

**FTC-Eastern
Wildlife Undercrossing Reports**

**1999 EASTERN TRANSPORTATION CORRIDOR WILDLIFE
UNDERCROSSING MONITORING REPORT**

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INTRODUCTION

This is the first annual report of a five year study documenting wildlife studies conducted by LSA Associates, Inc. (LSA) at four wildlife undercrossings along the Eastern Transportation Corridor (ETC) (Figure 1), which opened in October, 1998. The four wildlife undercrossings (UC) include Hicks Canyon Haul Road UC, Oak Canyon UC, Southern California Edison (SCE) UC, and Windy Ridge UC. These studies are funded by the Transportation Corridor Agencies (TCA) as required in the Section 7 Biological Opinion on the ETC, Orange County (No. 1-6-94-F-17) East and North Legs. The biological opinion identifies the Santiago Creek bridge as an alternative species wildlife crossing and is not included as part of this monitoring requirement.

STUDY AREA

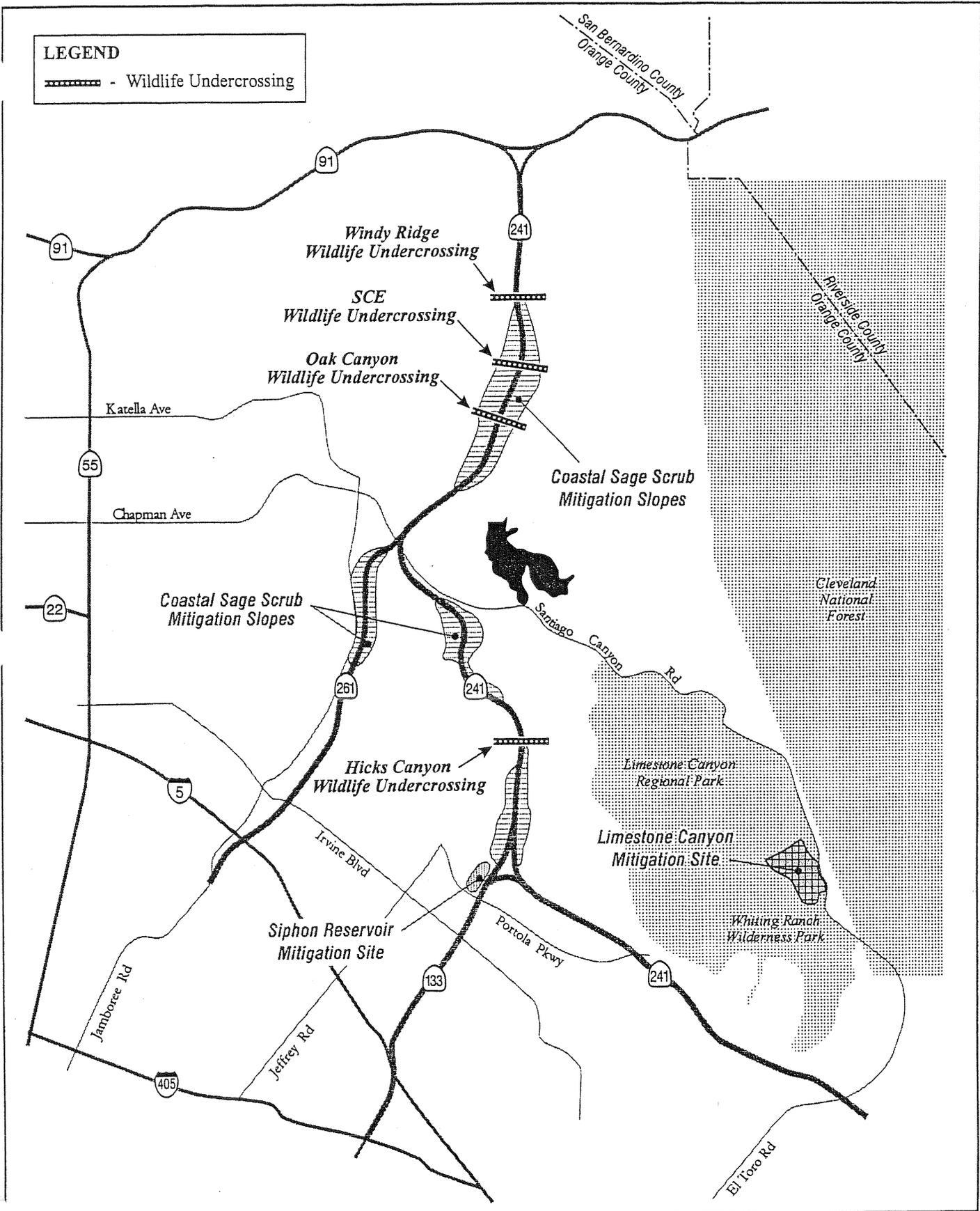
The wildlife movement study area includes four wildlife undercrossings along the east and north segments of the ETC stretching from State Route (SR) 133 to SR-91 (Figure 1); the eastern segment stretches from SR-133 to the Orange interchange of SR-241 and SR-261; and the northern segment stretches from the Orange interchange to SR-91. The study area also includes the area surrounding each undercrossing on both sides. The Hicks Canyon Haul Road UC is located in the eastern segment, and Oak Canyon UC, SCE UC, and Windy Ridge UC are located in the northern segment. In general, these wildlife UCs were designed to allow the passage of large to medium wildlife species such as mountain lions, deer, and coyotes.

The Hicks Canyon Haul Road UC is located approximately 1.3 miles north of the SR-133 interchange, and is approximately 20 feet high, 70 feet wide at the bottom, 130 feet wide at the top, and a 600 foot traverse length (Figure 2). This crossing provides for wildlife movement from the Cleveland National Forest through the currently designated Limestone Canyon Wilderness areas and the Lomas Ridge Reserve. Although this crossing provides a long traverse (600 feet), there are three gaps in the bridge structure that allow a significant amount of natural light to penetrate the crossing. The topography is nearly flat, with a two lane asphalt road that crosses on the southern portion of the crossing.

The Oak Canyon UC is located approximately 2.4 miles north of the Orange interchange, and is approximately 50 feet high, 100 feet wide at the bottom, 220 feet wide at the top, and a 250 foot traverse length (Figure 3). This site was considered to provide high potential for movement by both deer and mountain lion, connecting Fremont, Weir, and Blind Canyons. The topography is gentle, opening up to a large, expansive canyon on the west with a dirt road leading over the ridge to the east side.

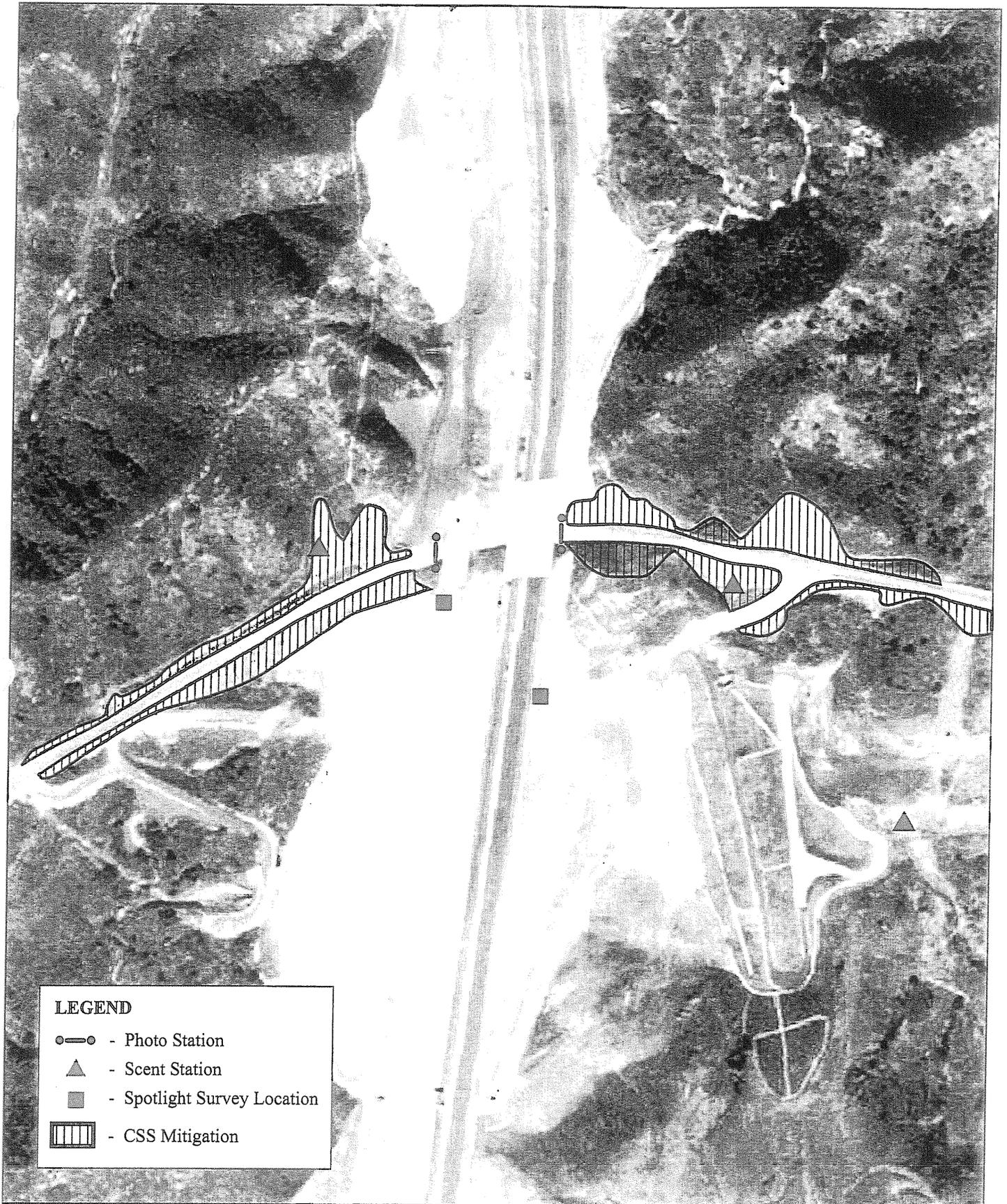
The SCE UC is located approximately 3.2 miles north of the Orange interchange, and is approximately 29 to 40 feet high, 100 feet wide at the bottom, and 230 feet wide at the top, with a traverse length of 250 feet (Figure 4). This crossing provides linkage between Weir Canyon and Fremont Canyon. This crossing is easily accessed, due to gradual topography and dirt roads on either side.

The Windy Ridge UC is located approximately 4.3 miles north of the Orange interchange, and is approximately 30 feet high, 80 feet wide at the bottom, and 220 feet wide at the top, with a 260 foot traverse length (Figure 5). This crossing was designed to provide major connectivity between



3/2/00(TCA930)

Figure 1



6/6/00(TCA930)

Figure 2


 L S A

No Scale

Hicks Canyon
Wildlife Undercrossing



LEGEND

- - Photo Station
- ▲ - Scent Station
- - Spotlight Survey Location

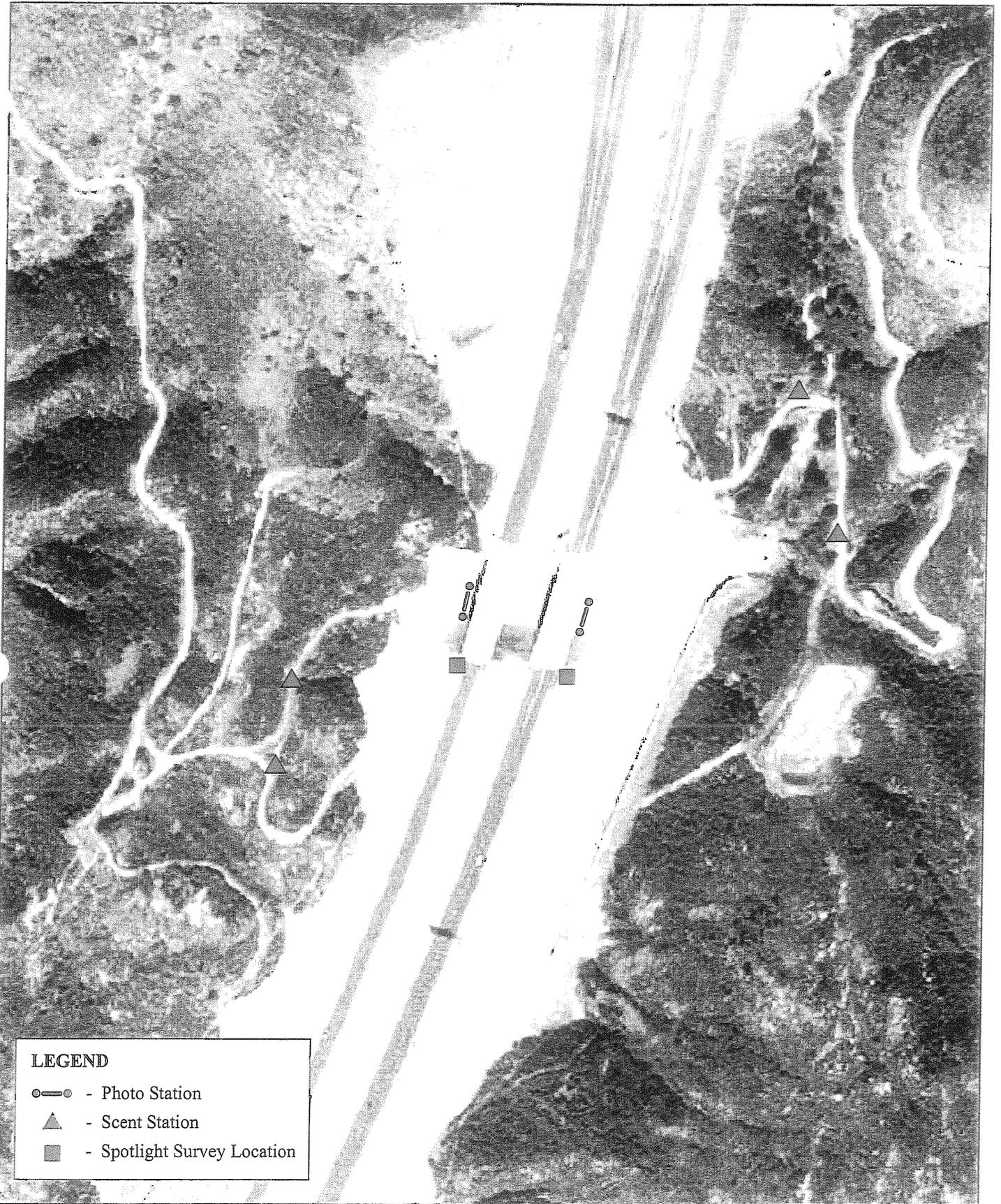
3/1/00(TCA930)

Figure 3



No Scale

Oak Canyon
Wildlife Undercrossing



LEGEND

- - Photo Station
- ▲ - Scent Station
- - Spotlight Survey Location

3/1/00(TCA930)

Figure 4


 N
 L S A

No Scale

SCE
Wildlife Undercrossing

Natural Communities Conservation Program (NCCP) open space reserve areas in Weir Canyon and Gypsum Canyon, especially for deer and mountain lions. The topography is steep leading up to the crossing, with a dirt road entering from the east and several animal trails leading up to a steep ridge to the west.

In addition to the basic design, all of the crossings include water guzzler and salt licks to help attract wildlife to these crossings.

METHODS

In the vicinity of each wildlife undercrossing, the presence and diversity of wildlife were documented using scent stations, spotlight surveys, general scat and track surveys, and direct observations. In addition, photo stations were set up at the UCs to determine direct wildlife use of the undercrossings. Surveys were conducted April 30, 1999, through May 7, 1999, and again on November 7, 1999, through November 14, 1999. During the five year study, the wildlife surveys will be conducted twice a year, in the spring and fall of each year through 2003.

SCENT STATIONS

The purpose of the scent stations is to help determine the species of wildlife in the vicinity of the UCs and the frequency with which they are present. This data will help to get an overall sense of the wildlife population that can then be compared with actual wildlife usage of the undercrossings. Two scent stations were placed at each end of the four UCs, for a total of 16 scent stations, as shown in Figures 2 through 5. An effort to attract carnivores and herbivores separately was made by the use of different baits. The scent stations locations were selected based on the topography, access, presence of game trails, and wildlife sign.

A 1x3 inch by 3 foot stake was placed in the center of each scent station. The vegetation within a three foot radius of the stake was cleared (as necessary) so that it would not interfere with making a clear track impression within the tracking medium. Diatomaceous earth (DE) was spread out within the three foot radius and smoothed to an even finish with a concrete trowel to provide a medium that aids the identification of tracks.

The bait was placed in a 12x12 inch bag constructed of a fine meshed metal screen. The bait was replaced on an as needed basis, as the bait dried or lost its scent. The bait bag was fastened to the stake using bailing wire. The bait targeting herbivores consisted of cut apple and banana, peanut butter, and bird seed. The bait targeting carnivores consisted of canned seafood flavored cat food and cut fish.

Each scent station was checked every morning during the survey period, and all clearly identifiable tracks at each station were recorded to genus and species, where possible. Once all tracks were recorded, the DE was smoothed and additional DE was added when necessary. Fresh bait was added to the bait bags as necessary to maintain a strong scent. Also, several automated, motion triggered

cameras were placed at the more active scent stations during the fall survey for further documentation of wildlife use.

AUTOMATED PHOTO STATIONS

Automated photo stations (Trail Master Infrared Trail Monitors) were set up at each end of the wildlife undercrossings, as shown in Figures 2 through 5. Most of the UCs could be covered with one photo station spanning the bottom of the undercrossing on each end; however, the uneven terrain at the SCE UC required two photo stations at each end. Each station consisted of an infrared sensing unit (transmitter and receiver) and a camera with a cord connected to the sensing unit. Since the spans of the crossings are so extensive, a laser was used to aid in aligning the invisible infrared beam on the transmitter units. Both pieces of the sensing unit and the camera were mounted to 1x3 inch by 3 foot wooden stakes, which were positioned to detect movement entering and exiting the UC. In addition, both pieces of the sensing unit were adjusted to a height of approximately 18 inches, to target medium to large mammals (e.g., racoons, bobcats, deer, mountain lions, etc.). The camera was positioned behind and upslope of the receiver unit, so that both units were in the frame of the camera viewfinder and offset so that the flash does not overexpose the receiver unit in the foreground, diminishing the clarity of the background. Excess cord connecting the receiving unit and the camera was securely fastened to the stakes to prevent disturbance by animals or wind.

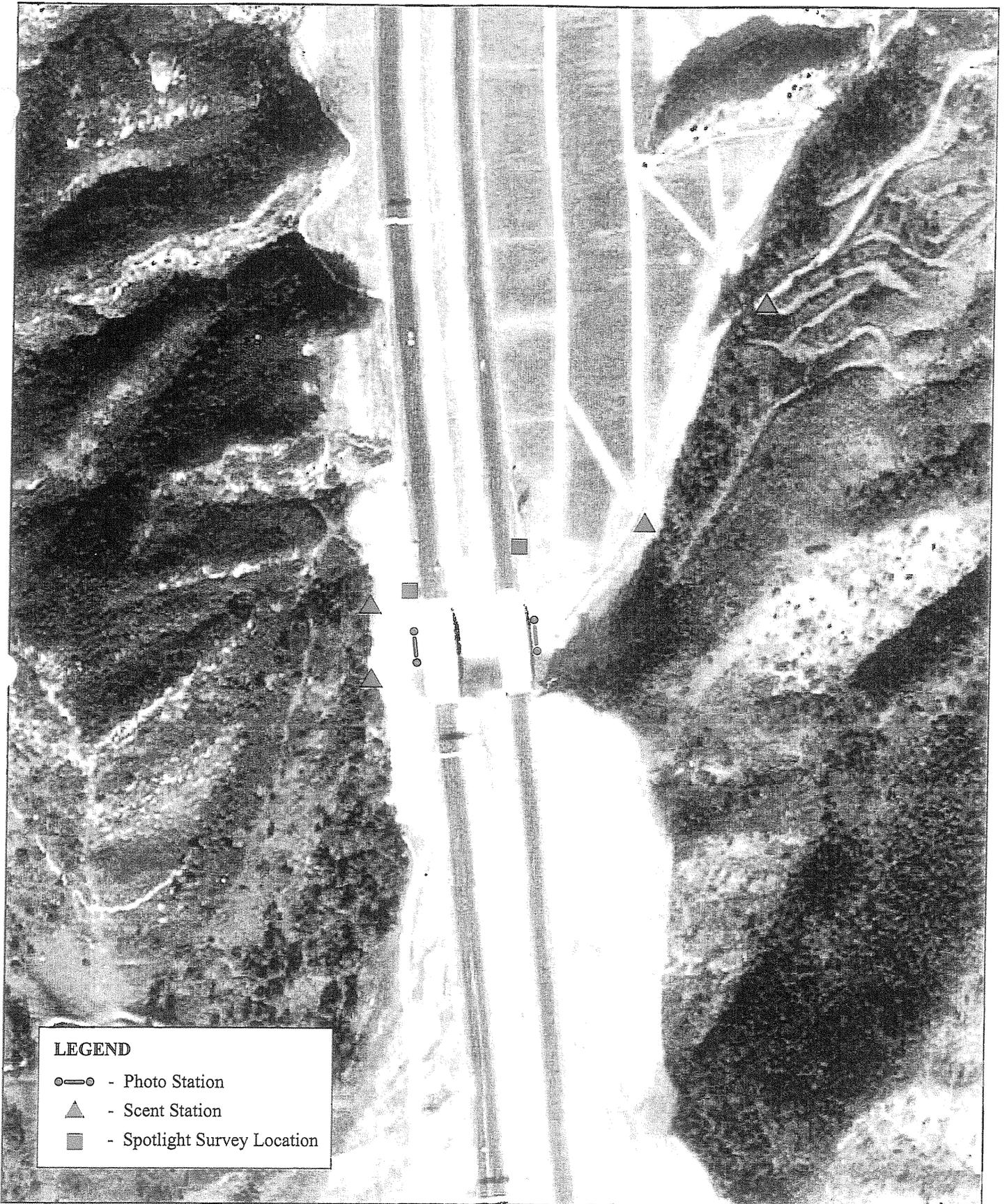
Each photo station was checked each morning during the study to ensure that it was functioning properly and that enough film was remaining to record any activity during the following 24 hour period.

SPOTLIGHT SURVEY

Spotlight surveys were conducted adjacent to each of the bridges overlooking each of the wildlife undercrossings for additional information on animals in the immediate vicinity of each undercrossing. Each side of the bridge was surveyed each night for approximately five minutes. A two million candlepower spotlight was used for the surveys. The surveys were conducted at least one hour following sunset. The survey was conducted by first scanning the area directly below, then away in a sweeping, side to side motion. This sequence was repeated until the time elapsed. The survey time was extended, if additional time was required to identify any animals observed. The genus and/or species of each sighting was recorded. If sighted animals could not be identified due to vegetative cover and the limited range of the spotlight, the approximate location was recorded so that other signs, if any, could be used the following day to identify the sighting.

GENERAL TRACK AND SCAT SURVEYS

General surveys for tracks and scat were conducted throughout the study area each morning as the scent stations and photo stations were checked. These surveys consisted of a biologist meandering throughout the study area, locating game trails, and observing tracks and scat. The surveyor was also



3/1/00(TCA930)

Figure 5

N
LSA

No Scale

Windy Ridge
Wildlife Undercrossing

on the alert for direct observations of wildlife. Since the study area is so extensive and much of the substrate is hard, the tracks were not cleared each day.

RESULTS

The results of the scent station, photo station, and spotlight surveys are summarized in Tables A through F. Wildlife and sign that were observed away from the scent stations, but within the vicinity of the study area, are provided in Table G.

DISCUSSION

Although this is only the first year of a five year study, the data show that there is a considerable amount of wildlife within the study area, and that some of these animals are using the UCs. Although there were similar numbers and species documented at the scent stations during the spring and fall, substantially more wildlife was using the undercrossings during the fall than in the spring.

The preliminary data do not show that there is a direct correlation between the number and species using the scent stations and those using the crossings. For example, during the fall, coyote were recorded at the four scent stations a total of six times; however, there were 15 incidents of coyote at the UC photo stations (three incidents of probably the same animal recorded on both sides of the UC), for a total of 12 occurrences. Also, a mountain lion track was recorded at the Windy Ridge scent station, but this individual was not photographed using the undercrossing. In addition, at one of the cameras set up at one of the scent stations, a deer was recorded walking past the scent station without stopping to smell or to leave tracks in the DE. Although an effort was made to attract herbivores and carnivores to separate bait stations, both bait stations seemed to attract carnivores and herbivores alike.

