resources, land use, air quality, noise, soil erosion, and pipeline safety and maintenance. The pipeline crossed seven perennial streams, four of which support trout fisheries. Habitat of the endangered black-footed ferret, bald eagle, and peregrine falcon would also be potentially impacted by the project.
- **Casper-Douglas Pipeline Loop and Spur Project - FERC.** Produced Wildlife and Threatened/Endangered Species Sections for an EA that addressed the construction and operation of a 43.7-mile, 30-inch natural gas pipeline loop and 8 miles of 8-inch pipeline from Casper to Douglas, Wyoming. Facilities also included the addition of 2,000 hp at the existing Guernsey Compressor Station southeast of Douglas. The applicant was KN Interstate.
- **Paiute Expansion II Project - FERC.** Produced Wildlife and Threatened/Endangered Species Sections for an EA that addressed the construction and operation of a 19.9-mile natural gas pipeline loop project in Washoe, Douglas, and Humboldt Counties, Nevada. The applicant was Paiute Pipeline Company. Facilities also included the upgrade of 268-hp of compression at the existing Paradise Compressor Station; relocation of the South Tahoe Lateral pressure reduction station; installation of pressure regulating equipment at the California Check Meter on the North Tahoe Lateral; and modification of the Wadsworth Junction pressure regulating station on Paiute's mainline. The EA addressed the proposed project's impacts on water quality, wetlands, perennial streams, endangered and threatened species, cultural resources, land use, air quality, noise, and pipeline safety and maintenance.

- **Springfield Loop Project - FERC.** Produced Wildlife and Threatened/Endangered Species Sections for an EA for the Springfield Loop Project proposed by Williams Natural Gas Company. The EA addressed the looping of an existing 16-inch natural gas pipeline with 28.2 miles of 20-inch pipeline in Newton, Lawrence, and Christian Counties, Missouri. The EA addressed the potential environmental impacts of the construction and operation of the pipeline on biological and cultural resources, land use, air quality, noise, soil erosion, and pipeline safety and maintenance.
- **Natural Gas Pipeline Construction and Restoration Compliance Inspections - Federal Energy Regulatory Commission.** Project Manager and Chief Inspector of a field monitoring team for construction and restoration compliance inspections for the Federal Energy Regulatory Commission (FERC), Office of Pipeline Regulation on natural gas pipeline projects throughout the United States. The purpose of the inspections are to evaluate compliance with construction, erosion control, and restoration plans and procedures set forth by the FERC, especially at environmentally sensitive areas such as wetlands and stream crossings. The Upland Erosion Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures are required under Section 7C (new construction), Section 2.55 (replacement), Section 157.207 (blanket certificate), and Section 284.11 (Section 311) of the Natural Gas Pipeline Act. The Chambers Group field team has conducted numerous construction and restoration inspections in over 25 states.
- **Natural Gas Pipeline Annual Restoration Compliance Inspections - Federal Energy Regulatory Commission.** Project Manager and Chief Inspector of a field monitoring team for annual restoration compliance inspection support for the FERC Office of Pipeline Regulation on natural gas pipeline projects throughout the United States. The purpose of the annual inspections are to evaluate compliance with the Upland Erosion Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures set forth by the FERC, or Plans and Procedures developed by natural gas companies that have been approved by the FERC. Annual inspections are also intended to monitor the progress of pipeline project restoration efforts. Restoration is required of pipeline companies for a period of 3 to 5 years after pipeline construction. These guidelines are required under Section 2.55 (replacement), Section 157.207 (blanket certificate), and Section 284.11 (Section 311) of the Natural Gas Pipeline Act. Annual restoration inspections have been conducted by Chambers Group personnel in over 20 states.
- **EIS for Proposed Natural Gas Pipeline - Maritimes & Northeast Pipeline Company and Federal Energy Regulatory Commission Provided Wildlife, Vegetation, and Threatened and Endangered Species sections for a 64.1 mile 24" diameter natural gas pipeline proposed to be constructed over numerous counties throughout Massachusetts, New Hampshire, and Maine.** Also included impacts analysis and mitigation measures for pipeline construction.
- **Biological Resources Assessment, Impacts Analysis, and Conceptual Visual Analysis for the Sawpit Dam Modification Project - LACDPW.** Field Coordinator for a series of surveys to determine existing wildlife and plant resources, including sensitive species, in the areas that will be affected by the draining of the reservoir behind the dam. The impacts analysis identified potential impacts to wildlife and vegetation both upstream and downstream of the

dam. A conceptual visual analysis described the potential scenarios as the area behind the dam and downstream filled with sediments and vegetation.