The data show that mountain lions use the Oak Canyon UC and SCE UC. Also, the Hicks Canyon UC and SCE UC recorded mostly carnivores (coyote and mountain lions) and Oak Canyon UC and Windy Ridge recorded mostly herbivores (mule deer). The data show that most of the wildlife movement at the UCs occurred between 8 p.m. and 8 a.m. Samples of the photographs resulting from the photo stations and scent stations are provided in Figures 6, 7, and 8.

The spotlight survey results included relatively few observations, especially in contrast with the number of animals recorded by other methods. These low numbers are probably due to the relatively short sampling period and the random chance of observing an animal.

There are wildlife guzzlers (catch basin/watering devices) and salt licks at each side of the UCs, with the exception of the west side of Hicks Canyon. During the spring survey, the soil was smoothed out in front of the guzzlers and DE was used to aid identification of tracks; however, relatively few animals used the guzzlers. As with other natural water sources in the area, the water levels in the guzzlers was extremely low and in some cases completely dry. During the fall survey, monitoring of the guzzlers was discontinued since it seemed unlikely that animals would be able to utilize them.

Table A - Hicks Canyon Scent Station Data

Common Name	Hicks Canyon East				
	Carnivore		Herbivore		Guzzler
	Spring 1999	Fall 1999	Spring 1999	Fall 1999	Spring 1999
unidentified small bird	2				
Audubon's cottontail	3	4	3	4	
black-tailed jackrabbit	1				
unidentified small rodent	1	1		2	
woodrat		1			
coyote	3		1	1	
long-tailed weasel			2		
spotted skunk			1		
bobcat		1		1	
mule deer	1				
Total	11	7	7	8	0

Common Name	Hicks Canyon West			
	Carnivore		Herbivore	
	Spring 1999	Fall 1999	Spring 1999	Fall 1999
unidentified small bird		2		1
unidentified medium bird				2
unidentified large bird			1	
Audubon's cottontail	2	3	2	2
unidentified small rodent	1	2		1
woodrat				1
coyote		2	1	2
long-tailed weasel			1	
striped skunk			1	
bobcat		1	1	2
mule deer	1			
Total	4	10	7	11

Table B - Oak Canyon Scent Station Data

Common Name	Oak Canyon East				
	Carnivore		Herbivore		Guzzler
	Spring 1999	Fall 1999	Spring 1999	Fall 1999	Spring 1999
unidentified frog/toad			2		
unidentified small bird		1			1
unidentified medium bird	1				
Audubon's cottontail	1		1		
woodrat	2		1		
gray fox	1				
coyote	1		1		1
striped skunk				1	
bobcat	2	2		3	
mule deer					1
Total	8	3	5	4	3

Common Name	Oak Canyon West				
	Carnivore		Herbivore		Guzzler
	Spring 1999	Fall 1999	Spring 1999	Fall 1999	Spring 1999
unidentified frog/toad					1
unidentified medium bird					3
unidentified small rodent		2		1	
woodrat					1
gray fox				1	
coyote	2	1	1		3
bobcat	2	1	1		
mule deer			1		
Total	4	4	3	2	8

Table C - SCE Scent Station Data

Common Name	SCE East				
	Carnivore		Herbivore		Guzzler
	Spring 1999	Fall 1999	Spring 1999	Fall 1999	Spring 1999
unidentified small bird				1	
Audubon's cottontail			4		
unidentified small rodent		1			
woodrat		2			
coyote	1		1		
long-tailed weasel			1		
mountain lion			1		
mule deer	1		1		
Total	2	3	8	1	0

Common Name	SCE West				
	Carnivore		Herbivore		Guzzler
	Spring 1999	Fall 1999	Spring 1999	Fall 1999	Spring 1999
1/2" unidentified snake			1		
unidentified medium bird					1
Audubon's cottontail	3	1		1	
black-tailed jackrabbit	1				
unidentified small rodent		1		1	
kangaroo rat	1		3		
woodrat		3		3	
coyote	1		1		2
bobcat	1				
Total	7	5	5	5	3

Table D - Windy Ridge Scent Station Data

Common Name	Windy Ridge East				
	Carnivore		Herbivore		Guzzler
	Spring 1999	Fall 1999	Spring 1999	Fall 1999	Spring 1999
unidentified small bird		1			
Audubon's cottontail	2		5	3	
unidentified small rodent		1		2	
woodrat		1		1	
coyote	1		1		
spotted skunk	2				
bobcat				2	
mountain lion		1			
Total	5	4	6	8	0

Common Name	Windy Ridge West				
	Carnivore		Herbivore		Guzzler
	Spring 1999	Fall 1999	Spring 1999	Fall 1999	Spring 1999
unidentified frog/toad			1		
unidentified small lizard			1		
unidentified small bird		1			
Virginia opossum		1			
Audubon's cottontail	1	1	6	3	
Beechey ground squirrel	1				1
woodrat	1			1	
coyote	1				
bobcat	1	1	1	3	
mule deer				1	
Total	5	4	9	8	1

Table F - Photo Station Data

Spring 1999

Hicks Canyon Under Crossing

Date	Time	East End	West End
5/2/99	0035		coyote
5/6/99	2039		coyote

Oak Canyon Under Crossing

Date	Time	East End	West End
5/3/99	0540	mule deer	
5/4/99	0833	house finch	
5/4/99	2342	mountain lion	
5/4/99	2344		mountain lion
5/6/99	0224		coyote
5/6/99	2303		great horned owl

SCE Under Crossing

Date	Time	East End	West End
5/2/99	0023		coyote
5/3/99	0212		coyote
5/4/99	2003	coyote	
5/5/99	2251		mountain lion

Windy Ridge Under Crossing

Date	Time	East End	West End
5/1/99	?	common raven	

Fall 1999

Hicks Canyon Under Crossing

Date	Time	East End	West End
11/7/99	11:26		coyote
11/8/99	2:30	coyote	
11/9/99	1:42		coyote
11/9/99	1:43	coyote	
11/9/99	20:28		bobcat
11/9/99	21:53		coyote
11/11/99	2:42	coyote	
11/11/99	22:42		coyote
11/12/99	1:23	coyote	
11/12/99	1:23		2 coyote
11/12/99	7:20	coyote	
11/12/99	7:21		coyote
11/12/99	23:51		coyote
11/13/99	2:08		coyote
11/14/99	0:04		raccoon
11/14/99	5:03		unidentified
11/14/99	5:11	coyote	

Oak Canyon Under Crossing

Date	Time	East End	West End
11/8/99	9:48		mule deer
11/8/99	10:18		mule deer
11/12/99	10:20		mule deer
11/13/99	4:17	unidentified	
11/13/99	10:47	mule deer	
11/13/99	11:04		2 mule deer
11/14/99	1:39		2 mule deer

SCE Under Crossing

Date	Time	East End	West End
11/7/99	10:37		2 mule deer
11/7/99	12:53		mule deer
11/7/99	?	mule deer	
11/8/99	3:40		coyote
11/8/99	3:42	coyote	
11/11/99	23:05	mountain lion	
11/11/99	23:06		mountain lion
11/12/99	21:22	coyote	
11/13/99	1:30		coyote
11/13/99	1:31	coyote	
11/13/99	23:18		coyote
11/13/99	23:21	coyote	
11/14/99	1:20	coyote	

Windy Ridge Under Crossing

Date	Time	East End	West End
11/8/99	7:31		mule deer
11/8/99	7:33	mule deer	
11/8/99	7:49		mule deer
11/9/99	23:35		mule deer
11/9/99	23:36	mule deer	
11/9/99	23:50		mule deer
11/9/99	23:52	mule deer	
11/11/99	7:46		mule deer
11/11/99	7:48	mule deer	

Table G - General Wildlife and Wildlife Sign Observations

Scientific Name	Common Name	Crossing			
		Hicks Cayon	Oak Canyon	SCE	Windy
<i>Sylvilagus auduboni</i>	Audubon's cottontail	D/O, S	D/O, S	D/O, S	D/O, S
<i>Neotoma</i> sp.	woodrat	S	S	S	S
<i>Canis latrans</i>	coyote	T, S	T, S	T, S	T, S
<i>Felis rufus</i>	bobcat	T	T	T	T
<i>Odocoileus hemionus</i>	mule deer	T, S	D/O, T, S	D/O, T, S	D/O, T, S
<i>Spilogale</i> sp. or <i>Mephitis</i> sp.	skunk		SC		

D/O - Direct Observation

T - Tracks

S - Scat

SC - Scent

Other wildlife species observed in the area

LepidopteraNymphalidae*Coenonympha californica*Lycaenidae*Apodemia mormo virgulti**Callophrys perplexa**ucopsyche lygdamus austalis**isalia augustinus**Precis coenia*ButterfliesBrush-footed Butterflies

California ringlet

Metalmarks, hairstreaks, Coppers, and Blues

Behr's metalmark

perplexing hairstreak

southern blue

brown elfin

buckeye

ReptiliaIguanidae*Sceloporus occidentalis**Uta stansburiana*Anguidae*Gerrhonotus multicarinatus*Colubridae*Thamnophis hammondi*Reptiles

iguanids

western fence lizard

side blotch lizard

alligator

southern alligator lizard

colubrids

two striped garter

AvesCathartidae*Cathartes aura*Accipitridae*Buteo jamaicensis*Odontophoridae*Callipepla californica*Columbidae*Zenaida macroura*BirdsNew World Vultures

turkey vulture

Kites, Hawks, Eagles, and Ospreys

red-tailed hawk

New World Quail

California quail

Pigeons and Doves

mourning dove

s	<u>Birds</u>
<i>Acrididae</i>	Cuckoos and Roadrunners
<i>Geococcyx californianus</i>	greater roadrunner
Trochilidae	Hummingbirds
<i>Archilochus alexandri</i>	black-chinned hummingbird
<i>Calypte anna</i>	Anna's hummingbird
Tyrant Flycatchers	Tyrannidae
<i>Sayornis nigricans</i>	black phoebe
<i>Tyrannus verticalis</i>	western kingbird
Corvidae	Jays, Magpies, and Crows
<i>Aphelocoma californica</i>	scrub jay
<i>Corvus corax</i>	common raven
Hirundinidae	Swallows
<i>Petrochelidon pyrrhonota</i>	cliff swallow
Aegithalidae	Bushtits
<i>Psaltriparus minimus</i>	bushtits
Troglodytidae	Wren
<i>Troglodytes aedon</i>	house wren
Mimidae	Mimic Thrushes
<i>Mimus polyglottos</i>	northern mockingbird
Emberizidae	New World Sparrows
<i>Pipilo maculatus</i>	spotted towhee
<i>Pipilo crissalis</i>	California towhee
<i>Trichia leucophrys</i>	white crowned sparrow
<i>Troglodytes aedon</i>	rufous crowned sparrow
<i>Melospiza melodia</i>	song sparrow
Icteridae	American orioles
<i>Sturnella neglecta</i>	western meadowlark
Fringillidae	Fringillid Finches
<i>Carpodacus mexicanus</i>	house finch
<i>Carduelis psaltria</i>	lesser goldfinch



Mule deer, photographed at the west side of the Windy Ridge undercrossing.



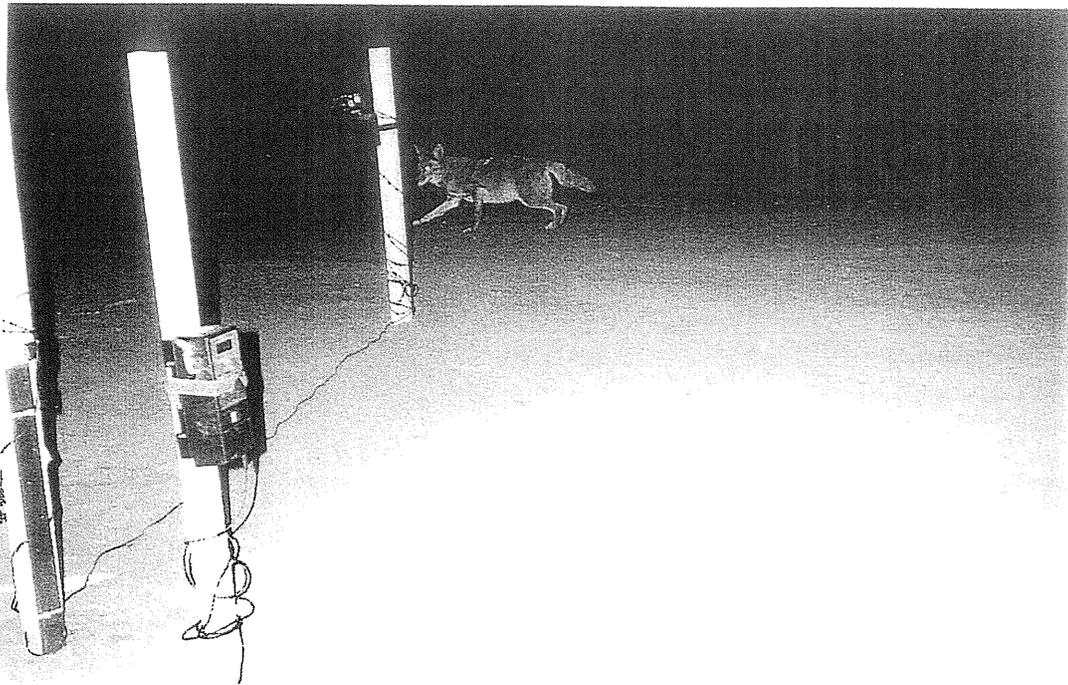
Mountain lion photographed at the east side of the SCE undercrossing.

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Figure 6

LSA

Site Photos



Coyote photographed at the east side of the SCE undercrossing.



Bobcat photographed at the Hicks Canyon herbivore baited scent station.

3/31/00(TCA930)

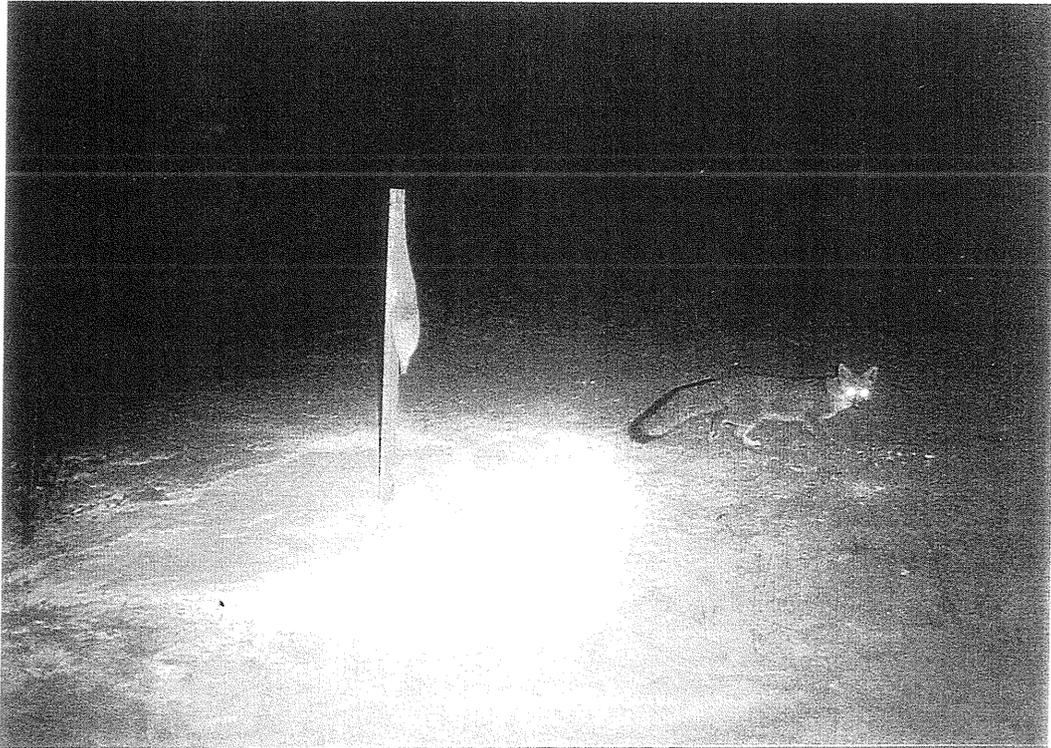
Figure 7

LSA

Site Photos



Mule deer photographed walking past the SCE herbivore baited scent station, without leaving tracks in the diatomaceous earth.



Gray fox photographed at the Oak Canyon herbivore baited scent station.

3/31/00(TCA930)

Figure 8

LSA

Site Photos

During the two seven day studies, there was a considerable amount of human activity observed at and in the vicinity of the UCs. This activity consisted of work crews installing and maintaining the habitat restoration areas and modifying the right-of-way fence. These work crews were observed parking and eating lunch under the bridges at the UCs, littering, and leaving the gates opened. Also, a group of three deer was observed within the right-of-way at the same location as one of these work crews, adjacent to the SCE UC.

It is unclear whether the deer jumped over the right-of-way fence or walked through an open gate. These same deer, presumably, were later seen on the opposite side of the ETC, outside of the right-of-way adjacent to the Oak Canyon UC. In addition, a coyote was observed during the spotlight survey crossing under the right-of-way fence via a v-ditch and jumping over the right-of-way fence at the Oak Creek UC.

Although there are fences along the right-of-way and UCs, animals were observed crawling under and jumping over the fences and presumably crossing over the roadway. There is no method for recording these animals throughout the study area.

CONCLUSIONS AND RECOMMENDATIONS

Overall, the first year's results indicate that the wildlife undercrossings are being used by a variety of large to medium mammals, including mountain lion, mule deer, coyote, and bobcat. The number of animals using the UCs increased from the spring to the fall surveys. This could be the result of seasonal variations in activity or of a learned behavior, since the ETC opened in October, 1998. Wildlife activity through the UCs may increase in subsequent years due to the following factors: reduced human activity, increased vegetative cover created by habitat restoration at the UCs, right-of-way fence modifications, increased road traffic, and an increased learned behavior related to UC usage.

Although the results of the first year's survey are promising, it is too early in the study to draw any significant conclusions. We will begin surveying the wildlife usage at the guzzlers again, and continue this practice each year. In addition, we recommend that all work crews be educated and encouraged to close all gates and minimize their presence and disturbance at the UCs, especially during the periods of high activity, between 8 p.m. and 8 a.m. Also, the guzzlers should be regularly maintained so that they can be utilized throughout the year to help attract wildlife and encourage usage of the crossings.

WILDLIFE UNDERCROSSING
MONITORING REPORT

2000 EASTERN TRANSPORTATION CORRIDOR
ORANGE COUNTY, CALIFORNIA

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LSA Project No. TCA930

LSA

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EXECUTIVE SUMMARY

LSA Associates, Inc. (LSA) concluded its second year of a five year study documenting the use of four wildlife undercrossings (UC) along the Eastern Transportation Corridor. Those crossings include Hicks Canyon Haul Road UC, Oak Canyon UC, Southern California Edison (SCE) UC, and Windy Ridge UC. A variety of techniques was used to document wildlife usage, including general track and scat surveys, baited scent stations, photo stations and spotlight surveys. The scent stations, spotlight surveys, and track and scat survey documented wildlife in the vicinity of the crossing, and the photo stations document wildlife that actually use the crossings. The study was conducted from April 4, 2000, through April 11, 2000, and again on November 1, 2000, through November 7, 2000.

The second year study found that a number of animals continue to utilize the undercrossings, including mule deer, coyote, bobcat, and gray fox. Both the numbers and diversity of species have increased from the previous year. However, no mountain lions were recorded this year, unlike the previous year. The preliminary results of the study are promising; however, more study is required for a more conclusive analysis.

INTRODUCTION

This is the second annual report of a five year study documenting wildlife studies conducted by LSA Associates, Inc. (LSA) at four wildlife undercrossings along the Eastern Transportation Corridor (ETC) (Figure 1), which opened in October, 1998. The four wildlife undercrossings (UC) include Hicks Canyon Haul Road UC, Oak Canyon UC, Southern California Edison (SCE) UC, and Windy Ridge UC. These studies are funded by the Transportation Corridor Agencies (TCA) as required in the Section 7 Biological Opinion on the ETC, Orange County (No. 1-6-94-F-17) East and North Legs. The biological opinion identifies the Santiago Creek bridge as an alternative species wildlife crossing and is not included as part of this monitoring requirement.

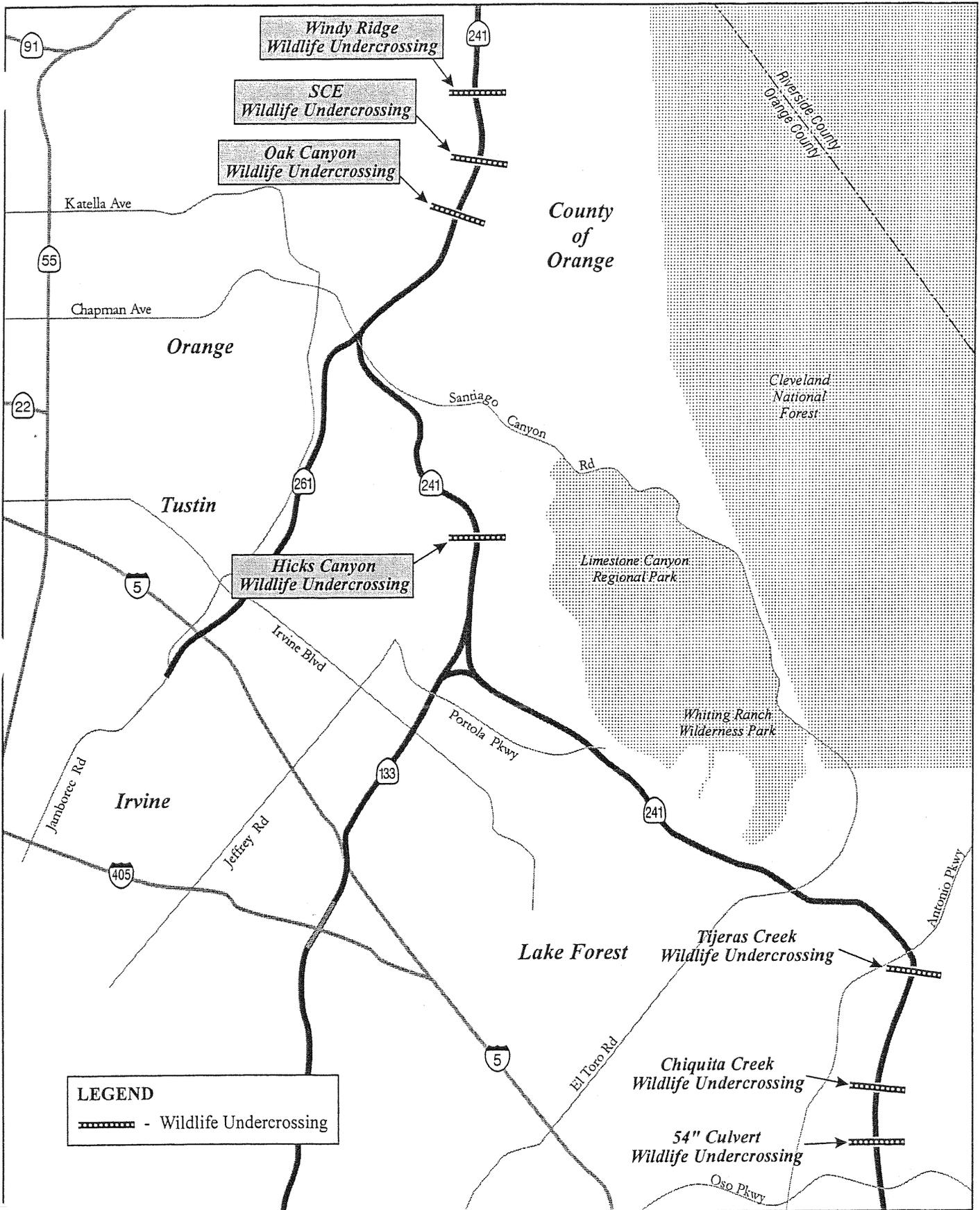
STUDY AREA

The wildlife movement study area includes four wildlife undercrossings along the east and north segments of the ETC stretching from State Route (SR) 133 to SR-91 (Figure 1); the eastern segment stretches from SR-133 to the Orange interchange of SR-241 and SR-261; and the northern segment stretches from the Orange interchange to SR-91. The study area also includes the area surrounding each undercrossing on both sides. The Hicks Canyon Haul Road UC is located in the eastern segment, and Oak Canyon UC, SCE UC, and Windy Ridge UC are located in the northern segment. In general, these wildlife UCs were designed to allow the passage of large to medium wildlife species such as mountain lions, deer, and coyotes.

The Hicks Canyon Haul Road UC is located approximately 1.3 miles north of the SR-133 interchange, and is approximately 20 feet high, 70 feet wide at the bottom, 130 feet wide at the top, and a 600 foot traverse length (Figure 2). This crossing provides for wildlife movement from the Cleveland National Forest through the currently designated Limestone Canyon Wilderness areas and the Lomas Ridge Reserve. Although this crossing provides a long traverse (600 feet), there are three gaps in the bridge structure that allow a significant amount of natural light to penetrate the crossing. The topography is nearly flat, with a two lane asphalt road that crosses the southern portion of the crossing.

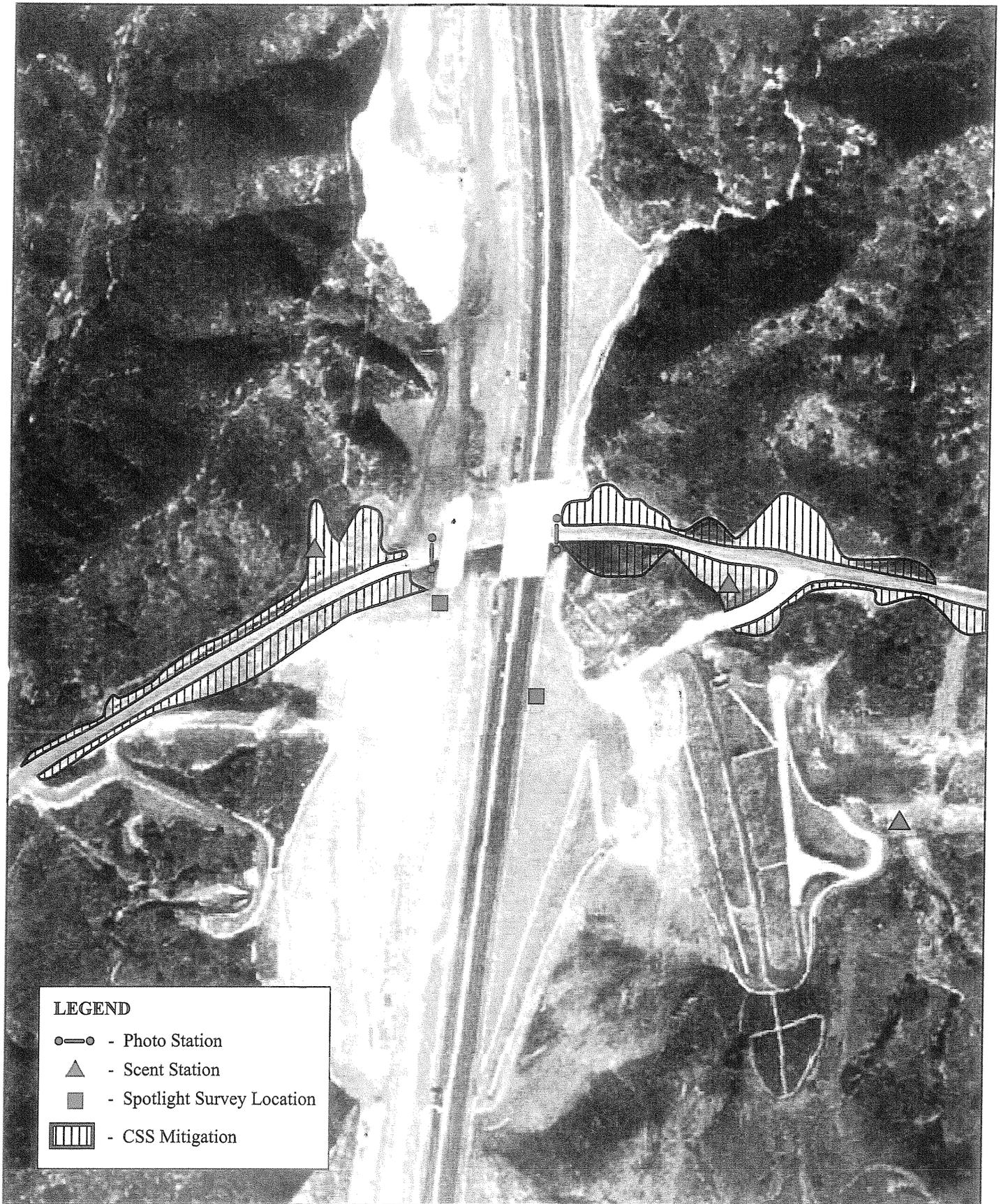
The Oak Canyon UC is located approximately 2.4 miles north of the Orange interchange, and is approximately 50 feet high, 100 feet wide at the bottom, 220 feet wide at the top, and a 250 foot traverse length (Figure 3). This site was considered to provide high potential for movement by both deer and mountain lions, connecting Fremont, Weir, and Blind Canyons. The topography is gentle, opening up to a large, expansive canyon on the west with a dirt road leading over the ridge to the east side.

The SCE UC is located approximately 3.2 miles north of the Orange interchange, and is approximately 29 to 40 feet high, 100 feet wide at the bottom, and 230 feet wide at the top, with a traverse length of 250 feet (Figure 4). This crossing provides linkage between Weir Canyon and Fremont Canyon. This crossing is easily accessed, due to gradual topography and dirt roads on either side.



1/26/01(TCA930)

Figure 1



6/6/00(TCA930)

Figure 2


 N
 L S A

No Scale

Hicks Canyon
Wildlife Undercrossing



3/1/00(TCA930)

Figure 3



LSA

No Scale

Oak Canyon
Wildlife Undercrossing



Figure 4

3/1/00(TCA930)


 N
 L S A

No Scale

SCE
Wildlife Undercrossing

The Windy Ridge UC is located approximately 4.3 miles north of the Orange interchange, and is approximately 30 feet high, 80 feet wide at the bottom, and 220 feet wide at the top, with a 260 foot traverse length (Figure 5). This crossing was designed to provide major connectivity between Natural Communities Conservation Program (NCCP) open space reserve areas in Weir Canyon and Gypsum Canyon, especially for deer and mountain lions. The topography is steep leading up to the crossing, with a dirt road entering from the east and several animal trails leading up to a steep ridge to the west.

In addition to the basic design, all of the crossings include water guzzler and salt licks to help attract wildlife to these crossings.

METHODS

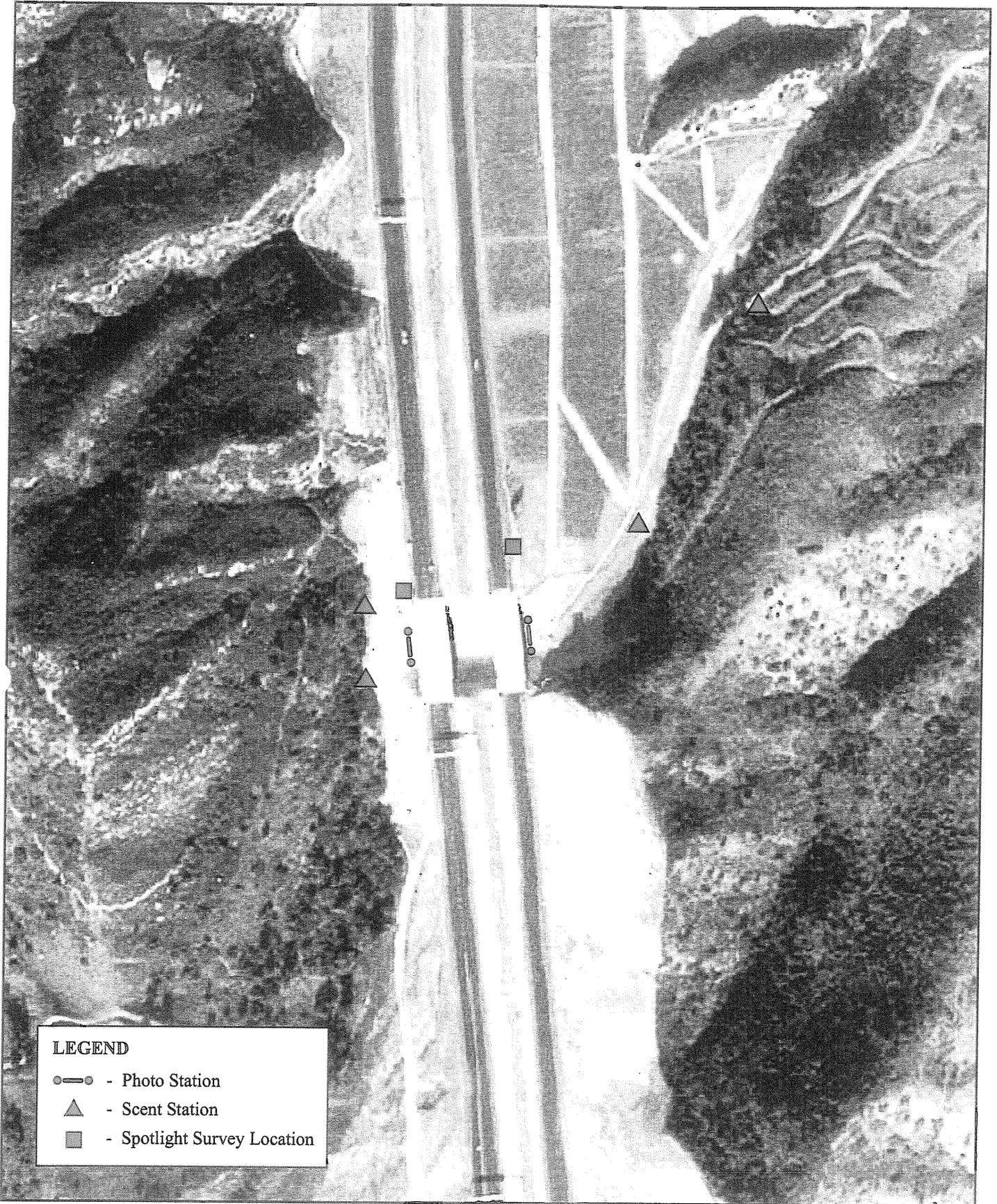
In the vicinity of each wildlife undercrossing, the presence and diversity of wildlife were documented using scent stations, spotlight surveys, general scat and track surveys, and direct observations. In addition, photo stations were set up at the UCs to determine direct wildlife use of the undercrossings. Surveys were conducted April 4, 2000, through April 11, 2000, and again on November 1, 2000, through November 7, 2000. During the five year study, the wildlife surveys will be conducted twice a year, in the spring and fall of each year through 2003.

Scent Stations

The purpose of the scent stations is to help determine the species of wildlife in the vicinity of the UCs and the frequency with which they are present. These data will help to get an overall sense of the wildlife population that can then be compared with actual wildlife usage of the undercrossings. Two scent stations were placed at each end of the four UCs, for a total of 16 scent stations, as shown in Figures 2 through 5. An effort to attract carnivores and herbivores separately was made by the use of different baits. The scent stations locations were selected based on the topography, access, presence of game trails, and wildlife sign.

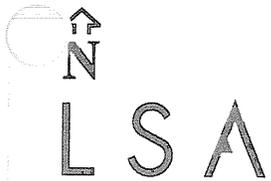
A 1x3 inch by 3 foot stake was placed in the center of each scent station. The vegetation within a three foot radius of the stake was cleared (as necessary) so that it would not interfere with making a clear track impression within the tracking medium. Diatomaceous earth (DE) was spread out within the three foot radius and smoothed to an even finish with a concrete trowel to provide a medium that aided the identification of tracks.

The bait was placed in a 12x12 inch bag constructed of a fine meshed metal screen. The bait was replaced on an as needed basis, as the bait dried or lost its scent. The bait bag was fastened to the stake using bailing wire. The bait targeting herbivores consisted of cut apple and banana, peanut butter, and bird seed. The bait targeting carnivores consisted of canned seafood flavored cat food and cut fish.



3/1/00(TCA930)

Figure 5



No Scale

Windy Ridge
Wildlife Undercrossing

Each scent station was checked every morning during the survey period, and all clearly identifiable tracks at each station were recorded to genus and species, where possible. Once all tracks were recorded, the DE was smoothed and additional DE was added when necessary. Fresh bait was added to the bait bags as necessary to maintain a strong scent. Also, several automated, motion triggered cameras were placed at the more active scent stations during the fall survey for further documentation of wildlife use.

Automated Photo Stations

Automated photo stations (Trail Master Infrared Trail Monitors) were set up at each end of the wildlife undercrossings, as shown in Figures 2 through 5. Most of the UCs could be covered with one photo station spanning the bottom of the undercrossing on each end; however, the uneven terrain at the SCE UC required two photo stations at each end. Each station consisted of an infrared sensing unit (transmitter and receiver) and a camera with a cord connected to the sensing unit. Since the spans of the crossings are so extensive, a laser was used to aid in aligning the invisible infrared beam on the transmitter units. Both pieces of the sensing unit and the camera were mounted to 1x3 inch by 3 foot wooden stakes, which were positioned to detect movement entering and exiting the UC. In addition, both pieces of the sensing unit were adjusted to a height of approximately 18 inches, to target medium to large mammals (e.g., raccoons, bobcats, deer, mountain lions, etc.). The camera was positioned behind and upslope of the receiver unit, so that both units were in the frame of the camera viewfinder and offset so that the flash did not overexpose the receiver unit in the foreground, diminishing the clarity of the background. Excess cord connecting the receiving unit and the camera was securely fastened to the stakes to prevent disturbance by animals or wind.

Each photo station was checked each morning during the study to ensure that it was functioning properly and that enough film was remaining to record any activity during the following 24 hour period.

Spotlight Survey

Spotlight surveys were conducted adjacent to the bridges overlooking each of the wildlife undercrossings for additional information on animals in the immediate vicinity of each undercrossing. Each side of the bridge was surveyed each night for approximately five minutes. A two million candlepower spotlight was used for the surveys. The surveys were conducted at least one hour following sunset. The survey was conducted by first scanning the area directly below, then away in a sweeping, side to side motion. This sequence was repeated until the time elapsed. The survey time was extended, if additional time was required to identify any animals observed. The genus and/or species of each sighting was recorded. If sighted animals could not be identified due to vegetative cover and the limited range of the spotlight, the approximate location was recorded so that other signs, if any, could be used the following day to identify the sighting.

General Track and Scat Surveys

General surveys for tracks and scat were conducted throughout the study area each morning as the scent stations and photo stations were checked. These surveys consisted of a biologist meandering throughout the study area, locating game trails, and observing tracks and scat. The surveyor was also on the alert for direct observations of wildlife. Since the study area is so extensive and much of the substrate is hard, the tracks were not cleared each day.

RESULTS

The results of the scent station, photo station, and spotlight surveys are summarized in Tables A through F. Wildlife and sign that were observed away from the scent stations, but within the vicinity of the study area, are provided in Table G.

DISCUSSION

The second year's data show that the number and diversity of animals have increased slightly from the numbers recorded the previous year by the photo stations, scent stations, spotlight surveys, and general wildlife observations. As indicated in the previous report, the number of animals recorded in the area does not appear to correlate with the number of animals using the UCs. For example, animals recorded at the scent stations do not necessarily use the crossing and conversely the animals that use the UC do not always investigate the bait at the scent stations. However, both of these methods combined give a good indication of wildlife species in the area and their behavior. All of the UCs were used by wildlife with Hicks Canyon UC having the most activity and Windy Ridge UC having the least amount of activity. Overall, the number of animals recorded at the crossings is greater during the fall than the spring. This is probably due to seasonal variation in their feeding patterns. The dominant species recorded using the crossings were mule deer and coyote (Figures 6 and 7). No mountain lions were recorded in 2000, unlike the previous year, which had several at Windy Ridge UC, SCE UC, and Oak Canyon UC. A number of field biologists were conducting flora and fauna surveys throughout the area during the week of the spring survey and may have disrupted the natural behavior of the local wildlife.

Similar to previous years, the carnivore and herbivore baited scent stations did not appear to be target specific, but animals seem to visit either regardless of whether they are a carnivore or herbivore. The scent stations recorded a diversity of wildlife, including frog and bird to coyote, bobcat, and gray fox (Figure 7). The number and diversity of wildlife recorded at the scent stations appear to have increased from 1999. The increase in activity may be due to natural population fluctuations, rain patterns, and animals settling back into the area following the disturbance by the construction of the ETC.

Table A - Hicks Canyon Scent Station Data

Common Name	Hicks Canyon East					
	Carnivore		Herbivore		Guzzler	
	Spring 2000	Fall 2000	Spring 2000	Fall 2000	Spring 2000	Fall 2000
unidentified frog/toad		1			2	
unidentified lizard			1		3	
unidentified small bird			3			
unidentified medium bird	2		2			
black-tailed jackrabbit			2			
Audubon's cottontail	4	3	6	2	1	1
mouse		1		3		4
woodrat	1					2
unidentified small rodent	4					
spotted skunk	1		1		1	
raccoon					1	2
long-tailed weasel				1		
bobcat	2	1	3			
mountain lion		1				
gray fox				1		
coyote		1	1			
mule deer		1	1			
unidentified	1		1		2	
Total	15	9	21	7	10	9

Common Name	Hicks Canyon West			
	Carnivore		Herbivore	
	Spring 2000	Fall 2000	Spring 2000	Fall 2000
unidentified snake	1			
unidentified small bird		1		1
unidentified medium bird	1			
Audubon's cottontail	2		1	1
mouse				3
unidentified small rodent	1		3	
spotted skunk			1	
coyote		2		
Total	5	3	5	5

Table B - Oak Canyon Scent Station Data

Common Name	Oak Canyon East					
	Carnivore		Herbivore		Guzzler	
	Spring 2000	Fall 2000	Spring 2000	Fall 2000	Spring 2000	Fall 2000
unidentified frog/toad	2		2	1	5	3
unidentified bird	1	1	1	5	3	2
black-tailed jackrabbit	2					
mouse				1		1
woodrat			1			
unidentified small rodent	1				3	
striped skunk		1				
gray fox	2	1				
coyote	1				2	
mule deer						1
Total	9	3	4	7	13	7

Common Name	Oak Canyon West					
	Carnivore		Herbivore		Guzzler	
	Spring 2000	Fall 2000	Spring 2000	Fall 2000	Spring 2000	Fall 2000
bullfrog					2	
unidentified frog/toad					4	
unidentified lizard			1			
unidentified small bird				1	1	3
unidentified medium bird					1	
black tailed jackrabbit					1	
woodrat				1		
unidentified small rodent			3	1	1	3
bobcat	1	1	1	2		
gray fox	2		1		1	
coyote	1				3	
Total	4	1	6	5	14	6

Table C - SCE Scent Station Data

Common Name	SCE East					
	Carnivore		Herbivore		Guzzler	
	Spring 2000	Fall 2000	Spring 2000	Fall 2000	Spring 2000	Fall 2000
bullfrog					1	
unidentified frog/toad					3	1
unidentified lizard	1					
unidentified raptor					1	
unidentified small bird						1
opossum					1	
black-tailed jackrabbit	1					
Audubon's cottontail						1
unidentified small rodent		1	1	1		
bobcat	3	4	1	2		
gray fox	1					
coyote	1			1	1	
unidentified					1	
Total	7	5	2	4	8	3

Common Name	SCE West					
	Carnivore		Herbivore		Guzzler	
	Spring 2000	Fall 2000	Spring 2000	Fall 2000	Spring 2000	Fall 2000
unidentified frog/toad					3	
unidentified small bird					2	
Audubon's cottontail					1	
woodrat			3	3		
unidentified small rodent	1		2	3	1	
raccoon					1	
gray fox	2					
coyote					2	
mule deer						2
Total	3	0	5	6	10	2

Table D - Windy Ridge Scent Station Data

Common Name	Windy Ridge East					
	Carnivore		Herbivore		Guzzler	
	Spring 2000	Fall 2000	Spring 2000	Fall 2000	Spring 2000	Fall 2000
bullfrog					1	
unidentified frog/toad	4	2	2		4	3
unidentified lizard	1					
unidentified small bird		1		2	4	1
unidentified medium bird	1		1			
Audubon's cottontail	3		3	1	1	
Beechey ground squirrel					3	
woodrat						1
unidentified small rodent		1	3	1	6	1
bobcat		1		1		
coyote				2	1	
Total	9	5	9	7	20	6

Common Name	Windy Ridge West					
	Carnivore		Herbivore		Guzzler	
	Spring 2000	Fall 2000	Spring 2000	Fall 2000	Spring 2000	Fall 2000
unidentified frog/toad	1		1		4	2
unidentified small bird		1	2	2	2	
unidentified medium bird	1		1			
Audubon's cottontail					1	
Beechey ground squirrel					7	
woodrat		2			1	
unidentified small rodent	4	1	3	2		
skunk			1			
raccoon	1					
bobcat	1	1	1			
coyote			1			
Total	8	5	10	4	15	2

Table E - Spot Light Survey Data

Spring 2000	Hicks Canyon		Oak Canyon		SCE UC		Windy Ridge	
	East	West	East	West	East	West	East	West
unidentified frog/toad					1			
mule deer			2					
unidentified	1		1				1	
Total	1	0	3	0	1	0	1	0

Fall 2000	Hicks Canyon		Oak Canyon		SCE UC		Windy Ridge	
	East	West	East	West	East	West	East	West
Great horned owl					2			
bobcat		1						
coyote						1		
mule deer	3			3	3			
unidentified				1				
Total	3	1	0	4	5	1	0	0

Table F - Photo Station Data

Photo Stations - Spring 2000
ETC Wildlife Monitoring - TCA930

Hicks Canyon Undercrossing			
Date	Time	East End	West End
4/9/00	2027	coyote	
4/9/00	2034	coyote	
4/10/00	0723		mule deer
4/10/00	0803		coyote
4/10/00	0812		coyote
4/10/00	1726		mule deer
4/11/00	0519		mule deer
4/11/00	0628		coyote

Photo Stations - Fall 2000
ETC Wildlife Monitoring - TCA930

Hicks Canyon Undercrossing			
Date	Time	East End	West End
11/1/00	?*		coyote
11/1/00	?*		coyote
11/1/00	?*		coyote
11/2/00	0327	unidentified	
11/2/00	0409	coyote	
11/2/00	2340	coyote	
11/2/00	2342	coyote	
11/3/00	0123	nidentified	
11/3/00	0420	nidentified	
11/3/00	1739		coyote
11/3/00	1833		coyote
11/3/00	2008		coyote
11/3/00	2333	nidentified	
11/5/00	2336		coyote
11/6/00	0452		coyote
11/6/00	0453	coyote	
11/6/00	0721	mule deer	
11/6/00	2329		coyote
11/7/00	0326	nidentified	
11/7/00	0111		coyote
11/8/00	0202		coyote
11/8/00	0213		coyote
11/8/00	0323		coyote
11/8/00	0323	nidentified	

time unknown due to data collector malfunction

Oak Canyon Undercrossing

Date	Time	East End	West End
4/5/00	1510		mule deer
4/5/00	1513	2 mule deer	
4/5/00	1518	2 mule deer	
4/5/00	1519		mule deer
4/5/00	2353		gray fox

Oak Canyon Undercrossing

Date	Time	East End	West End
11/2/00	0346	mule deer	
11/5/00	0227	gray fox	
11/7/00	1614	3 mule deer	
11/8/00	0012	nidentified	
11/8/00	0241	raccoon	

Windy Ridge Undercrossing

Date	Time	East End	West End
------	------	----------	----------

Windy Ridge Undercrossing

Date	Time	East End	West End
11/4/00	0104	nidentified	
11/7/00	0325	nidentified	

SCE Undercrossing

Date	Time	East End	West End
4/4/00	2119	coyote	
4/7/00	0056	bobcat	
4/10/00	0249	coyote	

SCE Undercrossing

Date	Time	East End	West End
11/2/00	1552	merican crow	
11/3/00	1325		2 mule deer
11/4/00	1933	mule deer	
11/4/00	1930		mule deer
11/6/00	0726	2 mule deer	
11/6/00	0453		mule deer
11/6/00	0728		mule deer
11/7/00	1210	3 mule deer	

Table G - General Wildlife and Wildlife Sign Observations

Scientific Name	Common Name	Undercrossing			
		Hicks Canyon	Oak Canyon	SCE	Windy
<i>Sylvilagus audubonii</i>	Audubon's cottontail	D/O, S	D/O, S	D/O, S	D/O, S
<i>Neotoma</i> sp.	woodrat	S	S	S	S
<i>Spilogale</i> sp. or <i>Mephitis</i> sp.	skunk		SC		
<i>Felis rufus</i>	bobcat	T	T	T	T
<i>Canis latrans</i>	coyote	T, S	T, S	T, S	T, S
<i>Odocoileus hemionus</i>	mule deer	T, S	D/O, T, S	D/O, T, S	D/O, T, S

D/O - Direct Observation

T - Tracks

S - Scat

SC - Scent

Other wildlife species observed in the area

Lepidoptera**Butterflies****Nymphalidae****Brush-footed Butterflies***Coenonympha californica*

California ringlet

Lycaenidae**Metalmarks, Hairstreaks, Coppers, and Blues***Apodemia mormo*

Behr's metalmark

Callophrys perplexa

perplexing hairstreak

Glaucopsyche lygdamus

southern blue

Incisalia augustinus

brown elfin

Precis coenia

buckeye

Reptilia**Reptiles****Iguanidae****Iguanids***Sceloporus occidentalis*

western fence lizard

Uta stansburiana

side-blotched lizard

Anguidae**Alligator Lizards***Gerrhonotus multicarinatus*

southern alligator lizard

Colubridae**Colubrids***Thamnophis hammondi*

two-striped garter snake

Aves**Birds****Cathartidae****New World Vultures***Cathartes aura*

turkey vulture

Accipitridae**Kites, Hawks, Eagles, and Ospreys***Buteo jamaicensis*

red-tailed hawk

Odontophoridae**New World Quail***Callipepla californica*

California quail

Columbidae**Pigeons and Doves***Zenaida macroura*

mourning dove

Cuculidae**Cuckoos and Roadrunners***Geococcyx californianus*

greater roadrunner

Trochilidae**Hummingbirds***Archilochus alexandri*

black-chinned hummingbird

Calypte anna

Anna's hummingbird

Tyrant Flycatchers

Sayornis nigricans

Tyrannus verticalis

Corvidae

Aphelocoma californica

Corvus corax

Hirundinidae

Petrochelidon pyrrhonota

Aegithalidae

Psaltriparus minimus

Troglodytidae

Troglodytes aedon

Mimidae

Mimus polyglottos

Emberizidae

Pipilo maculatus

Pipilo crissalis

Zonotrichia leucophrys

Aimophila ruficeps

Melospiza melodia

Icteridae

Sturnella neglecta

Fringillidae

Carpodacus mexicanus

Carduelis psaltria

Tyrannidae

black pheobe

western kingbird

Jays, Magpies, and Crows

western scrub-jay

common raven

Swallows

cliff swallow

Bushtits

bushtit

Wren

house wren

Mimic Thrushes

northern mockingbird

New World Sparrows

spotted towhee

California towhee

white-crowned sparrow

rufous-crowned sparrow

song sparrow

American orioles

western meadowlark

Fringillid Finches

house finch

lesser goldfinch



A doe and two young mule deer cross under the road at Oak Canyon.