- **North Alvord Slope Desert Tortoise Mark/Recapture Study, Fort Irwin - Corps of Engineers, Los Angeles District.** Project Manager and Field Coordinator for an extensive capture-recapture survey to assess desert tortoise subpopulation densities at twenty-seven 25-hectare plots randomly located throughout the north slope of the Alvord Mountains. Tortoise population counts for each plot were compared with population density estimates of previous surveys to check the validity of current methods for estimating desert tortoise populations. Sophisticated biostatistical analyses based on the results of this study were used to estimate desert tortoise densities on the North Alvord Slope.
- **1995 Desert Tortoise Survey at the National Training Center, Fort Irwin - Los Angeles District Corps of Engineers.** Project Manager for a survey of the fragmented populations of desert tortoise at Fort Irwin. Developing sophisticated methodology and using GIS to maximize the efficiency of the surveys.
- **EIR for Hidden River Estates - City of Redlands.** Conducted biological surveys and prepared wildlife sections.
- **EA for Green Farms Electric Gun Facility Extension Project, Naval Air Station Miramar, San Diego County - U.S. Navy.** Conducted general wildlife surveys for the Green Farms expansion project.
- **Southwest Natural Gas Pipeline Project - City of Los Angeles Department of Water and Power.** Performed reconnaissance-level wildlife surveys for proposed pipeline routes through desert, chaparral, coastal sage scrub, juniper, and oak woodland habitats in Ventura, Los Angeles, and San Bernardino Counties.
- **EIR for Summit Valley Ranch, San Bernardino County - City of Hesperia.** Conducted biological surveys and produced wildlife sections of the EIR.
- **EIS for Expansion of Fort Irwin National Training Center (NTC), San Bernardino County - Los Angeles District Corps of Engineers.** Quantified desert tortoise population using capture/recapture methods on the North Alvord Slope at Fort Irwin. Conducted 70-square-mile focused survey for the desert tortoise in twenty-seven 25-hectare study plots as well as a 100-percent cover survey of 3 square miles along the North Alvord Slope. Also conducted general wildlife and focused surveys for the desert tortoise for the Silurian Valley alternative and was principal author for the wildlife sections of the document.
- **Survey to Assess Raven Populations and Predator Pressure on Desert Tortoise, Fort Irwin - Corps of Engineers, Los Angeles District.** Project Manager for an extensive study on the nature and extent of predators such as the common raven and coyote on desert tortoise populations within the boundaries of Fort Irwin. The goal of the study is to provide a database for designing and implementing a predator management program at the NTC. Chambers Group staff trained NTC's Environmental Division staff to assist with the surveys in 1995 and conduct their own surveys in subsequent years.

- **Desert Tortoise Surveys at Las Vegas Wash, Nevada - Corps of Engineers, Los Angeles District.** Field coordinator for a team of desert tortoise biological monitors who accompanied Corps engineers and land survey teams in the Las Vegas Wash area as part of the ongoing Las Vegas Wash flood damage control project. The monitors enforced a survey protocol agreed to by the USFWS that is designed to minimize and/or eliminate impacts to the desert tortoise and its habitat during Corps operations. Surveyed work areas and access roads for desert tortoise and its sign and directed crews to avoid potential impacts to tortoise habitat. A detailed report of findings that included completed standardized environmental assessment forms for each site was prepared for each survey period.
- **Desert Tortoise Survey, Searchlight, Nevada - U.S. Coast Guard.** Participated on survey team to determine the presence and relative abundance of desert tortoise along proposed road improvement route at the U.S. Coast Guard Loran Station at Searchlight.
- **EA for Fort Huachuca Tank Range, Fort Huachuca, Arizona - Los Angeles District Corps of Engineers.** Field Coordinator of general wildlife surveys of approximately 14,000 acres within the proposed M-1 tank range on three sites adjoining Fort Huachuca. Reconnaissance-level surveys included habitat evaluation for potential sensitive wildlife species, wildlife movement corridors, and sensitive water resources.
- **Defense Environmental Restoration Program (DERP) at Corn Springs, California - Los Angeles District Corps of Engineers.** Conducted biological survey of a site near Corn Springs in San Bernardino County to determine the presence of any rare, endangered, threatened, candidate, or otherwise sensitive species or habitat and evaluate the potential impact of underground storage tank removal on the natural environment.
- **Clearance Surveys of Hazardous Waste Sites at Fort Irwin - Corps of Engineers, Los Angeles District.** Project Manager for a series of clearance surveys for cultural resources, sensitive plants, and sensitive wildlife species throughout the National Training Center, Fort Irwin, California. The purpose of the surveys was to determine potential impacts of hazardous waste site remediation on sensitive resources. Recommendations will be made regarding measures to avoid sensitive resources during the remediation phase of the project. This project was conducted in cooperation with the Corps of Engineers, Sacramento District.
- **Focused Sensitive Species Surveys, Lake Mathews - Metropolitan Water District.** Assisted with general biological surveys and focused surveys for sensitive reptiles (orange-throated whiptail and San Diego coast horned lizard) in the Lake Mathews area of Riverside County.
- **EAs for U.S. Border Patrol (JTF-6) - Los Angeles District Corps of Engineers.** Monitored construction activity along the U.S./Mexico border for concerns related to California gnatcatcher and least Bell's vireo.
- **EIS for Silver Bells Training Complex, Marana, Arizona - Los Angeles District Corps of Engineers.** Conducted surveys for resident and migratory wildlife, sensitive wildlife species, and potential habitat for sensitive species at numerous locations throughout the Sonora Desert of