A coyote makes its way along Hicks Haul Road passing under the 241.

4/18/01(TCA930)

Figure 6

LSA

Site Photos



A buck mule deer uses the SCE Right-of-Way to pass under the tollway.



A gray fox visits the carnivore scent station at the Oak Canyon undercrossing.

4/18/01(TCA930)

Figure 7

The number of mule deer, bobcat, and coyote observed during the spotlight survey is greater than what was recorded in 1999. The spotlight surveys recorded more animals during the fall than in the spring, which is consistent with the results of the other survey methods. Again, this fluctuation in data could be due to natural season variations in feeding patterns. Although the number of animals recorded is relatively low compared to other methods, the lower numbers are probably due to the relatively short sampling period and the random chance of observing an animal.

There are wildlife guzzlers (catch basin/watering devices) and salt licks at each side of the UCs, with the exception of the west side of Hicks Canyon. The guzzlers contained water in the spring and were dry or nearly dry in the fall. Mostly birds, small rodents, and frogs frequented the guzzlers, but occasionally medium to larger animals, such as coyote, fox, and mule deer, would visit the guzzlers. These data are probably heavily dependent on the amount of rain received and the amount of water available from other sources in the area.

CONCLUSIONS AND RECOMMENDATIONS

Overall, the second year's results indicate that the wildlife undercrossings are continuing to be used by a variety of large to medium mammals, including mule deer, coyote, and bobcat. The number of animals using the UCs increased from 1999 to 2000 and from the spring to the fall surveys. This could be the result of both seasonal variations in activity or learned behavior, since the ETC opened in October, 1998. Wildlife activity through the UCs may continue to increase in subsequent years due to the following factors: reduced human activity, increased vegetative cover created by habitat restoration at the UCs, right-of-way fence modifications, increased road traffic, and an increased learned behavior related to UC usage.

Preliminary results from the first two year's of surveys are promising as all of the UCs appear to be functioning according to their design.

WILDLIFE UNDERCROSSING MONITORING REPORT

2001 EASTERN TRANSPORTATION CORRIDOR
ORANGE COUNTY, CALIFORNIA

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LSA Project No. TCA930

LSA

June 17, 2002

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EXECUTIVE SUMMARY

LSA Associates, Inc. (LSA) concluded its third year of a five year study documenting the use of four wildlife undercrossings (UC) along the Eastern Transportation Corridor. Those crossings include Hicks Canyon Haul Road UC, Oak Canyon UC, Southern California Edison (SCE) UC, and Windy Ridge UC. A variety of techniques was used to document wildlife usage, including general track and scat surveys, baited scent stations, photo stations and spotlight surveys. The scent stations, spotlight surveys, and track and scat survey documented wildlife in the vicinity of the crossing, and the photo stations document wildlife that actually use the crossings. The study was conducted from April 26, 2001, through May 3, 2001, and again on November 14, 2001, through November 22, 2001.

The third year study found that the number of animals using the undercrossings was highly variable, both with respect to individual UCs, and seasonally. No movement was recorded through the Windy Ridge UC, while the Hicks Canyon Haul Road UC was the most consistently used. The Oak Canyon UC and SCE UC, had the highest numbers recorded in the spring, with lower numbers in the fall. Overall, the number and diversity of wildlife appear to be similar to the previous year, with species including mountain lion (Oak Canyon UC), mule deer, coyote, bobcat, and gray fox.

INTRODUCTION

This is the third annual report of a five year study documenting wildlife studies conducted by LSA Associates, Inc. (LSA) at four wildlife undercrossings along the Eastern Transportation Corridor (ETC) (Figure 1), which opened in October, 1998. The four wildlife undercrossings (UC) include Hicks Canyon Haul Road UC, Oak Canyon UC, Southern California Edison (SCE) UC, and Windy Ridge UC. These studies are funded by the Transportation Corridor Agencies (TCA) as required in the Section 7 Biological Opinion on the ETC, Orange County (No. 1-6-94-F-17) East and North Legs. The biological opinion identifies the Santiago Creek bridge as an alternative species wildlife crossing and is not included as part of this monitoring requirement.

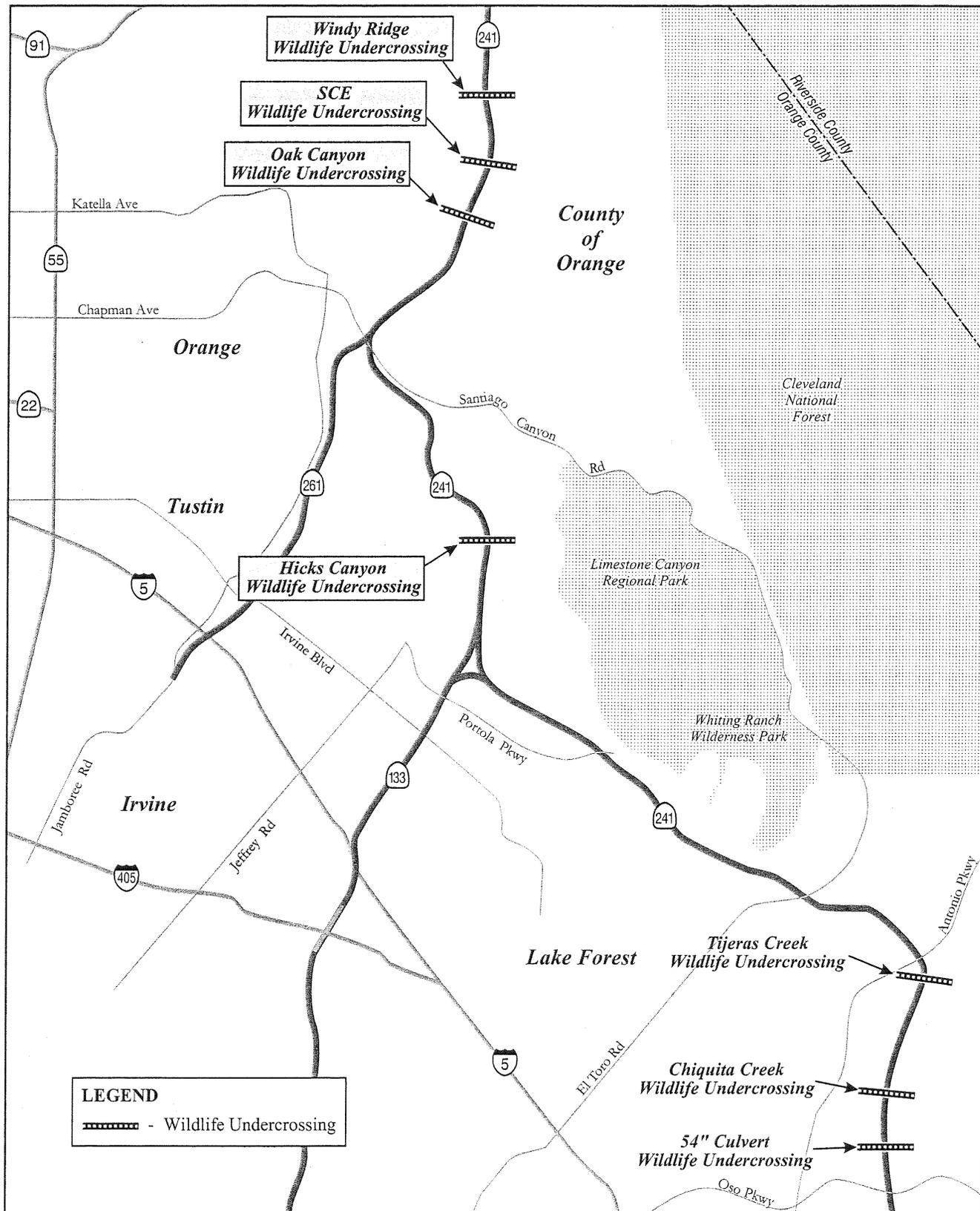
STUDY AREA

The wildlife movement study area includes four wildlife undercrossings along the east and north segments of the ETC stretching from State Route (SR) 133 to SR-91 (Figure 1); the eastern segment stretches from SR-133 to the Orange interchange of SR-241 and SR-261; and the northern segment stretches from the Orange interchange to SR-91. The study area also includes the area surrounding each undercrossing on both sides. The Hicks Canyon Haul Road UC is located in the eastern segment, and Oak Canyon UC, SCE UC, and Windy Ridge UC are located in the northern segment. In general, these wildlife UCs were designed to allow the passage of large to medium wildlife species such as mountain lions, deer, and coyotes.

The Hicks Canyon Haul Road UC is located approximately 1.3 miles north of the SR-133 interchange, and is approximately 20 feet high, 70 feet wide at the bottom, 130 feet wide at the top, and a 600 foot traverse length (Figure 2). This crossing provides for wildlife movement from the Cleveland National Forest through the currently designated Limestone Canyon Wilderness areas and the Lomas Ridge Reserve. Although this crossing provides a long traverse (600 feet), there are three gaps in the bridge structure that allow a significant amount of natural light to penetrate the crossing. The topography is nearly flat, with a two lane asphalt road that crosses the southern portion of the crossing.

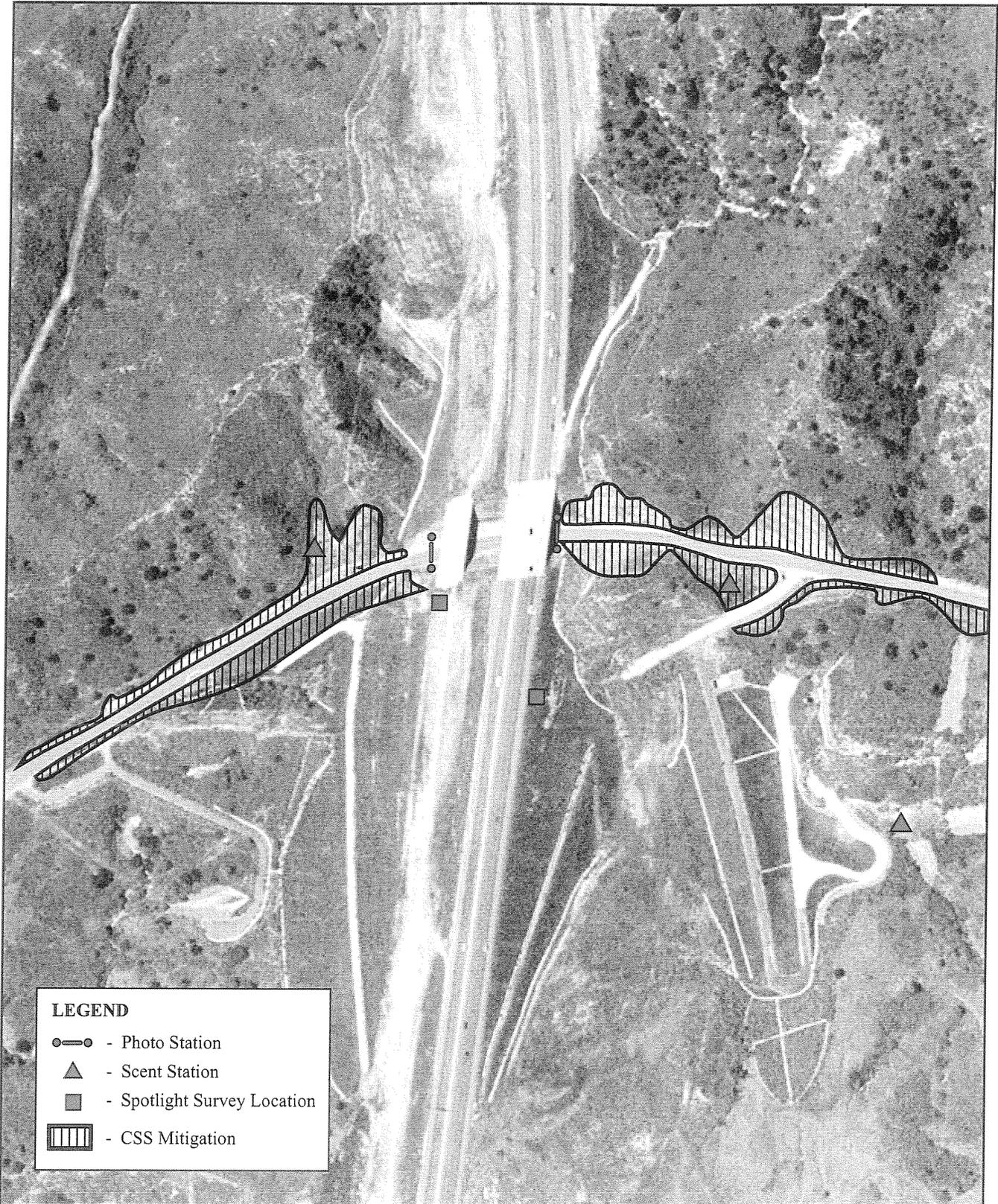
The Oak Canyon UC is located approximately 2.4 miles north of the Orange interchange, and is approximately 50 feet high, 100 feet wide at the bottom, 220 feet wide at the top, and a 250 foot traverse length (Figure 3). This site was considered to provide high potential for movement by both deer and mountain lions, connecting Fremont, Weir, and Blind Canyons. The topography is gentle, opening up to a large, expansive canyon on the west with a dirt road leading over the ridge to the east side.

The SCE UC is located approximately 3.2 miles north of the Orange interchange, and is approximately 29 to 40 feet high, 100 feet wide at the bottom, and 230 feet wide at the top, with a traverse length of 250 feet (Figure 4). This crossing provides linkage between Weir Canyon and Fremont Canyon. This crossing is easily accessed, due to gradual topography and dirt roads on either side.



6/26/01(TCA930)

Figure 1



LEGEND

- - Photo Station
- ▲ - Scent Station
- - Spotlight Survey Location
- ▨ - CSS Mitigation

3/12/02(TCA930)

Figure 2

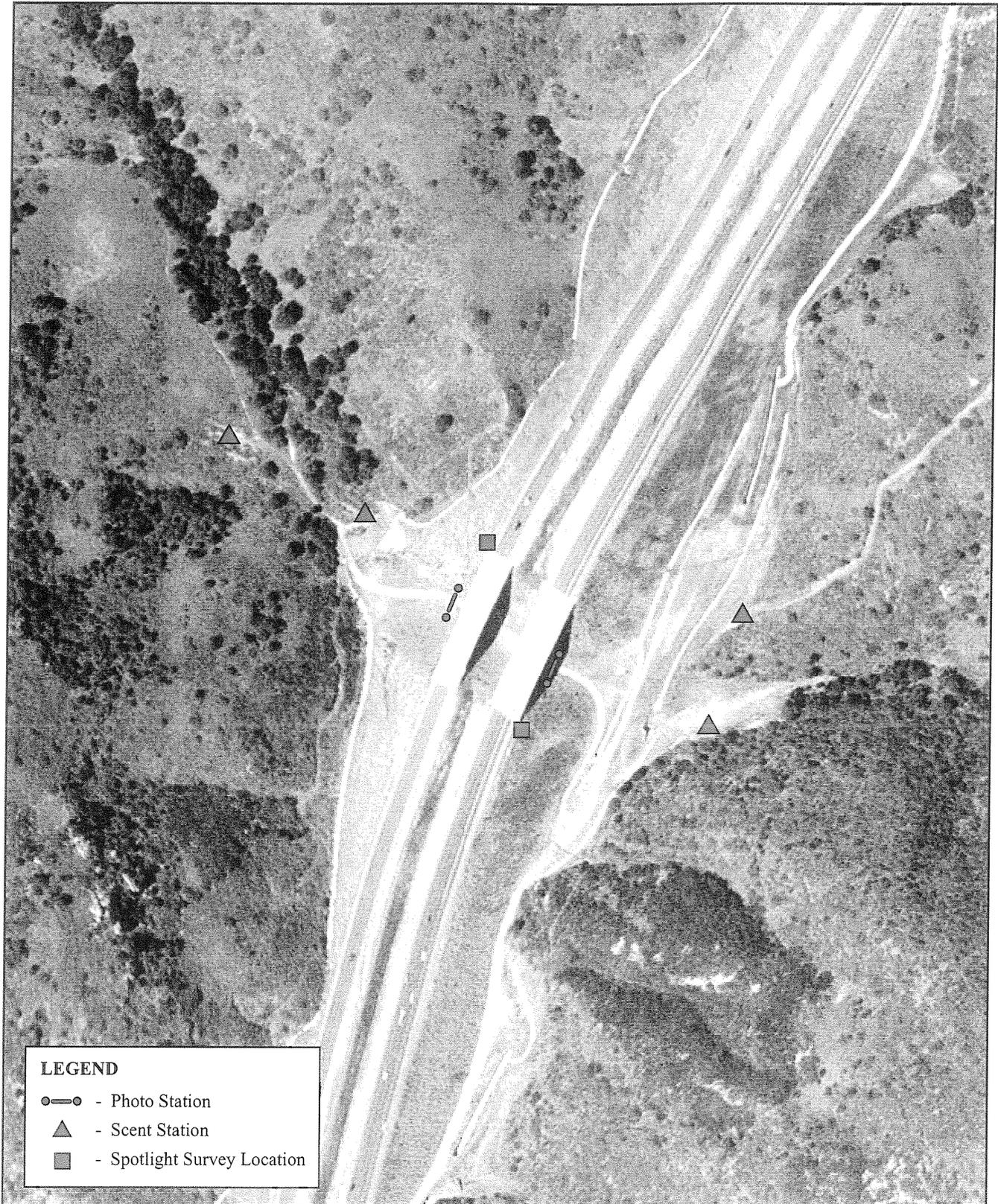


N

LSA

No Scale

Hicks Canyon
Wildlife Undercrossing



3/12/02(TCA930)

Figure 3



LSA

No Scale

Oak Canyon
Wildlife Undercrossing



LEGEND
 ●—● - Photo Station
 ▲ - Scent Station
 ■ - Spotlight Survey Location

3/12/02(TCA930)

Figure 4



LSA

No Scale

SCE
 Wildlife Undercrossing

The Windy Ridge UC is located approximately 4.3 miles north of the Orange interchange, and is approximately 30 feet high, 80 feet wide at the bottom, and 220 feet wide at the top, with a 260 foot traverse length (Figure 5). This crossing was designed to provide major connectivity between Natural Communities Conservation Program (NCCP) open space reserve areas in Weir Canyon and Gypsum Canyon, especially for deer and mountain lions. The topography is steep leading up to the crossing, with a dirt road entering from the east and several animal trails leading up to a steep ridge to the west.

In addition to the basic design, all of the crossings include water guzzlers and salt licks to help attract wildlife to these crossings.

METHODS

In the vicinity of each wildlife undercrossing, the presence and diversity of wildlife were documented using scent stations, spotlight surveys, general scat and track surveys, and direct observations. In addition, photo stations were set up at the UCs to determine direct wildlife use of the undercrossings. Surveys were conducted April 26, 2001, through May 3, 2001, and again on November 14, 2001, through November 22, 2001. During the five year study, the wildlife surveys will be conducted twice a year, in the spring and fall of each year through 2003.

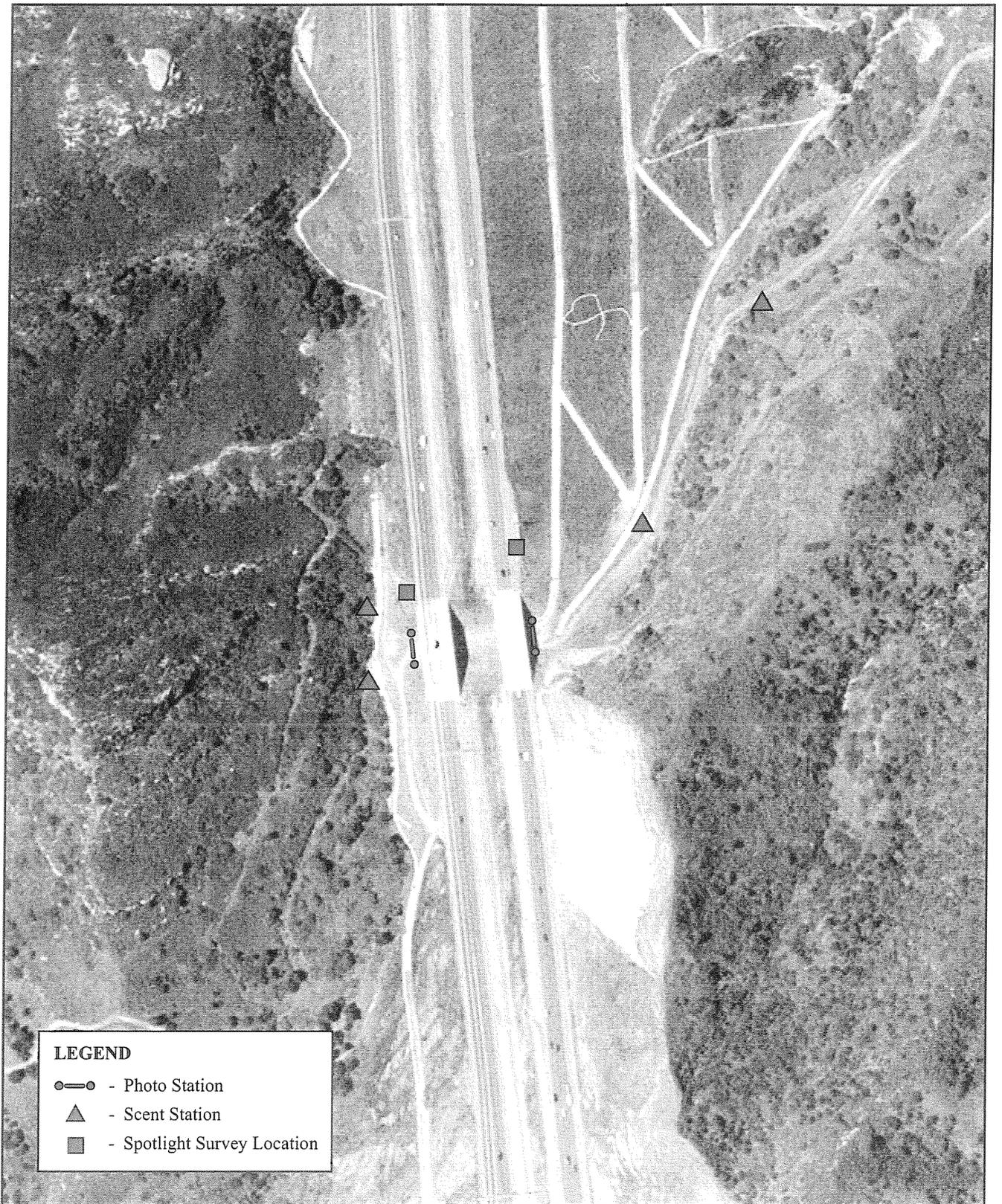
Scent Stations

The purpose of the scent stations is to help determine the species of wildlife in the vicinity of the UCs and the frequency with which they are present. These data will help to get an overall sense of the wildlife population that can then be compared with actual wildlife usage of the undercrossings. Two scent stations were placed at each end of the four UCs, for a total of 16 scent stations, as shown in Figures 2 through 5. An effort to attract carnivores and herbivores separately was made by the use of different baits. The scent stations locations were selected based on the topography, access, presence of game trails, and wildlife sign.

A 1x3 inch by 3 foot wooden stake was placed in the center of each scent station. The vegetation within a three foot radius of the stake was cleared (as necessary) so that it would not interfere with making a clear track impression in the tracking medium. Diatomaceous earth (DE) was spread out within the three foot radius and smoothed to an even finish with a concrete trowel to provide a medium that aided the identification of tracks.

The bait was placed in a 12x12 inch bag constructed of a fine meshed metal screen. The bait was replaced on an as needed basis, as the bait dried or lost its scent. The bait bag was fastened to the stake using bailing wire. The bait targeting herbivores consisted of cut apple, banana, carrot, and peanut butter. The bait targeting carnivores consisted of canned cat food, beef liver, and cut fish.

Each scent station was checked every morning during the survey period, and all clearly identifiable tracks at each station were recorded to genus and species, where possible. Once all tracks were recorded, the DE was smoothed and additional DE was added when necessary. Fresh bait was added to the bait bags as necessary to maintain a strong scent. Also, several automated, motion triggered



LEGEND
 ●—● - Photo Station
 ▲ - Scent Station
 ■ - Spotlight Survey Location

3/12/02(TCA930)

Figure 5


 L S A

No Scale

Windy Ridge
 Wildlife Undercrossing

cameras were placed at the more active scent stations during the fall survey for further documentation of wildlife use.

Automated Photo Stations

Automated photo stations (Trail Master Infrared Trail Monitors) were set up at each end of the wildlife undercrossings, as shown in Figures 2 through 5. Most of the UCs could be covered with one photo station spanning the bottom of the undercrossing on each end; however, the uneven terrain at the SCE UC required two photo stations at each end. Each station consisted of an infrared sensing unit (transmitter and receiver) and a camera with a cord connected to the sensing unit. Since the spans of the crossings are so extensive, a laser was used to aid in aligning the invisible infrared beam on the transmitter units. Both pieces of the sensing unit and the camera were mounted to 1x3 inch by 3 foot wooden stakes, which were positioned to detect movement entering and exiting the UC. In addition, both pieces of the sensing unit were adjusted to a height of approximately 18 inches, to target medium to large mammals (e.g., raccoons, bobcats, deer, mountain lions, etc.). The camera was positioned behind and upslope of the receiver unit, so that both units were in the frame of the camera viewfinder and offset so that the flash did not overexpose the receiver unit in the foreground, diminishing the clarity of the background. Excess cord connecting the receiving unit and the camera was securely fastened to the stakes to prevent disturbance by animals or wind.

Each photo station was checked each morning during the study to ensure that it was functioning properly and that enough film was remaining to record any activity during the following 24 hour period.

Spotlight Survey

Spotlight surveys were conducted adjacent to the bridges overlooking each of the wildlife undercrossings for additional information on animals in the immediate vicinity of each undercrossing. Each side of the bridge was surveyed each night for approximately five minutes. A two million candlepower spotlight was used for the surveys. The surveys were conducted at least one hour following sunset. The survey was conducted by first scanning the area directly below, then away in a sweeping, side to side motion. This sequence was repeated until the time elapsed. The survey time was extended, if additional time was required to identify any animals observed. The genus and/or species of each sighting was recorded. If sighted animals could not be identified due to vegetative cover and the limited range of the spotlight, the approximate location was recorded so that other signs, if any, could be used the following day to identify the sighting.

General Track and Scat Surveys

General surveys for tracks and scat were conducted throughout the study area each morning as the scent stations and photo stations were checked. These surveys consisted of a biologist meandering throughout the study area, locating game trails, and observing tracks and scat. The surveyor was also on the alert for direct observations of wildlife. Since the study area is so extensive and much of the substrate is hard, the tracks were not cleared each day.

RESULTS

The results of the scent station, photo station, and spotlight surveys are summarized in Tables A through F. Wildlife and sign that were observed away from the scent stations, but within the vicinity of the study area, are provided in Table G.

DISCUSSION

The third year's data show that wildlife usage at the UCs are highly variable. A wide variety of animals utilized the UCs, including bobcats, mule deer, coyotes, and a mountain lion (Figure 6). The number of animals recorded during this year's study varied from UC to UC, as well as season to season. For example, the Windy Ridge UC did not have any animals recorded during the two study periods in the 2001 study year and Oak Canyon UC had 22 pictures of animals recorded during the spring, but none during the fall. All of the cameras were checked and none were found to be defective, with the exception of the time and date not being recorded on the pictures. In addition, the data show that a number of animals were recorded on both sides of the undercrossing, while others were only recorded on one side. This may be due to the fact that the cameras use an automatic flash, which may startle the animal and make it too cautious to cross. Although SCE and Oak Canyon UC had the most animals recorded during the spring, few animals used the crossings during the fall. The Hicks Canyon UC appears to be used the most consistently by wildlife throughout the year, even though this crossing has the most vehicular traffic, since it is a major haul road for trucks. Windy Ridge had no wildlife recorded at the photo stations, although it had a large number of animals recorded in the vicinity by the scent stations. Overall, more animals utilized the UCs during the spring than the fall. The mountain lion that was recorded at the Oak Canyon UC had a radio tracking collar. According to Randy Botta of the California Department of Fish and Game, the collar is part of the "Orange County Cooperative Mountain Lion Study," June 1, 1993.

Similar to previous years, the carnivore and herbivore baited scent stations did not appear to be target specific, but animals seem to visit either regardless of the animals' diets. The scent stations recorded a diversity of wildlife, including animals as small as frogs and birds, and as large as coyotes, bobcats, and gray foxes (Figure 7). The number and diversity of wildlife recorded at the scent stations appear to be similar to those recorded during the previous two years. In addition, a dead mule deer was discovered at the SCE UC and appeared to have broken its neck by jumping off of the bridge. Additional cameras were set up surrounding the mule deer, and a bobcat was recorded feeding on the carcass along with a number of turkey vultures and common ravens (Figure 8). The bobcat fed on the carcass daily through the completion of the spring study.

The number of animals recorded by the spotlight survey was greater than the 1999 study, but less than the 2000 study. The spotlight surveys recorded more animals during the fall than in the spring, which is consistent with the results of the other survey methods. Again, this fluctuation in data could be due to natural seasonal variations in behavioral/feeding patterns, and there is likely some annual fluctuation in populations. Although the number of animals recorded during the spotlight survey was relatively low compared to the other data collection methods, the lower numbers are probably due to the relatively short sampling period and the random chance of observing an animal.

**ETC Spring 2001 to Fall 2001 Wildlife Data
Table A - Hicks Canyon Scent Station Data**

Common Name	Hicks Canyon East					
	Carnivore		Herbivore		Guzzler	
	Spring 2001	Fall 2001	Spring 2001	Fall 2001	Spring 2001	Fall 2001
unidentified frog/toad		1	2	1	3	
unidentified lizard						3
unidentified snake					2	
unidentified bird		2	5	1	2	
Audubon's cottontail	6	3	7	6		
mouse	3	5	6	2	2	1
woodrat		1				
coyote				1	1	
mule deer	1					
Total	10	12	20	11	10	4

Common Name	Hicks Canyon West					
	Carnivore		Herbivore		Guzzler	
	Spring 2001	Fall 2001	Spring 2001	Fall 2001	Spring 2001	Fall 2001
unidentified frog/toad	2	2		1		
unidentified lizard	1	1				1
unidentified snake	1					
unidentified bird				2		
greater roadrunner	1					
Audubon's cottontail	4					
mouse	1	2	1	2		
woodrat	1	3				
Total	11	8	1	5	0	1

**ETC Spring 2001 to Fall 2001 Wildlife Data
Table B - Oak Canyon Scent Station Data**

Common Name	Oak Canyon East					
	Carnivore		Herbivore		Guzzler	
	Spring 2001	Fall 2001	Spring 2001	Fall 2001	Spring 2001	Fall 2001
unidentified frog/toad				1	4	2
unidentified lizard				1		1
unidentified snake	1					
unidentified bird		5			6	3
mouse		1	1		6	6
gray fox		1				
coyote	2		2			
bobcat	1	1	1	1		
mule deer						2
Total	4	8	4	3	16	14

Common Name	Oak Canyon West					
	Carnivore		Herbivore		Guzzler	
	Spring 2001	Fall 2001	Spring 2001	Fall 2001	Spring 2001	Fall 2001
unidentified frog/toad					1	
unidentified snake			1			
unidentified lizard						1
unidentified bird	1				3	5
mouse	1		1		1	1
Pacific kangaroo rat					1	
gray fox	2	3	1			
coyote	1		1			
raccoon					1	
opossum		1				
bobcat	2	4	1	2		
Total	7	8	5	2	7	7

**ETC Spring 2001 to Fall 2001 Wildlife Data
Table C - SCE Scent Station Data**

Common Name	SCE East					
	Carnivore		Herbivore		Guzzler	
	Spring 2001	Fall 2001	Spring 2001	Fall 2001	Spring 2001	Fall 2001
unidentified frog/toad					3	
unidentified bird	2				1	
Audubon's cottontail						4
mouse	1				1	2
gray fox		1		1		
raccoon			1			
bobcat		1		1		
mule deer	1					
Total	4	2	1	2	5	6

Common Name	SCE West					
	Carnivore		Herbivore		Guzzler	
	Spring 2001	Fall 2001	Spring 2001	Fall 2001	Spring 2001	Fall 2001
unidentified frog/toad					6	1
unidentified bird	1				1	1
Audubon's cottontail				1		1
Beechey ground squirrel		1				
mouse	2	1	3	2		3
woodrat		1	2	3		
gray fox		1		1		
coyote					1	
bobcat	1	3	1	1		
mule deer						1
Total	4	7	6	8	8	7

ETC Spring 2001 to Fall 2001 Wildlife Data
Table D - Windy Ridge Scent Station Data

Common Name	Windy Ridge East					
	Carnivore		Herbivore		Guzzler	
	Spring 2001	Fall 2001	Spring 2001	Fall 2001	Spring 2001	Fall 2001
unidentified frog/toad	1		1		4	
unidentified bird				1	1	
Audubon's cottontail					1	
Beechey ground squirrel		1	1			
mouse		1	3	2	2	4
woodrat			1			
gray fox	1		1	1		
raccoon			1		1	
spotted skunk		1	4			
mule deer	1					
bobcat	2			3		
Total	5	3	12	7	9	4

Common Name	Windy Ridge West					
	Carnivore		Herbivore		Guzzler	
	Spring 2001	Fall 2001	Spring 2001	Fall 2001	Spring 2001	Fall 2001
unidentified frog/toad					1	2
unidentified snake	1					
unidentified bird	1		1	1		1
Audubon's cottontail				4		
Beechey ground squirrel				1		
mouse		1	1	2		1
coyote	2	1				
raccoon	1					
spotted skunk	1		2			
bobcat		1		3	1	
mule deer						2
Total	6	3	4	11	2	6

**Table E - Spot Light Survey Data
ETC Spring 2001 to Fall 2001 Wildlife Data**

Spring 2001	Hicks Canyon		Oak Canyon		SCE UC		Windy Ridge	
	East	West	East	West	East	West	East	West
great horned owl		2						
mouse		1						
mule deer		2		1		4		
unidentified animal								1
Total	0	5	0	0	1	4	0	1

Fall 2001	Hicks Canyon		Oak Canyon		SCE UC		Windy Ridge	
	East	West	East	West	East	West	East	West
unidentified frog/toad						1		3
great horned owl		1						
mouse		1						
coyote		2						
mule deer					1			
unidentified animal						6		3
Total	0	4	0	0	1	7	0	6

Table F-Photo Station Data
ETC Wildlife Monitoring Spring to Fall 2001

Hicks Canyon Undercrossing			
Date	Time	East End	West End
4/27/01	22:25		coyote
4/30/01	01:10		mule deer
4/30/01	05:27		mule deer
4/30/01	18:28		mule deer
4/30/01	18:36	mule deer	
4/30/01	22:04		mule deer
5/1/01	03:59	coyote	
5/2/01	05:01		coyote

Hicks Canyon Undercrossing			
Date	Time	East End	West End
11/14/01	10:42		coyote
11/15/01	15:52		mule deer
11/15/01	17:12		unidentified
11/15/01	23:15		coyote
11/15/01	03:17		2 coyotes
11/15/01	07:44		mule deer
11/15/01	07:44	mule deer	
11/16/01	2:00		coyote
11/16/01		mule deer	
11/17/01	3:12		coyote
11/17/01		coyote	
11/19/01	10:08		mule deer
11/19/01	04:53		coyote
11/19/01	17:14	mule deer	
11/19/01		mule deer	
11/20/01		coyote	

Oak Canyon Undercrossing			
Date	Time	East End	West End
4/29/01	03:15		mule deer
4/29/01	03:46		mule deer
4/29/01	03:54	mule deer	
4/29/01	04:19		mule deer
4/29/01	06:00	mule deer	
4/29/01	06:04		2 mule deer
4/29/01	06:34	mountain lion	
4/29/01	06:37		mountain lion
4/29/01	17:59		mule deer
4/29/01	17:59	mule deer	
4/30/01	03:21	mule deer	
4/30/01	07:36	common raven	
4/30/01	08:22		mule deer
5/2/01	08:52		mule deer
5/2/01	08:54		mule deer
5/2/01	09:30	mule deer	
5/2/01	09:31		mule deer
5/2/01	13:42	mule deer	
5/2/01	13:43		mule deer
5/2/01	20:02	mule deer	
5/2/01	20:05		mule deer

Oak Canyon Undercrossing			
Date	Time	East End	West End

Windy Ridge Undercrossing

Date	Time	East End	West End
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Windy Ridge Undercrossing

Date	Time	East End	West End
------	------	----------	----------

SCE Undercrossing

Date	Time	East End	West End
4/29/01	07:28	mule deer	
4/29/01	08:33	mule deer	
4/29/01	08:42	mule deer	
4/30/01	16:04		rough-winged swallow
5/1/01	06:35	turkey vulture	
5/1/01	13:52		bobcat
5/1/01	14:43		bobcat
5/1/01	16:05		bobcat
5/1/01	17:06		bobcat
5/1/01	18:55		bobcat
5/2/01	02:50		bobcat
5/2/01	03:51		bobcat
5/2/01	13:02		rough-winged swallow
5/2/01	14:21		rough-winged swallow
5/2/01	18:11		bobcat
5/2/01	19:39		bobcat
5/3/01	02:12	coyote	
5/3/01	05:34		bobcat
5/3/01	06:06		bobcat
5/3/01	09:06		mule deer
5/3/01	09:07	mule deer	
5/3/01	11:42		turkey vulture

SCE Undercrossing

Date	Time	East End	West End
11/1/01		coyote	

Table G - ETC Spring 2001 to Fall 2001 General Wildlife and Wildlife Sign Observations

Scientific Name	Common Name	Undercrossings			
		Hicks Canyon	Oak Canyon	SCE	Windy
<i>Sylvilagus audubonii</i>	Audubon's cottontail	D/O, S	D/O, S	D/O, S	D/O, S
<i>Neotoma</i> sp.	woodrat	S	S	S	S
<i>Felis rufus</i>	bobcat	T	T	T	T
<i>Canis latrans</i>	coyote	T, S	T, S	T, S	T, S
<i>Odocoileus hemionus</i>	mule deer	T, S	D/O, T, S	D/O, T, S	D/O, T, S

D/O - Direct Observation

T - Tracks

S - Scat

SC - Scent

Other wildlife species observed in the area***Lepidoptera*****Butterflies*****Nymphalidae*****Brush-footed Butterflies***Coenonympha californica*

California ringlet

Lycaenidae**Metalmarks, Hairstreaks, Coppers, and Blues***Apodemia mormo*

Behr's metalmark

Callophrys perplexa

perplexing hairstreak

Glaucopsyche lygdamus

southern blue

Precis coenia

buckeye

Reptilia**Reptiles*****Iguanidae*****Iguanids***Sceloporus occidentalis*

western fence lizard

Uta stansburiana

side-blotched lizard

Anguinae**Alligator Lizards***Gerrhonotus multicarinatus*

southern alligator lizard

Aves**Birds*****Cathartidae*****New World Vultures***Cathartes aura*

turkey vulture

Accipitridae**Kites, Hawks, Eagles, and Ospreys***Buteo jamaicensis*

red-tailed hawk

Odontophoridae**New World Quail***Callipepla californica*

California quail

Columbidae**Pigeons and Doves***Zenaida macroura*

mourning dove

Cuculidae

Geococcyx californianus

Trochilidae

Archilochus alexandri

Calypte anna

Tyrant Flycatchers

Sayornis nigricans

Tyrannus verticalis

Corvidae

Aphelocoma californica

Corvus corax

Hirundinidae

Petrochelidon pyrrhonota

Aegithalidae

Psaltriparus minimus

Troglodytidae

Troglodytes aedon

Mimidae

Mimus polyglottos

Emberizidae

Pipilo maculatus

Pipilo crissalis

Zonotrichia leucophrys

Aimophila ruficeps

Melospiza melodia

Icteridae

Sturnella neglecta

Fringillidae

Carpodacus mexicanus

Carduelis psaltria

Cuckoos and Roadrunners

greater roadrunner

Hummingbirds

black-chinned hummingbird

Anna's hummingbird

Tyrannidae

black phoebe

western kingbird

Jays, Magpies, and Crows

western scrub-jay

common raven

Swallows

cliff swallow

Bushtits

bushtit

Wren

house wren

Mimic Thrushes

northern mockingbird

New World Sparrows

spotted towhee

California towhee

white-crowned sparrow

rufous-crowned sparrow

song sparrow

American orioles

western meadowlark

Fringillid Finches

house finch

lesser goldfinch



Mountain lion with a radio collar traversing the Oak UC (4/29/01)



Coyote cautiously crossing through the SCE right-of-way (11/20/01)

LSA

FIGURE 6

ETC Wildlife Monitoring
Site Photos



Gray fox visiting the carnivore scent station at Oak Canyon. (11/19/01)



Opossum investigating the carnivore scent station at Oak Canyon. (11/19/01)

LSA

FIGURE 7

ETC Wildlife Monitoring
Site Photos



Bobcat walking along the SCE maintenance easement at the SCE UC from the west. (5/1/01)



Bobcat feeding on the mule deer carcass that was found dead in the SCE UC. (5/2/01)

LSA

FIGURE 8

ETC Wildlife Monitoring
Site Photos

There are wildlife guzzlers (catch basin/watering devices) and salt licks at each side of the UCs, with the exception of the west side of Hicks Canyon. The guzzlers contained water in the spring and were dry or nearly dry in the fall. The most frequent users of the guzzlers were birds, small rodents, and frogs, but occasionally medium to larger animals, such as coyotes, foxes, and mule deer, would visit the guzzlers. These data are probably heavily dependent on the amount of rain received and the amount of water available from other sources in the area.

CONCLUSIONS AND RECOMMENDATIONS

The data collected in the third year of the study have shown that a wide variety of medium to large mammals do, in fact, use the wildlife UCs, even the seldom seen mountain lion. The number of animals recorded by the photo stations and the spotlight survey increased from the previous years, while the number of animals recorded by the scent stations decreased slightly. The propensity for animals to directly traverse the UCs seems to have increased through the last three years of study, and the overall number of animals seems to have increased, as well. Further study will be required to distinguish trends related to increased wildlife usage, which may be attributed to increasing vegetative cover, decreasing construction activity, and continued acclimation to the UC structures themselves.

WILDLIFE UNDERCROSSING
MONITORING REPORT - 2002

EASTERN TRANSPORTATION CORRIDOR
ORANGE COUNTY, CALIFORNIA

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LSA

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EXECUTIVE SUMMARY

LSA Associates, Inc. (LSA) concluded its fourth year of a five-year study documenting the use of six (formerly four) wildlife undercrossings (UCs) along the Eastern Transportation Corridor (ETC). Those crossings include Hicks Canyon Haul Road UC, Oak Canyon UC, Southern California Edison (SCE) UC, Windy Ridge UC, and two additional areas included in the study for the first time in 2002, the Santiago Creek tributary and Handy Creek culverts. These two additional locations were included in the study at the request of the Transportation Corridor Agencies (TCA). A variety of techniques was used to document wildlife usage, including general track and scat surveys, baited scent stations, photo stations, and spotlight surveys. The scent stations, spotlight surveys, and track and scat survey documented wildlife in the vicinity of the crossing, and the photo stations document wildlife that actually use the crossings. The study was conducted May 7–13, 2002, and again November 19–26, 2002.

Although seasonal differences were slightly more pronounced this year at several of the UCs, the results of the fourth-year study indicate that the wildlife UCs continue to be used by medium to large mammals, including mule deer, coyote, and bobcat (Figures 8 and 9). For the first three years of the study, there has typically been less wildlife photographed at UCs and reported at scent stations and via general observations during the fall study than during the spring. This year, that disparity was more evident. During the spring 2002 study, the amount of wildlife photographed at some of the UCs increased slightly when compared to previous years; however, the decrease in wildlife documented at UCs during the fall 2002 study was more notable than had been documented in previous years, with some UCs yielding no photographs of target species. In addition to a reduction of wildlife occurrences at UCs, there was also less data collected at scent stations in the fall. The drop off in occurrences of wildlife detected during the fall may be a result of several days of high winds and low rainfall leading up to that study period.

Results at the individual UCs were varied when considering the types of wildlife and overall traffic during the 2002 study. As in previous years, mule deer and coyote were detected in similar patterns during the spring and fall study at Hicks Canyon Haul Road UC. Mule deer was the predominant wildlife species photographed at the Windy Ridge and Southern California Edison (SCE) UCs, where there was an increase in overall visits during the spring of 2002 compared to previous years' studies. During the fall 2002 study, no wildlife usage was recorded at the Oak Canyon UC or Windy Ridge UC, and only one animal was photographed using the SCE UC. For the first time since the study began, mountain lion were not detected in any of the six corridors, at scent stations, or via general observations of field personnel.

The Santiago Creek tributary and Handy Creek culverts were included in the survey for the first time during 2002. Mule deer, coyote, bobcat, and grey fox were documented via scent station data in the area of both culverts, yet there were few definitive instances of wildlife using the culverts during either the spring or fall study. Bobcat were photographed near the entrance of the culverts, but none were documented traversing the length of the culvert. The constrictive size and overall length of the culverts may prevent some larger wildlife from using these locations as crossings; however, more studies would be required for a more conclusive analysis.