western, central, and southern Arizona. Prepared biological resources sections and provided impact analyses and mitigation measures.

- **Biological Surveys for San Joaquin Hills Transportation Corridor - Sverdrup Corporation.** Conducted sensitive species surveys and monitoring for large mammals, the California gnatcatcher, and the San Diego cactus wren.
- **EIR/EA for Central Pool Augmentation and Water Quality Project, Riverside and Orange Counties - Metropolitan Water District.** Participated in numerous biological surveys and prepared biology section for EIR/EA for proposed water conveyance alignments and alternatives from Lake Mathews to Orange County.
- **Natural Resources Management Plan (NRMP) Update for Long Beach Naval Complex - U.S. Navy.** Conducted wildlife surveys for the existing conditions section of the NRMP.
- **Biological Survey of Laguna Beach Firebreak - Laguna Beach Fire Administration.** Assisted in biological resource survey for sensitive species, habitat, and general habitat of specific sites along a proposed firebreak area that will be created by grazing goats.
- **Biological Survey, Cajon Creek - CalMat Co.** Conducted focused surveys for the California gnatcatcher and San Diego cactus wren on 1,300 acres in support of an EIR for proposed sand and gravel mining facilities at Cajon Wash in San Bernardino County.
- **EIR for Soledad Canyon Sand and Gravel Mining Operation - Transit Mixed Concrete.** Conducted trapping and surveying for the sensitive southwestern pond turtle.

Scott Rowland (Continued)

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PUBLICATIONS AND PRESENTATIONS

1992 Activity, Behavior, Ecology, and Home Range of the Orange-Throated Whiptail, *Cnemidophorus hyperythrus beldingi*. Unpublished Master's thesis, California State University, Fullerton.

1991 Elements of Biology Laboratory Manual. Second Edition, Burgess International Group, Inc., Bellwether Press (with Biology Faculty, California State University, Fullerton).

1989 Does Tamarisk Reduce (small mammal, bird, and insect) Species Diversity? In *The Symposium on the Scientific Value of the Desert*, Anza Borrego, California (with A.M. Schroeder and L. McDonald).

RESEARCH

1990 Home Range of the Orange-Throated Whiptail: Minimum Spatial Requirements of a Viable Population

1988 The Biogeography of the Microteiid

1988 Bird Foraging Heights and Slope Effect in Birds Inhabiting San Antonio Canyon, San Bernardino County, California

GABRIEL A. VALDES
Project Biologist

EDUCATION

B.S., Zoology/Terrestrial Biology, California State University, Long Beach, 1994

REGISTRATIONS, CERTIFICATIONS, AND AFFILIATIONS

- California Gnatcatcher/Least Bell's Vireo Permit No. PRT 781217
- Southwestern Willow Flycatcher Workshop - USFWS

AREAS OF EXPERTISE

Mr. Valdes has 3 years of experience as a Field Biologist specializing in the identification and analysis of southern California wildlife and vegetation. He assists in conducting field surveys and preparing biological reports and studies for various company projects. He has experience with habitat evaluations in coastal sage scrub relative to the California gnatcatcher and nest monitoring for the California gnatcatcher and least Bell's vireo.