INTRODUCTION

This is the fourth annual report of a five-year study of wildlife movement conducted by LSA Associates, Inc. (LSA) at six (formerly four) wildlife UCs along the Eastern Transportation Corridor (ETC) (Figure 1), which opened in October 1998. The wildlife undercrossings (UC) include Hicks Canyon Haul Road UC, Oak Canyon UC, Southern California Edison (SCE) UC, Windy Ridge UC, and newly added Handy Creek culvert and Santiago Creek tributary culvert. This study of the original four crossings is funded by the Transportation Corridor Agencies (TCA), as required in the Section 7 Biological Opinion on the ETC, Orange County (No. 1-6-94-F-17) East and North Legs. The Biological Opinion identifies the Santiago Creek bridge as an alternative species wildlife crossing but is not included as part of this monitoring. The study of the Santiago Creek tributary and Handy Creek culverts is funded by the TCA and is not required as part of the Biological Opinion. These two culverts were included for the first time during spring 2002 study.

STUDY AREA

The wildlife movement study area includes the four wildlife undercrossings that were part of the original study, located along the east and north segments of the ETC stretching from State Route (SR) 133 to SR-91 (Figure 1); the eastern segment stretches from SR-133 to the Orange interchange of SR-241 and SR-261; and the northern segment stretches from the Orange interchange to SR-91. The study area also includes the area surrounding each undercrossing on both sides. The Hicks Canyon Haul Road UC is located in the eastern segment, and Oak Canyon UC, SCE UC, and Windy Ridge UC are located in the northern segment. In general, these wildlife UCs were designed to allow the passage of large to medium wildlife species such as mountain lions, deer, and coyotes. The two areas introduced as a part of the 2002 study include the Santiago Creek tributary culvert, located just north of the Orange interchange, along SR-241; and the Handy Creek culvert, located south of the Orange interchange, on SR-261.

The Hicks Canyon Haul Road UC is located 1.3 miles north of the SR-133 interchange and is approximately 20 feet high, 70 feet wide at the bottom, 130 feet wide at the top, and has a 600-foot traverse length (Figure 2). This crossing provides for wildlife movement from the Cleveland National Forest through the currently designated Limestone Canyon Wilderness areas and the Lomas Ridge Reserve. Although this crossing provides a long traverse (600 feet), there are three gaps in the bridge structure that allow a significant amount of natural light to penetrate the crossing. The topography is nearly flat, with a two-lane asphalt road that crosses the southern portion of the crossing.

The Oak Canyon UC is located 2.4 miles north of the Orange interchange and is 50 feet high, 100 feet wide at the bottom, 220 feet wide at the top, and has a 250-foot traverse length (Figure 3). This site was considered to provide high potential for movement by both deer and mountain lions, connecting Fremont, Weir, and Blind Canyons. The topography is gentle, opening up to a large, expansive canyon on the west with a dirt road leading over the ridge to the east side.

The SCE UC is located approximately 3.2 miles north of the Orange interchange and is 29 to 40 feet high, 100 feet wide at the bottom, and 230 feet wide at the top, with a traverse length of 250 feet

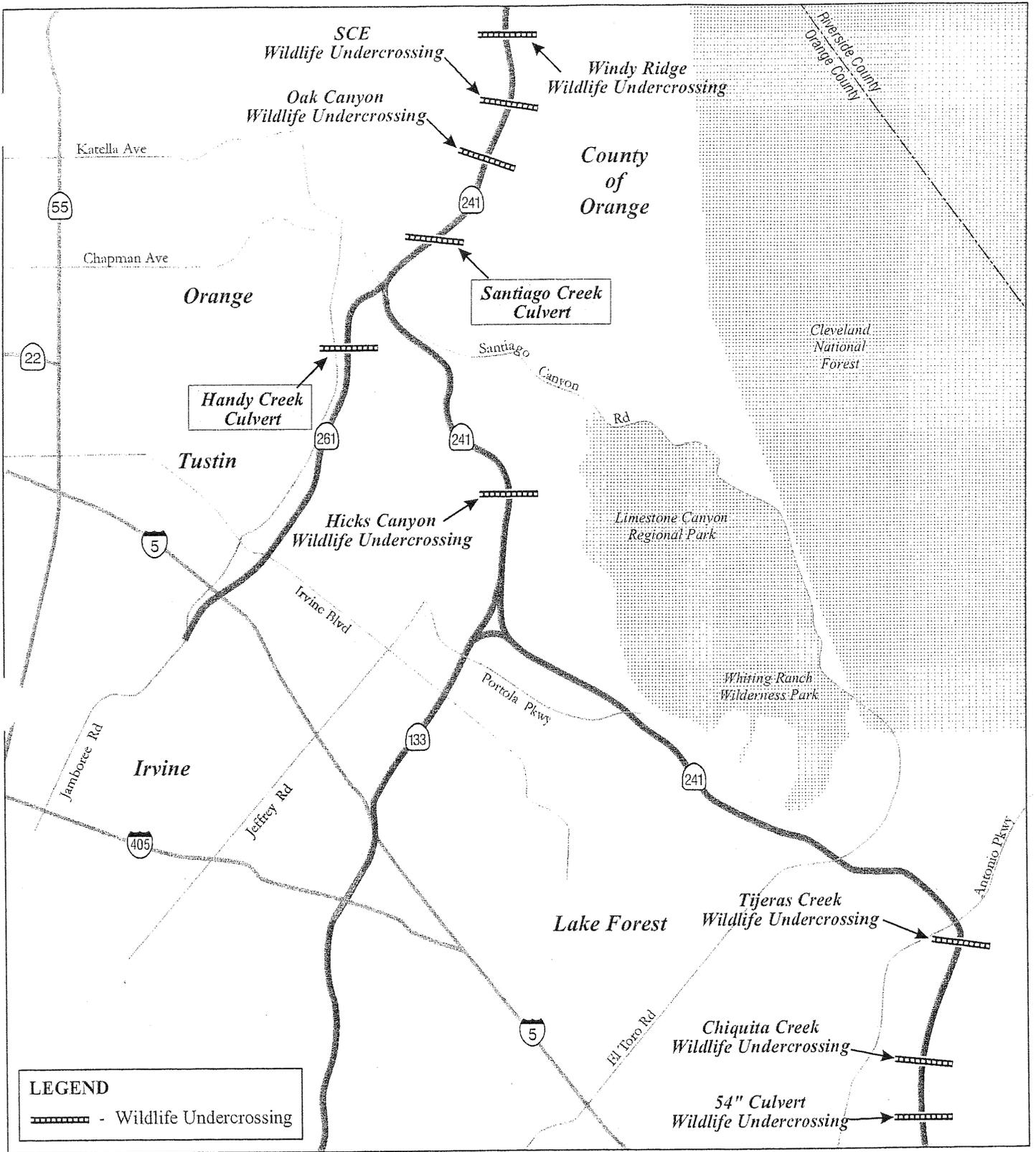


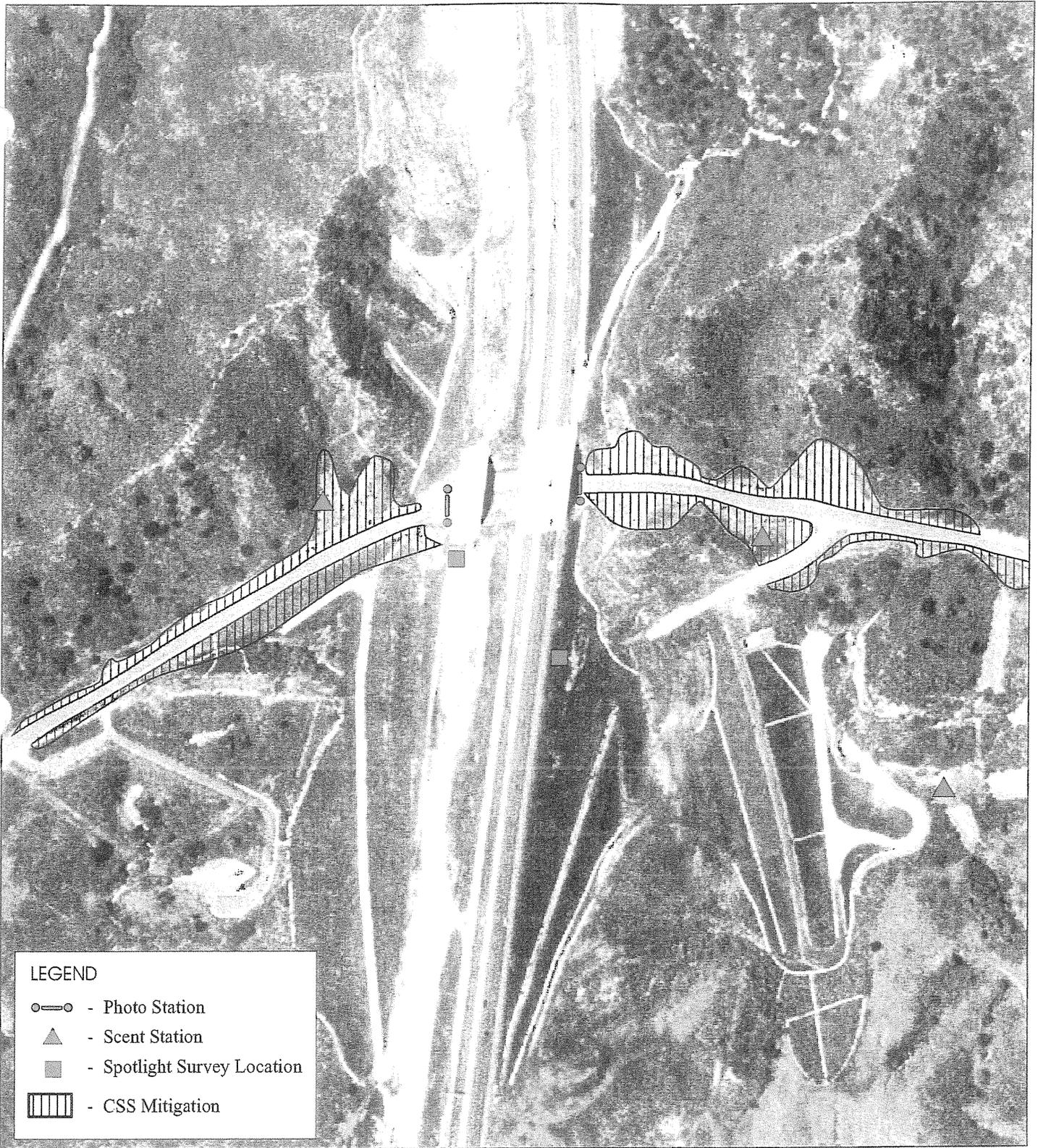
FIGURE 1

LSA



NO SCALE

ETC Wildlife Study
 Wildlife Crossing Locations



LEGEND

- - Photo Station
- ▲ - Scent Station
- - Spotlight Survey Location
- ▨ - CSS Mitigation

FIGURE 2

LSA



TO SCALE

Source: Eagle Aerial, 2002

I:\TCA930\G\Hicks.cdr (12/17/03)

ETC Wildlife Study
 Aerial Layout
 Hicks Canyon



FIGURE 3

LEGEND

- - Photo Station
- ▲ - Scent Station
- - Spotlight Survey Location

LSA



NO SCALE

Source: Eagle Aerial, 2002

L:\TCA930\G\Oak.cdr (1/19/04)

ETC Wildlife Study
 Aerial Layout
 Oak Canyon

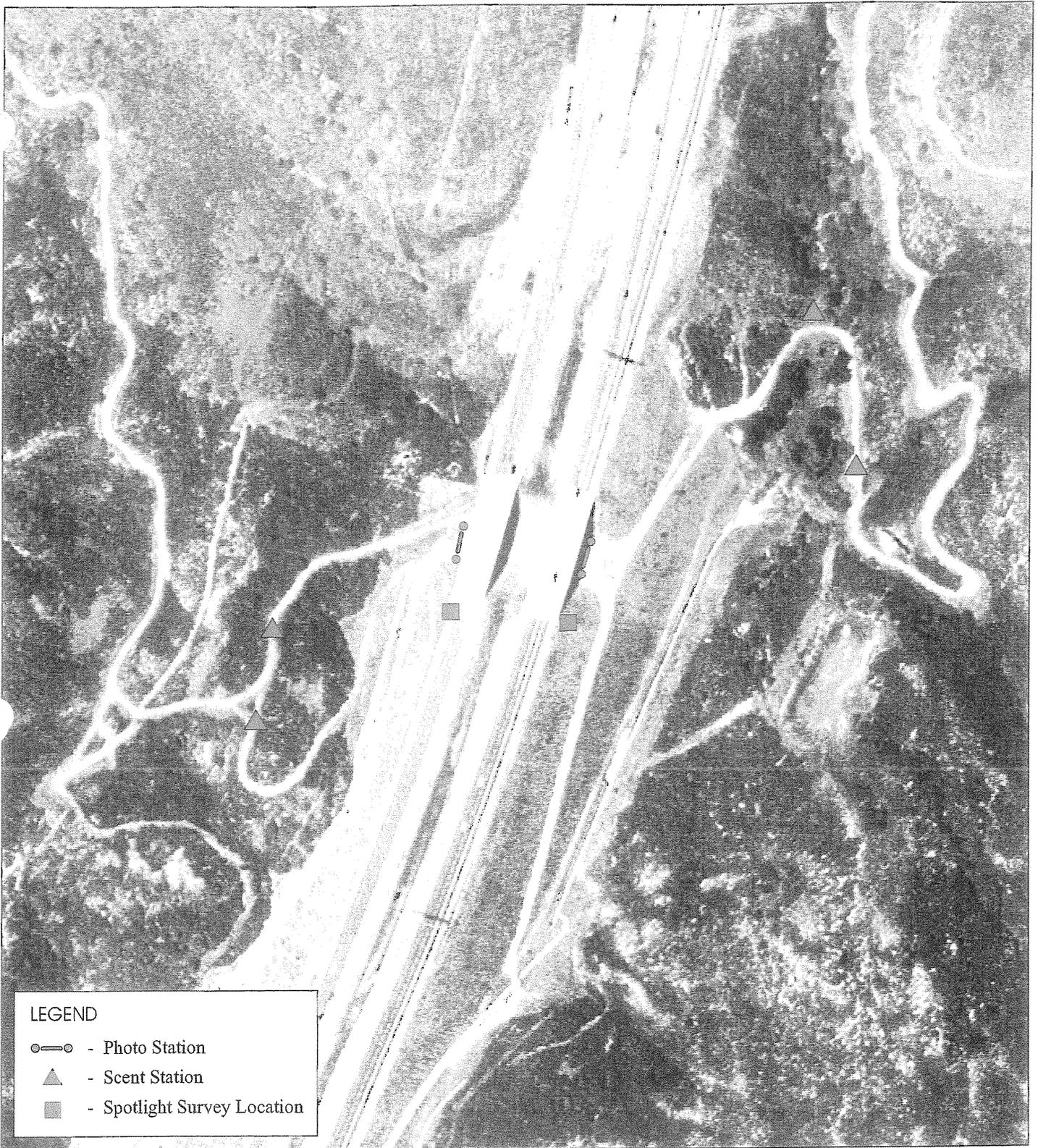


FIGURE 4

LSA



1:50,000 SCALE

Source: Eagle Aerial, 2002

I:\TCA930\G\SCE.cdr (12/17/03)

ETC Wildlife Study
Aerial Layout
SCE

(Figure 4). This crossing provides linkage between Weir and Fremont Canyons. This crossing is easily accessed due to gradual topography and dirt roads on either side.

The Windy Ridge UC is located 4.3 miles north of the Orange interchange and is 30 feet high, 80 feet wide at the bottom, and 220 feet wide at the top, with a 260-foot traverse length (Figure 5). This crossing was designed to provide major connectivity between Natural Communities Conservation Program (NCCP) open space reserve areas in Weir and Gypsum Canyons, especially for deer and mountain lions. The topography is steep leading up to the crossing, with a dirt road entering from the east and several animal trails leading up to a steep ridge to the west.

The Santiago Creek tributary culvert is located approximately 1.5 miles north of the Orange interchange, and is approximately 72 inches in diameter, with an approximate 720 foot traverse length (Figure 6).

The Handy Creek culvert is located 1.5 miles south of the Orange interchange, west of Jamboree Road, and is 72 inches in diameter, with a 720-foot traverse length (Figure 7).

In addition to the basic design, all the four major crossings described above (Hick's, Oak, SCE, & Windy) include a water guzzler and salt licks to attract wildlife.

METHODS

In the vicinity of each wildlife undercrossing, the presence and diversity of wildlife were documented using scent stations, spotlight surveys, general scat and track surveys, and direct observations. In addition, photo stations were set up at the UCs to determine direct wildlife use of the undercrossings. Surveys were conducted May 7–13, 2002, and again November 19–26, 2002. During the five-year study, the wildlife surveys will be conducted twice a year, in the spring and fall of each year through 2003.

Scent Stations

The purpose of the scent stations is to help determine the species of wildlife in the vicinity of the UCs and the frequency with which they are present. These data will help to get an overall sense of the wildlife population that can then be compared with actual wildlife usage of the undercrossings. Two scent stations were placed at each end of the six UCs, for a total of 24 scent stations, as shown in Figures 2–7. An effort to attract carnivores and herbivores separately was made by the use of different baits. The scent station locations were selected based on the topography, access, presence of game trails, and wildlife sign.

A 1"x3"x3' stake was placed in the center of each scent station. The vegetation within a three-foot radius of the stake was cleared (as necessary) so that it would not interfere with making a clear track impression within the tracking medium. Diatomaceous earth (DE) was spread out within the three-foot radius and smoothed to an even finish with a concrete trowel to provide a medium that aided the identification of tracks.

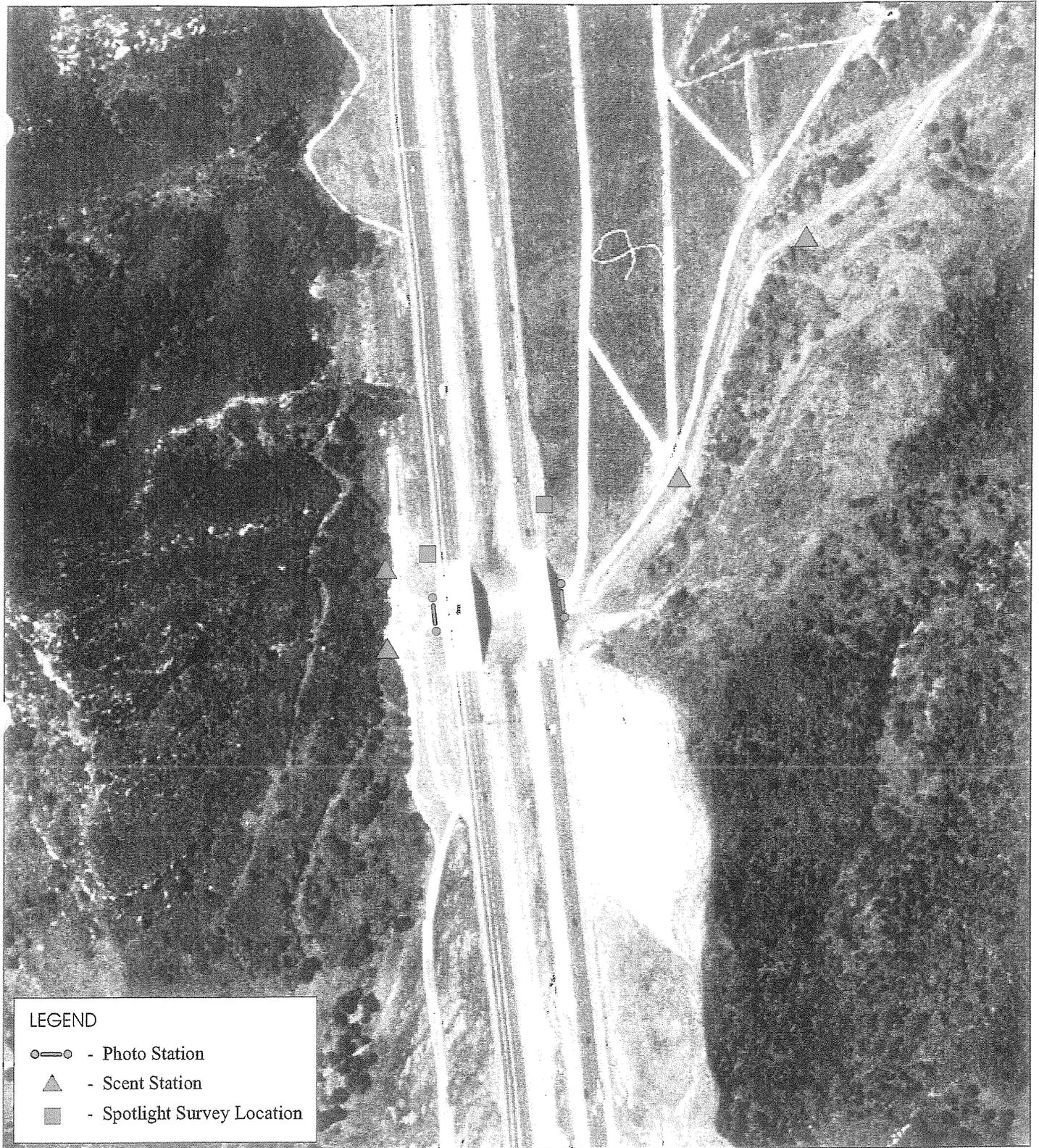


FIGURE 5

LSA



NO SCALE

Source: Eagle Aerial, 2002

LTCA930\G\Windy.cdr (1/19/04)

ETC Wildlife Study
 Aerial Layout
 Windy Ridge



LEGEND

○—○ - Photo Station

▲ - Scent Station

LSA



10 SCALE

Source: EagleAerial, 2002

LAACA930\G\Santiago Clvrt.cdr (12/16/03)

FIGURE 6

ETC Wildlife Study
 Aerial Layout
 Santiago Creek Culvert

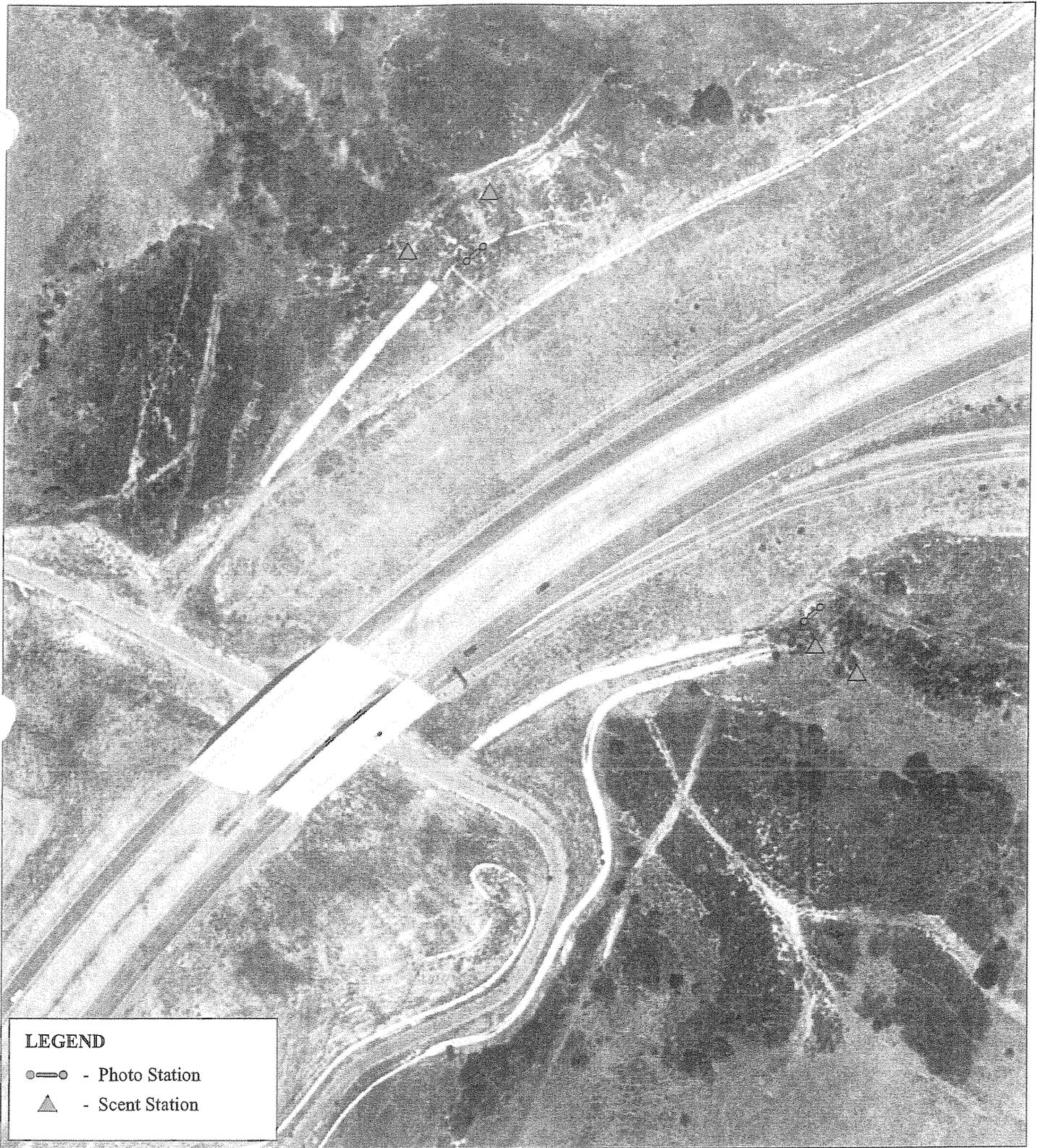


FIGURE 7

LSA



0 SCALE

Source: Eagle Aerial, 2002

I:\TCA930\G\Handy Clvrt.cdr (12/16/03)

ETC Wildlife Study
 Aerial Layout
 Handy Creek Culvert

The bait was placed in a 12"x12" bag constructed of a fine meshed metal screen. The bait was replaced on an as-needed basis, as the bait dried or lost its scent. The bait bag was fastened to the stake using bailing wire. The bait targeting herbivores consisted of cut apple, banana, and carrot. The bait targeting carnivores consisted of canned chicken and seafood flavored cat food, cow liver, and chicken and beef hearts. Each scent station was checked every morning during the survey period, and all clearly identifiable tracks at each station were recorded to genus and species, where possible. Once all tracks were recorded, the DE was smoothed and DE was added when necessary. Fresh bait was added to the bait bags as necessary to maintain a strong scent. Also, several automated, motion-triggered cameras were placed at the more active scent stations during the survey for further documentation of wildlife use.