REPRESENTATIVE PROJECT EXPERIENCE

- **Environmental Inspector - Federal Energy Regulatory Commission (FERC).** Conducted environmental inspections of natural gas pipelines throughout the United States to ensure that construction and restoration of these projects were in compliance with FERC's environmental guidelines. Provided detailed inspection reports to FERC within 2-day deadlines.
- **Mitigation Compliance Monitoring for the San Joaquin Hills Transportation Corridor (SJHTC) - Sverdrup Corp.** Conducted mitigation compliance monitoring along the 14-mile San Joaquin Hills Transportation Corridor to ensure that construction activities did not encroach upon Environmentally Sensitive Areas. Also monitored proper soil erosion control measures for construction throughout the linear project and revegetation plots and conducted surveys for the California gnatcatcher (*Polioptila californica californica*) along the corridor.
- **Mitigation Compliance Monitoring, Top of the World Reservoir - Laguna Beach County Water District.** Member of monitoring team to ensure compliance with mitigation measures for construction of a 3,000,000-gallon reservoir, pipeline, pump stations, and various appurtenances in the City of Laguna Beach. Produced biweekly summary reports detailing biological resource monitoring of construction-related activities (vegetation clearing, grading, trenching for pipeline placement, and burial of pipeline). Also coordinated and implemented focused biological surveys for plant (*Dudleya stolonifera* and *D. multicaulis*) and avian species (*Polioptila californica californica*).

- **Environmental Monitoring for San Joaquin Hills Transportation Corridor and Ford Road Extension, Orange County - Sverdrup Corporation.** Monitored construction activity for the SJHTC Project, including weekly surveys of California gnatcatchers, documented effects of construction on the gnatcatcher population in the project area, and evaluated and reported on the project's environmental compliance. Also conducted nest monitoring for the California gnatcatcher and least Bell' vireo throughout the breeding season.
- **Brown-headed Cowbird Trapping, Sensitive Bird Surveys, and Biological Technical Support for Eastern Transportation Corridor - CH2M Hill.** Field Biologist for a brown-headed cowbird trapping program as part of the mitigation for the Eastern Transportation Corridor. For this project, 25 traps were placed in suitable habitat in four locations along the length of the corridor. These locations included Siphon Reservoir, Rattlesnake Reservoir, Peters Canyon Regional Park, and El Toro Marine Base. The traps were baited with decoy birds, provided with fresh food and water daily, and checked daily to release non-target birds. The program followed the guidelines set forth by the U.S. Fish and Wildlife Service. A total of 630 cowbirds were caught during the trapping season.
- **Siphon Reservoir Gnatcatcher Study - CH2M Hill.** Member of the team conducting a population censusing, breeding monitoring, banding program, and dispersal study of California gnatcatchers at Siphon Reservoir. Helped design study methodology, monitored gnatcatchers to determine number and location of breeding pairs, observed and recorded gnatcatcher behavior to determine breeding status and nest location. Also assisted with banding gnatcatcher young and searching for banded birds.
- **Least Tern Monitoring, Coronado Naval Base, California.** Monitored the California least tern in San Diego Bay. Collected observational data on Coronado least tern preserve throughout breeding season of the colony. Observed terns coming into colony with fish as well as directions of incoming and outgoing terns. Identified fish being brought into colony. Mapped locations of foraging flocks within San Diego Bay and off the coast of Coronado using a boat. Organized data on dBase.
- **Raven Predation Studies, Fort Irwin.** Participated as a field crew member for a raven monitoring project in Mojave Desert at Fort Irwin, California. Constructed a bird blind for a monitoring station from which observational data were collected for 3 consecutive days. Mapped raven flight patterns within 360 degree radius.
- **Desert Tortoise Monitoring Study Plots, Fort Irwin.** Field crew member for desert tortoise monitoring project in the Mojave Desert at Fort Irwin, California. Navigated through 300-square meter study sites using Global Positioning System (GPS) to locate tortoise sign and burrows. Tortoises were weighed, measured, and tagged with a PIT tag on a rear marginal scute.
- **Vegetation Monitoring Project - Southern California Edison (SCE).** Field crew member for SCE riparian vegetation monitoring project along Bishop, Mill, McGee, and Birch Creeks in the eastern Sierra Nevada, California. Identified plant species, set up study site, tagged and cored trees, measured vegetation, kept record of new seedlings and snags, and used Lotus 1-2-3 spreadsheet on HP palmtop computers in the field.

- **California Gnatcatcher Habitat Survey, Laguna Beach, California.** Field crew member for California gnatcatcher habitat study. Identified and measured coastal shrub and chaparral plant species in Laguna Canyon and neighboring areas.
- **Spiny Lobster Resource Preservation with Dr. David L. Miller.** Received full paid scholarship to be a part of the EARTHWATCH field crew. Tagged and monitored spiny lobsters off the southern Yucatan Peninsula to determine the long-term impacts of artificial shelters in a spiny lobster fishery. Obtained SCUBA certification in preparation for the study.