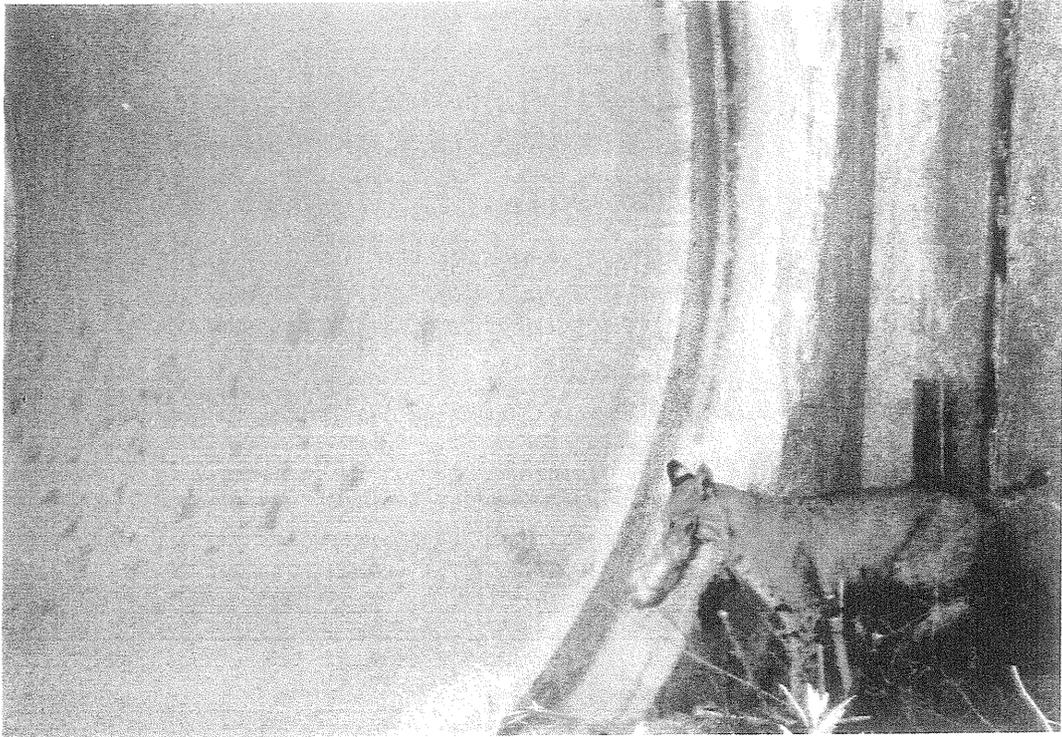
Automated Photo Stations

Automated photo stations (Trail Master Infrared Trail Monitors) were set up at each end of the wildlife undercrossings, as shown in Figures 2–7. Most of the UCs could be covered with one photo station spanning the bottom of the undercrossing on each end; however, the uneven terrain at the SCE UC required two photo stations at each end. Each station consisted of an infrared sensing unit (transmitter and receiver) and a camera with a cord connected to the sensing unit. Since the spans of the crossings are so extensive, a laser was used to aid in aligning the invisible infrared beam on the transmitter units. Both pieces of the sensing unit and the camera were mounted to 1"x3"x3' wooden stakes, which were positioned to detect movement entering and exiting the UC. In addition, both pieces of the sensing unit were adjusted to a height of 18 inches, to target medium to large mammals (e.g., fox, bobcats, deer, mountain lions). The camera was positioned behind and upslope of the receiver unit, so that both units were in the frame of the camera viewfinder and offset so that the flash did not overexpose the receiver unit in the foreground, diminishing the clarity of the background. Excess cord connecting the receiving unit and the camera was securely fastened to the stakes to prevent disturbance by animals or wind.

Each photo station was checked each morning during the study to ensure that it was functioning properly and that enough film remained to record any activity during the following 24-hour period.

Spotlight Survey

Spotlight surveys were conducted adjacent to the bridges overlooking each of the wildlife undercrossings. Although they offered a relatively short time frame for observance of wildlife, they were conducted so as to provide another method for collecting information on animals in the immediate vicinity of each undercrossing. Each side of the bridge was surveyed each night for approximately five minutes. A two million candlepower spotlight was used for the surveys. The surveys were conducted at least one hour following sunset. The survey was conducted by first scanning the area directly below, then away in a sweeping, side-to-side motion. This sequence was repeated until the time elapsed. The survey time was extended if additional time was required to identify any animals observed. The genus and/or species of each sighting was recorded. If sighted animals could not be identified due to vegetative cover and the limited range of the spotlight, the approximate location was recorded so that other signs, if any, could be used the following day to identify the sighting.



Bobcat with prey entering the east end of the Handy Creek culvert. (5/14/02)

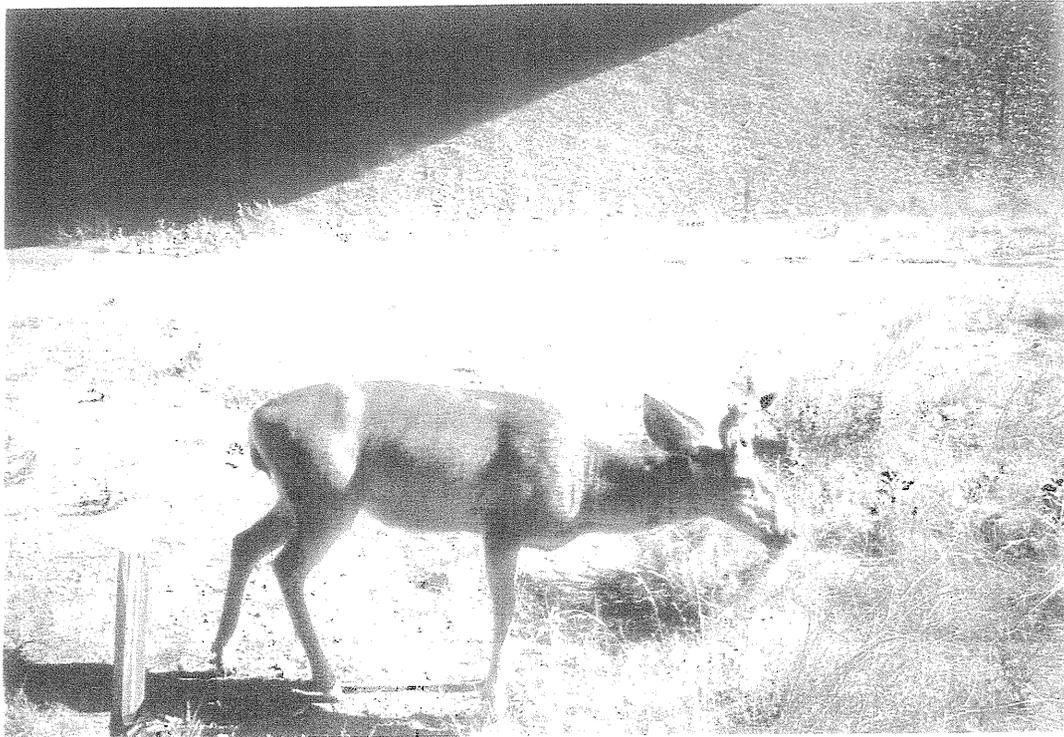


A bobcat triggers the camera on the western side of the Santiago Creek culvert. (11/24/02)

LSA

FIGURE 8

ETC Wildlife Study
Wildlife Monitoring Photos



A mule deer triggers the camera on the western side of the SCE undercrossing. (5/10/02)



A coyote inspects a scent station located on the western side of the Windy undercrossing. (5/13/02)

LSA

FIGURE 9

ETC Wildlife Study
Wildlife Monitoring Photos

General Track and Scat Surveys

General surveys for tracks and scat were conducted throughout the study area each morning as the scent stations and photo stations were checked. These surveys consisted of a biologist meandering throughout the study area, locating game trails, and observing tracks and scat. The surveyor was also on the alert for direct observations of wildlife. Since the study area is so extensive and much of the substrate is hard, the tracks were not cleared each day.

RESULTS

The results of the scent station, photo station, and spotlight surveys are summarized in Tables A–H. Wildlife and sign that were observed away from the scent stations but within the vicinity of the study area are provided in Table I.

DISCUSSION

Data collected during the spring 2002 study at the four original UCs indicated that a variety of wildlife continue to use the UCs, including mule deer, coyote, and bobcat. Throughout the past three years of the study, there has typically been more wildlife recorded through all methods during the spring than in the fall. The data collected during the 2002 study was slightly more seasonally variable than had been documented in previous years, and during the fall there were few photographs of target species at several of the UCs. The diversity and frequency of wildlife recorded at the Hicks Canyon Haul Road UC during the spring and fall 2002 study was similar to what had been documented in the past two years studies at that location. Both the Windy Ridge and SCE UCs recorded more wildlife using the UCs during the spring 2002 study than in any of the previous years at those crossings; however, the wildlife detected at the Oak Canyon, Windy Ridge, and SCE UCs was on average less than in the previous three years of studies, with only one photograph of wildlife among all UCs.

When comparing the scent station data from spring to fall 2002, there was on average a 50 percent decrease in occurrences of wildlife recorded during the fall at scent stations. The scent station data, spotlight survey, and general observations have been used in the previous years' studies as an indication of what wildlife is in the general vicinity of the corridors and thus would potentially use the UCs. The relative absence of wildlife documented via scent station and general observation surveys during the fall 2002 study could be due in part to the relatively low rainfall the region received leading up to the study period. With reduced water resources, wildlife may have potentially migrated out of the area, or may have remained in the area, but have reduced their range in order to stay close to known consistent water supplies. Unusually high wind gusts in excess of 50 mph were also documented during the fall study and may have been a contributing factor in reduced animal movement. Overall, the reduced activity of wildlife in the general vicinity could potentially lead to the decrease in wildlife documented using the UCs.

The Santiago Creek tributary and Handy Creek culverts were included in the survey for the first time during 2002 and there were few instances of wildlife utilizing them during both the spring and fall studies. Although mule deer were determined to be in the area via scent station data and general

observations, wildlife observed in proximity to these crossings was limited to coyote and bobcat. Large animals such as mule deer are unlikely to use crossings like the ones found at Handy Creek and the Santiago Creek tributary due to the relatively small size and overall length of the culvert.

Mountain lion had been recorded in previous years utilizing the Oak Canyon and SCE UCs; yet this year they were not detected in any of the six corridors, at scent stations, or via general observations of field personnel.

Similar to previous years, the carnivore and herbivore baited scent stations did not appear to be target specific, but animals seem to visit either regardless of whether they are a carnivore or herbivore. The scent stations recorded a diversity of wildlife, including toad, birds, grey fox, bobcat, coyote, and mule deer (Figures 9).

The number of animals recorded by the spotlight survey during the spring was similar to the 2001 spotlight survey. The fall spotlight surveys recorded fewer wildlife events than in previous years, with only three instances of wildlife. Over the course of the fall study, unusually high wind gusts—in excess of 50 mph—were documented. One night survey was aborted on November 25, 2002, due to sustained high winds during the normal survey hours. Although the number of animals recorded is relatively low compared to other methods, the lower numbers are probably due to the relatively short sampling period and the random chance of observing an animal.

There are wildlife guzzlers (catch basin/watering devices) and salt licks on each side of the UCs, with the exception of Hicks Canyon, which has only one guzzler on the east side. The culverts located at Santiago Creek tributary and Handy Creek do not have guzzlers. The guzzlers contained water in the spring and were dry or nearly dry in the fall. Mostly birds, small rodents, and frogs frequented the guzzlers, but occasionally medium to larger animals, such as coyote, fox, and mule deer, would visit the guzzlers. The guzzlers are only filled by rainfall; therefore, the data collected is probably heavily dependent on the amount of rain received and the amount of water available from other sources in the area.

The precipitation received from winter 2001 through the fall of 2002 was light compared to local averages from previous years. Precipitation data received from the Tustin Irvine Ranch weather station indicates that from November 2001 through May 2002 the local area received 4.22 inches of rain compared to the average of 12.05 inches for that time period. This reduction in rainfall may have led to the dry condition of the guzzlers during the fall 2002 study. The drop off in occurrences of wildlife at the guzzlers during the fall was greater than in previous years fall data. Considering visits by all species, Oak Canyon's guzzler saw 22 visits by wildlife in the spring and only 8 in the fall; similarly, a guzzler at the SCE UC saw a drop off from 28 visits in the spring to 5 in the fall.

CONCLUSIONS

Overall, the fourth year's results indicate that the wildlife UCs are continuing to be used by medium to large mammals, including mule deer, coyote, and bobcat. Although little evidence of wildlife using the UCs was collected during this year's fall study, results from the spring 2002 study are positive, with the number of animals using the Windy Ridge and SCE increasing compared to

previous years. In addition, the data collected during both spring and fall at Hicks Canyon Haul Road UC indicate that the crossing is still being used by mule deer and coyote.

The low occurrence of wildlife recorded at the various UCs during the fall may be attributed to the light rainfall received throughout the 2002 study and the high winds during the fall. Therefore, no conclusions should be drawn regarding the lack of use of the UCs during this time period. With average precipitation and the subsequent recharge of some local water resources, it would be expected that following the completion of next year's study, observations of wildlife should return to normal and usage of the UCs would resume.

Included in the study for the first time this year, the Santiago Creek tributary and Handy Creek culverts are similar in terrain and biota to the other UCs and through either scent stations or general observations, mule deer, coyote, bobcat, grey fox, and raccoon were determined to be in the area. Throughout the spring and fall studies, each site had only one photograph of a single bobcat using the crossing. These culverts may potentially be too size constrictive to be used as corridors for some larger animals. Further study is necessary to determine if these are viable crossings.

Despite local weather abnormalities, data collected at several of the wildlife crossings during the spring 2002 study appear promising. The increased number of wildlife photographed using the Windy Ridge and SCE UCs during the spring may indicate that upon a return to normal weather conditions wildlife may use these UCs more frequently than in the past. The Hicks Haul Road UC data have remained consistent over the years, with mule deer and coyote documented often throughout spring and fall studies. With an increased number of target species being photographed over the years at several of the UCs, preliminary results from the first four years of surveys indicate the UCs appear to be functioning according to their design.

As stated in prior reports, wildlife activity through the UCs may continue to increase in subsequent years due to reduced human activity, increased vegetative cover created by habitat restoration at the UCs, right-of-way fence modifications, increased road traffic, and an increase in learned behavior related to UC usage.

Table A - Hicks Canyon Scent Station Data

Common Name	Hicks Canyon East					
	Carnivore		Herbivore		Guzzler	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002	Spring 2002	Fall 2002
unidentified frog/toad		1			1	1
unidentified lizard				1	1	1
unidentified bird			4		7	
black-tailed jackrabbit	1					
Audubon's cottontail	5	3	7	1		
mouse	3	2	4	1	2	
woodrat	2					
bobcat		1				
coyote	1					
grey fox		1				
squirrel	2					
spotted skunk	2					
opposum					1	
mule deer						
Total	16	8	15	3	12	

Common Name	Hicks Canyon West			
	Carnivore		Herbivore	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002
unidentified snake				
unidentified small bird				
woodrat	2			
Audubon's cottontail	7		3	
mouse	1		6	
toad		1		1
roadrunner				
lizard	1			
squirrel	1			
striped skunk	2			
spotted skunk	1			
bobcat	1			1
unidentified frog/toad				
Total	16	1	9	2

Table B - Oak Canyon Scent Station Data

Common Name	Oak Canyon East					
	Carnivore		Herbivore		Guzzler	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002	Spring 2002	Fall 2002
unidentified frog/toad			1		3	1
unidentified bird	1	1	2		5	1
black-tailed jackrabbit					1	
mouse		1			2	4
lizard						
unidentified snake						1
bobcat	4	1	3			1
gray fox						
coyote						
raccoon					5	
mule deer						
Total	5	3	6	0	16	8

Common Name	Oak Canyon West					
	Carnivore		Herbivore		Guzzler	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002	Spring 2002	Fall 2002
raven						1
unidentified frog/toad	1				5	3
Pacific kangaroo rat						
unidentified bird		1	1		5	
striped skunk						2
unidentified lizard						
opossum						
mouse			1		3	2
bobcat	1		1	2	1	
woodrat	1					
gray fox		1				
mule deer			4		6	
coyote	1		1		2	
Total	4	2	8	2	22	8

Table C - SCE Scent Station Data

Common Name	SCE East					
	Carnivore		Herbivore		Guzzler	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002	Spring 2002	Fall 2002
unidentified frog/toad			1			1
mule deer						
unidentified bird			3	1	4	
raccoon	3		2			
Audubon's cottontail	1					
mouse		1			2	2
bobcat	1	1	1	1		
woodrat			1			
squirrel			1			
roadrunner			1			
great horned owl					1	
gray fox						
Total	5	2	10	2	7	3

Common Name	SCE West					
	Carnivore		Herbivore		Guzzler	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002	Spring 2002	Fall 2002
unidentified frog/toad					6	1
unidentified bird	1		1		5	1
Audubon's cottontail			1			
woodrat			3	1		
mouse	2	2	5	1	3	3
ground squirrel	1					
gray fox			1			
bobcat	4		1			
coyote	1		1		1	
raccoon	1		1			
mule deer					3	
Total	10	2	14	2	18	5

Table D - Windy Ridge Scent Station Data

Common Name	Windy Ridge East					
	Carnivore		Herbivore		Guzzler	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002	Spring 2002	Fall 2002
raccoon			1			
unidentified frog/toad		3			1	2
Beechey ground squirrel			1		4	
unidentified bird	3	1	5	1	1	
mule deer					2	
Audubon's cottontail	2				1	
striped skunk					1	
woodrat			1			
mouse	1				1	4
bobcat	3	2				
gray fox	1		2			
lizard	1		1			
coyote						
Total	11	6	11	1	11	6

Common Name	Windy Ridge West					
	Carnivore		Herbivore		Guzzler	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002	Spring 2002	Fall 2002
unidentified frog/toad		1				
unidentified bird			1	1	3	1
unidentified snake						
Audubon's cottontail	1					
Beechey ground squirrel					1	
mule deer					1	
mouse	1		4			1
spotted skunk	1					
gray fox	3		3			
raccoon	1		2			
snake			1			
bobcat	1		1			
coyote				1		
Total	8	1	12	2	5	2

Table E- Santiago Culvert Scent Station Data

Common Name	Santiago Culvert East			
	Carnivore		Herbivore	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002
bobcat	2		1	
woodrat	2		1	
fox		1	1	
unidentified frog/toad				
Audubon's Cottontail	2		2	
roadrunner				
California Thrasher				
mouse			6	
ground squirrel				
unidentified bird	1			
coyote	1		2	
raccoon				
Total	8	1	13	0

Common Name	Santiago Culvert West			
	Carnivore		Herbivore	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002
bobcat				
woodrat				
lizard				
unidentified frog/toad	1			
Audubon's Cottontail	1			
roadrunner				
fox				1
mouse	1			1
ground squirrel	1			1
unidentified bird				
coyote				
raccoon	1			
Total	5	0	0	3

Table F- Handy Creek Scent Station Data

Handy Creek East				
Common Name	Carnivore		Herbivore	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002
Audubon's Cottontail	6		6	1
roadrunner	1		2	
California Thrasher	1			
mouse	5		4	3
ground squirrel				
unidentified bird	4		1	4
coyote	1	1		1
raccoon				
Total	18	1	13	9

Handy Creek West				
Common Name	Carnivore		Herbivore	
	Spring 2002	Fall 2002	Spring 2002	Fall 2002
Audubon's Cottontail	6	1	7	2
roadrunner	2		2	
Lizard				1
mouse	4	1	6	1
ground squirrel	3		2	
unidentified bird			2	
coyote		3		
raccoon	1		1	
Total	16	5	20	4

Table G - Spot Light Survey Data
ETC Spring 2002 Wildlife Data

Spring 2002	Hicks Canyon		Oak Canyon		SCE UC		Windy Ridge		Handy creek		Santiago Culvert	
	East	West	East	West	East	West	East	West	East	West	East	West
great horned owl	1						1				1	
barn owl			1	1						1		
cottontail												
mouse						1						
gray fox							1					
coyote	2										1	
bobcat												1
mule deer			2	4		2						
Total	1	2	3	5	0	2	1	2	0	0	2	1

ETC Fall 2002 Wildlife Data

Fall 2002	Hicks Canyon		Oak Canyon		SCE UC		Windy Ridge		Handy creek		Santiago Culvert	
	East	West	East	West	East	West	East	West	East	West	East	West
mouse											1	
coyote	1											
mule deer	1											
Total	2										1	

Table H - Photo Station Data

Spring 2002

Hicks Canyon Undercrossing

Date	Time	East End	West End
5/7/02	17:20		2 birds
5/8/02	12:31	coyote	
5/8/02	0:13		coyote
5/10/02	21:08	coyote	
5/13/02	18:36		coyote

Fall 2002

Hicks Canyon Undercrossing

Date	Time	East End	West End
11/21/02	**	Coyote	
11/22/02	**	Coyote	
11/24/02	**	Coyote	

**Data Loss Due to Camera Malfunction

Oak Canyon Undercrossing

Date	Time	East End	West End
5/9/02	1:11		2 mule deer
5/8/02	0:28		coyote
5/11/02	0:53		mule deer
5/11/02	21:26	mule deer	
5/13/02	22:31		mule deer
5/14/02	4:17		mule deer

Oak Canyon Undercrossing

Date	Time	East End	West End
			No Observations

Windy Ridge Undercrossing

Date	Time	East End	West End
5/11/02	19:12	mule deer	
5/11/02	19:24	mule deer	
5/12/02	19:13		2 mule deer
5/12/02	19:14	mule deer	
5/12/02	19:21	mule deer	
5/12/02	19:23	4 mule deer	
5/12/02	19:26	mule deer	
5/12/02	19:36		mule deer
5/12/02	19:40		mule deer
5/12/02	19:47	mule deer	
5/13/02	4:46		mule deer
5/13/02	4:51		mule deer
5/13/02	4:58	mule deer	
5/13/02	5:29		mule deer
5/13/02	5:33	mule deer	
5/13/02	22:02		gray fox

Windy Ridge Undercrossing

Date	Time	East End	West End
			No Observations

Table H - Photo Station Data (continued)

Spring 2002

SCE Undercrossing			
Date	Time	East End	West End
5/8/02	5:38	mule deer	
5/8/02	5:47		2 mule deer
5/8/02	11:39		2 mule deer
5/8/02	20:23		bobcat
5/8/02	23:39		mule deer
5/9/02	0:00		mule deer
5/9/02	0:03		mule deer
5/9/02	7:23		bird/crow
5/9/02	11:12		bird
5/9/02	16:10		bird
5/10/02	16:30		mule deer
5/11/02	19:24		bird/crow
5/12/02	8:31		mule deer
5/13/02	5:52		bird/crow
5/13/02	6:53		bird/crow
5/13/02	7:12	bird	
5/13/02	17:13		mule deer
5/13/02	18:23		bird and mule deer

Fall 2002

SCE Undercrossing			
Date	Time	East End	West End
11/21/02	23:19	Bobcat	

Santiago Culvert

Date	Time	East End	West End
**	**		bobcat
**	**		bobcat
**	**		bobcat

**Data Loss Due to Camera Malfunction

Santiago Culvert

Date	Time	East End	West End
			No Observations

Handy Canyon Culvert

Date	Time	East End	West End
5/13/02	5:31	bobcat	

Handy Canyon Culvert

Date	Time	East End	West End
11/24/02	0:54		Raccoon

Table I - General Wildlife and Wildlife Sign Observations

Scientific Name	Common Name	Undercrossing					
		Hicks Canyon	Oak Canyon	SCE	Windy	Handy Creek	Santiago Tributary
<i>Sylvilagus audubonii</i>	Audubon's cottontail	D/O, S	D/O, S	D/O, S	D/O, S	D/O, S	D/O, S
<i>Neotoma</i> sp.	woodrat	S	S	S	S	S	S
<i>Felis rufus</i>	bobcat	T	T	T	T		
<i>Canis latrans</i>	coyote	T, S	T, S	T, S	T, S	T, S	T, S
<i>Odocoileus hemionus</i>	mule deer	T, S	D/O, T, S	D/O, T, S	D/O, T, S	T, S	S
<i>Urocyon cinereoargenteus</i>	gray fox				D/O, T, S		

D/O - Direct Observation

T - Tracks

S - Scat

SC - Scent

Other wildlife species observed in the area

Scientific Name	Common Name
Lepidoptera	Butterflies
<i>Nymphalidae</i>	Brush-footed Butterflies
<i>Coenonympha californica</i>	California ringlet
<i>Lycaenidae</i>	Metalmarks, Hairstreaks, Coppers, and Blues
<i>Apodemia mormo</i>	Behr's metalmark
<i>Glaucopsyche lygdamus</i>	southern blue
Reptilia	Reptiles
<i>Iguanidae</i>	Iguanids
<i>Sceloporus occidentalis</i>	western fence lizard
<i>Anguidae</i>	Alligator Lizards
<i>Gerrhonotus multicarinatus</i>	southern alligator lizard
Aves	Birds
<i>Cathartidae</i>	New World Vultures
<i>Cathartes aura</i>	turkey vulture
<i>Accipitridae</i>	Kites, Hawks, Eagles, and Ospreys
<i>Buteo jamaicensis</i>	red-tailed hawk
<i>Odontophoridae</i>	New World Quail
<i>Callipepla californica</i>	California quail
<i>Columbidae</i>	Pigeons and Doves
<i>Zenaida macroura</i>	mourning dove
<i>Cuculidae</i>	Cuckoos and Roadrunners
<i>Geococcyx californianus</i>	greater roadrunner
<i>Trochilidae</i>	Hummingbirds
<i>Calypte anna</i>	Anna's hummingbird
<i>Tyrant Flycatchers</i>	Tyrannidae
<i>Sayornis nigricans</i>	black phoebe
<i>Corvidae</i>	Jays, Magpies, and Crows
<i>Aphelocoma californica</i>	western scrub-jay
<i>Corvus corax</i>	common raven
<i>Hirundinidae</i>	Swallows
<i>Petrochelidon pyrrhonota</i>	cliff swallow
<i>Aegithalidae</i>	Bushtits
<i>Psaltriparus minimus</i>	bushtit
<i>Troglodytidae</i>	Wren
<i>Thryomanes bewickii</i>	Bewick's wren
<i>Troglodytes aedon</i>	house wren
<i>Muscicapidae</i>	Kinglets and Gnatcatchers
<i>Chamaea fasciata</i>	wren-tit
<i>Mimidae</i>	Mimic Thrushes
<i>Mimus polyglottos</i>	northern mockingbird
<i>Emberizidae</i>	New World Sparrows
<i>Pipilo maculatus</i>	spotted towhee
<i>Passerina amoena</i>	Lazuli bunting
<i>Pheucticus melanocephalus</i>	Black-headed grosbeak
<i>Pipilo crissalis</i>	California towhee
<i>Zonotrichia leucophrys</i>	white-crowned sparrow
<i>Aimophila ruficeps</i>	rufous-crowned sparrow
<i>Melospiza melodia</i>	song sparrow
<i>Icteridae</i>	American orioles

Sturnella neglecta
Fringillidae
Carpodacus mexicanus
Carduelis psaltria

western meadowlark
Fringillid Finches
house finch
lesser goldfinch

WILDLIFE UNDERCROSSING
MONITORING REPORT - 2003

EASTERN TRANSPORTATION CORRIDOR
ORANGE COUNTY, CALIFORNIA

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LSA

February 5, 2004

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EXECUTIVE SUMMARY

LSA Associates, Inc. (LSA) concluded its fifth and final year of a study documenting the use of six wildlife undercrossings (UCs) along the Eastern Transportation Corridor (ETC). Those crossings include Hicks Canyon Haul Road UC, Oak Canyon UC, Southern California Edison (SCE) UC, Windy Ridge UC, and the Santiago Creek tributary and Handy Creek culverts. A variety of techniques were used to document wildlife usage, including general track and scat surveys, baited scent stations, photo stations and spotlight surveys. The scent stations, spotlight surveys, and track and scat survey documented wildlife in the vicinity of the crossing, and the photo stations document wildlife that actually use the crossings. The study was conducted from May 29 through June 6, 2003, and again on November 3-11, 2003.

Results from the fifth and final year of the ETC Wildlife Study indicate that the wildlife UCs continue to be used by a variety of medium to large mammals, including mountain lion, mule deer, coyote, and bobcat (Figures 8 & 9). Mule deer and coyote were photographed at the Hicks Canyon Haul Road UC as well as at the Oak Canyon UC. Mountain lion and mule deer were photographed at the Windy Ridge UC and a single photograph of a bobcat was taken at the SCE UC. Through either scent station or general observations data, mountain lion were determined to be in the vicinity of the Oak Canyon, SCE, and Windy Ridge UCs during the 2003 study.

This marked only the second year in which the Santiago Creek tributary and Handy Creek culverts were included in the study. In 2002 and again during this year's study, mule deer, coyote, bobcat, and grey fox were determined to be in the vicinity of the culverts via scent station data. For the second straight year, what appears to be a single resident bobcat was the only wildlife photographed at the Santiago Creek tributary culvert, and coyote and bobcat were both documented using the Handy Creek culvert during 2003 (Figure 8). The overall length and constrictive nature of these culverts may deter some larger animals, such as mule deer and mountain lion from using them as corridors; however, it appears that the culverts are serving as linkages for medium sized mammals.

Data collected over the course of the five year study indicate that the variety of wildlife that inhabit the areas along the east and west sides of the SR-241 correlates with the variety of wildlife documented utilizing the UCs. Target species photographed at the UCs during the five year study include mountain lion, mule deer, coyote, and bobcat. Although results have varied from 1999-2003, both seasonally and from crossing to crossing; as a whole, the data suggest that the six UCs are being utilized by a variety of medium to large wildlife that inhabit the local areas surrounding the ETC.

INTRODUCTION

This is the fifth and final report documenting wildlife studies conducted by LSA Associates, Inc. (LSA) at six wildlife UCs along the Eastern Transportation Corridor (ETC) (Figure 1), which opened in October, 1998. The wildlife undercrossings (UC) include Hicks Canyon Haul Road UC, Oak Canyon UC, Southern California Edison (SCE) UC, Windy Ridge UC, Handy Creek culvert, and Santiago Creek tributary culvert. This study of the original four crossings is funded by the Transportation Corridor Agencies (TCA) as required in the Section 7 Biological Opinion on the ETC, Orange County (No. 1-6-94-F-17) East and North Legs. The Biological Opinion identifies the Santiago Creek bridge as an alternative species wildlife crossing, but it is not included as part of this monitoring requirement. The study of the Santiago Creek tributary and Handy Creek culverts is funded by the TCA and is not required as part of the Biological Opinion. These two culverts were first included in the study during the spring of 2002.

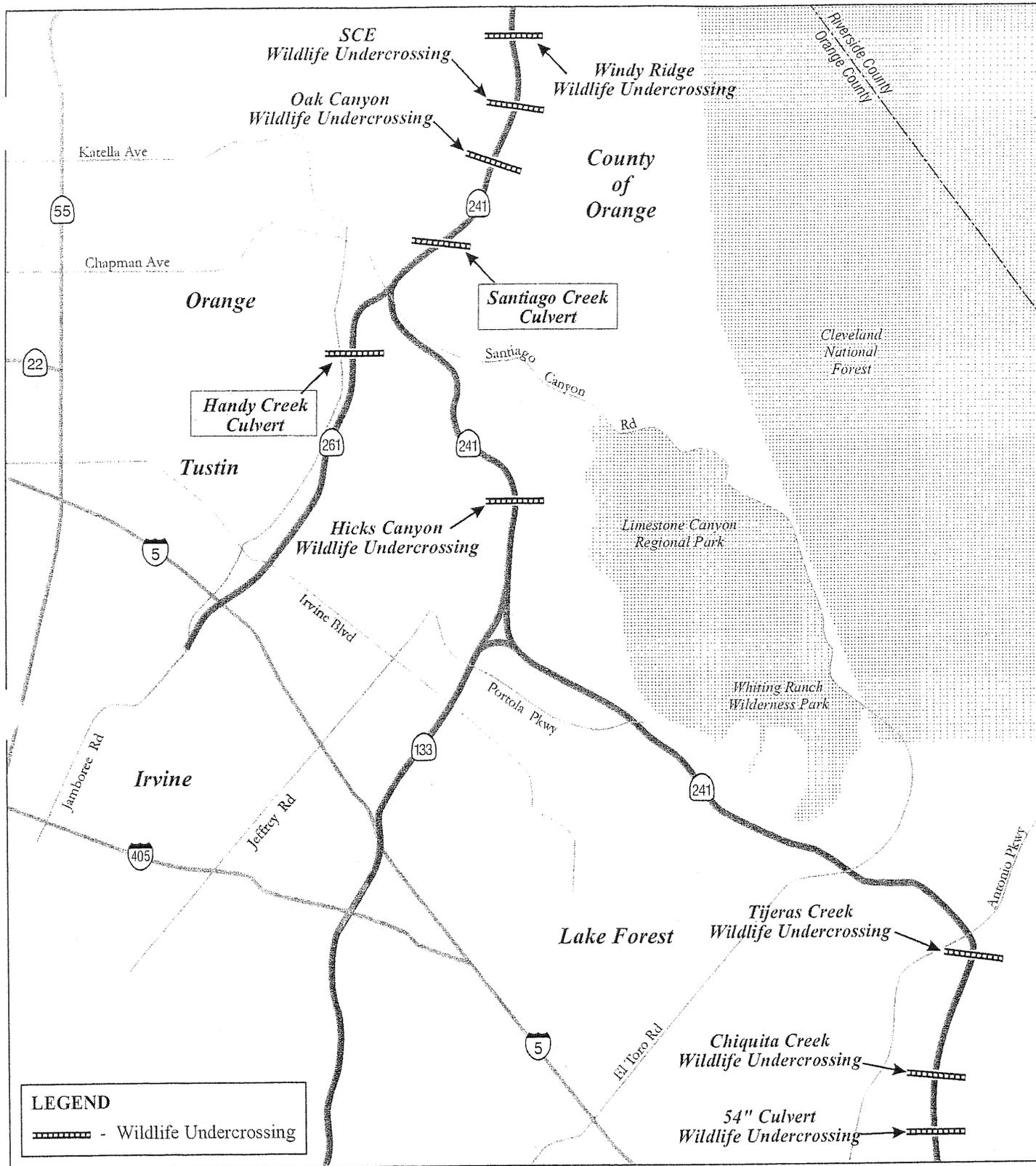
STUDY AREA

The wildlife movement study area includes the four wildlife undercrossings part of the original study, located along the east and north segments of the ETC stretching from State Route (SR) 133 to SR-91 (Figure 1); the eastern segment stretches from SR-133 to the Orange interchange of SR-241 and SR-261; and the northern segment stretches from the Orange interchange to SR-91. The study area also includes the area surrounding each undercrossing on both sides. The Hicks Canyon Haul Road UC is located in the eastern segment, and Oak Canyon UC, SCE UC, and Windy Ridge UC are located in the northern segment. In general, these wildlife UCs were designed to allow the passage of large to medium wildlife species such as mountain lions, deer, and coyotes. Two crossings introduced during 2002 include the Santiago Creek tributary culvert, located just north of the Orange interchange, along SR-241; and the Handy Creek culvert, located south of the Orange interchange, on SR-261.

The Hicks Canyon Haul Road UC is located approximately 1.3 miles north of the SR-133 interchange, and is approximately 20 feet high, 70 feet wide at the bottom, 130 feet wide at the top, and a 600 foot traverse length (Figure 2). This crossing provides for wildlife movement from the Cleveland National Forest through the currently designated Limestone Canyon Wilderness areas and the Lomas Ridge Reserve. Although this crossing provides a long traverse (600 feet), there are three gaps in the bridge structure that allow a significant amount of natural light to penetrate the crossing. The topography is nearly flat, with a two lane asphalt road that crosses the southern portion of the crossing.

The Oak Canyon UC is located approximately 2.4 miles north of the Orange interchange, and is approximately 50 feet high, 100 feet wide at the bottom, 220 feet wide at the top, and a 250 foot traverse length (Figure 3). This site was considered to provide high potential for movement by both deer and mountain lions, connecting Fremont, Weir, and Blind Canyons. The topography is gentle, opening up to a large, expansive canyon on the west with a dirt road leading over the ridge to the east side.

The SCE UC is located approximately 3.2 miles north of the Orange interchange, and is approximately 29 to 40 feet high, 100 feet wide at the bottom, and 230 feet wide at the top, with a traverse



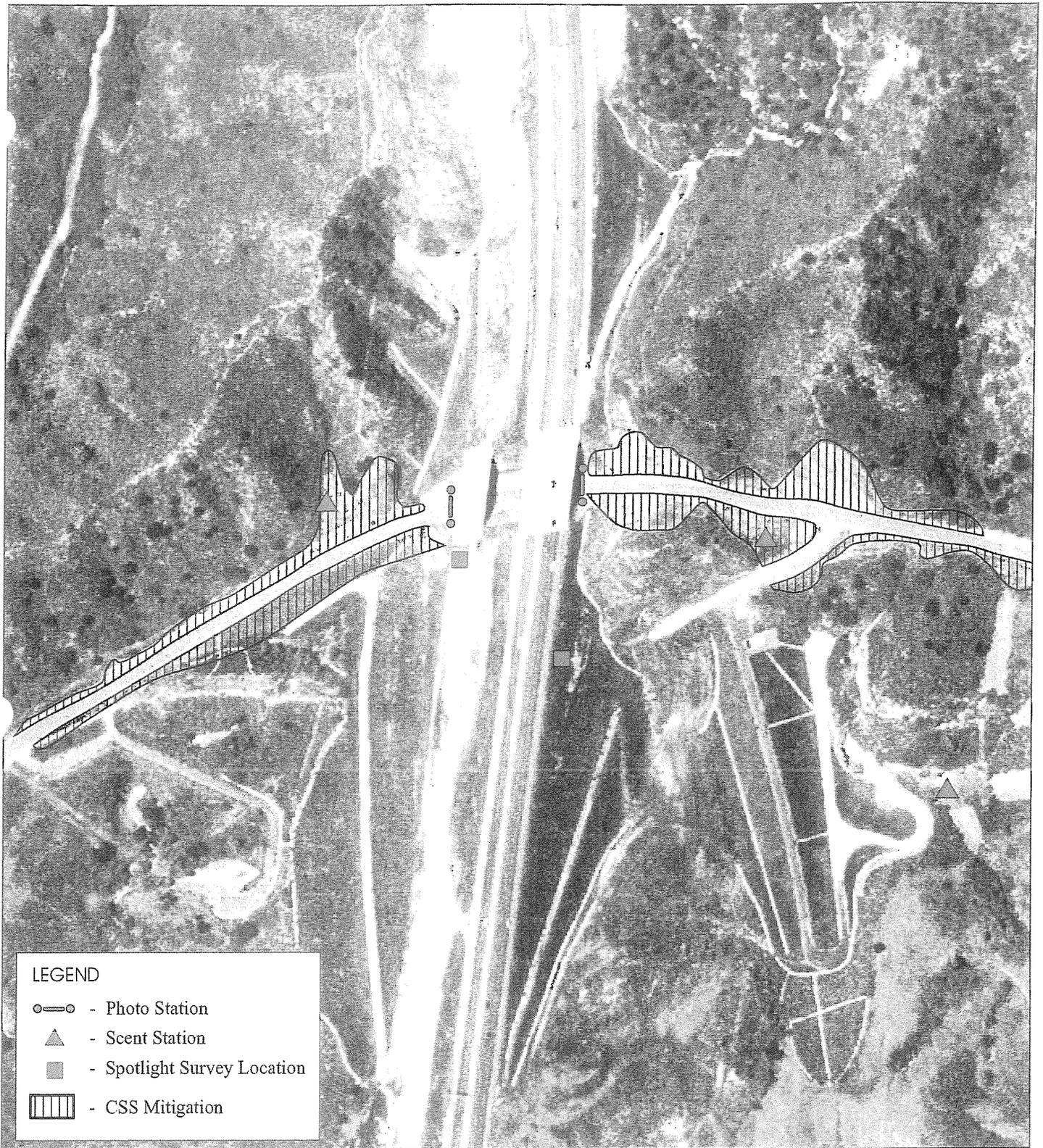
LEGEND
 - Wildlife Undercrossing

FIGURE 1

LSA
 ↑
 N

NO SCALE

ETC Wildlife Study
 Wildlife Crossing Locations



LEGEND

- - Photo Station
- ▲ - Scent Station
- - Spotlight Survey Location
- ▨ - CSS Mitigation

LSA



NO SCALE

Source: Eagle Aerial, 2002

I:\TCA930\G\Hicks.cdr (12/17/03)

FIGURE 2

ETC Wildlife Study
 Aerial Layout
 Hicks Canyon



LEGEND

- - Photo Station
- ▲ - Scent Station
- - Spotlight Survey Location

FIGURE 3

LSA

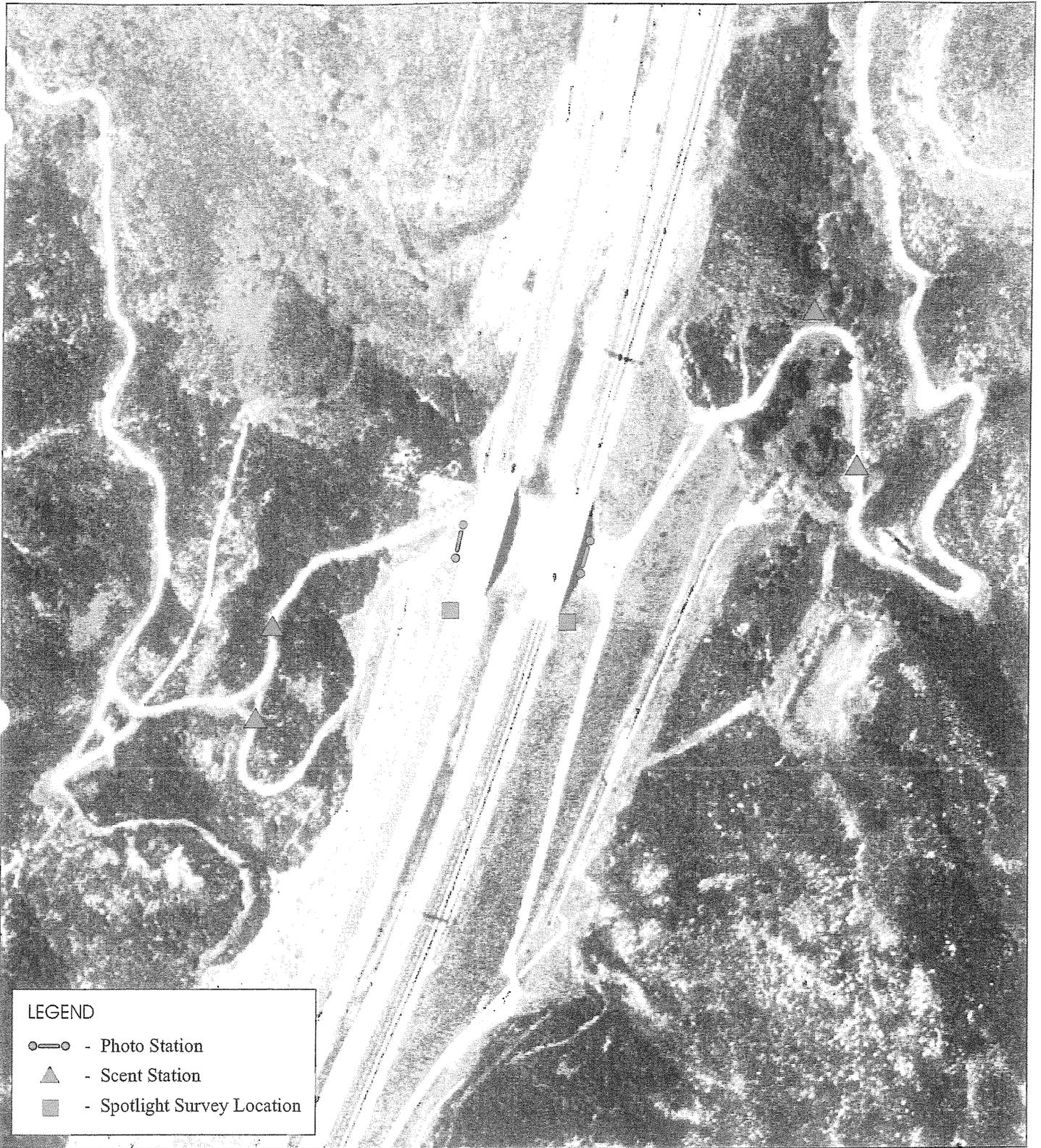


1:50 SCALE

Source: Eagle Aerial, 2002

I:\TCA930\G\Oak.cdr (1/19/04)

ETC Wildlife Study
 Aerial Layout
 Oak Canyon



LEGEND

- - Photo Station
- ▲ - Scent Station
- - Spotlight Survey Location

FIGURE 4

LSA



NO SCALE

Source: Eagle Aerial, 2002

I:\TCA930\GSCE.cdr (12/17/03)

ETC Wildlife Study
Aerial Layout
SCE

length of 250 feet (Figure 4). This crossing provides linkage between Weir Canyon and Fremont Canyon. This crossing is easily accessed, due to gradual topography and dirt roads on either side.

The Windy Ridge UC is located approximately 4.3 miles north of the Orange interchange, and is approximately 30 feet high, 80 feet wide at the bottom, and 220 feet wide at the top, with a 260 foot traverse length (Figure 5). This crossing was designed to provide major connectivity between Natural Communities Conservation Program (NCCP) open space reserve areas in Weir Canyon and Gypsum Canyon, especially for deer and mountain lions. The topography is steep leading up to the crossing, with a dirt road entering from the east and several animal trails leading up to a steep ridge to the west.

The Santiago Creek tributary culvert is located approximately 1.5 miles north of the Orange interchange, and is approximately 72 inches in diameter, with an approximate 720 foot traverse length (Figure 6).

The Handy Creek culvert is located approximately 1.5 miles south of the Orange interchange, west of Jamboree Road, and is approximately 72 inches in diameter, with an approximate 720 foot traverse length (Figure 7).

In addition to the basic design, all the four major crossings described above (Hick's, Oak, SCE, & Windy) include water guzzler and salt licks to help attract wildlife to these crossings.

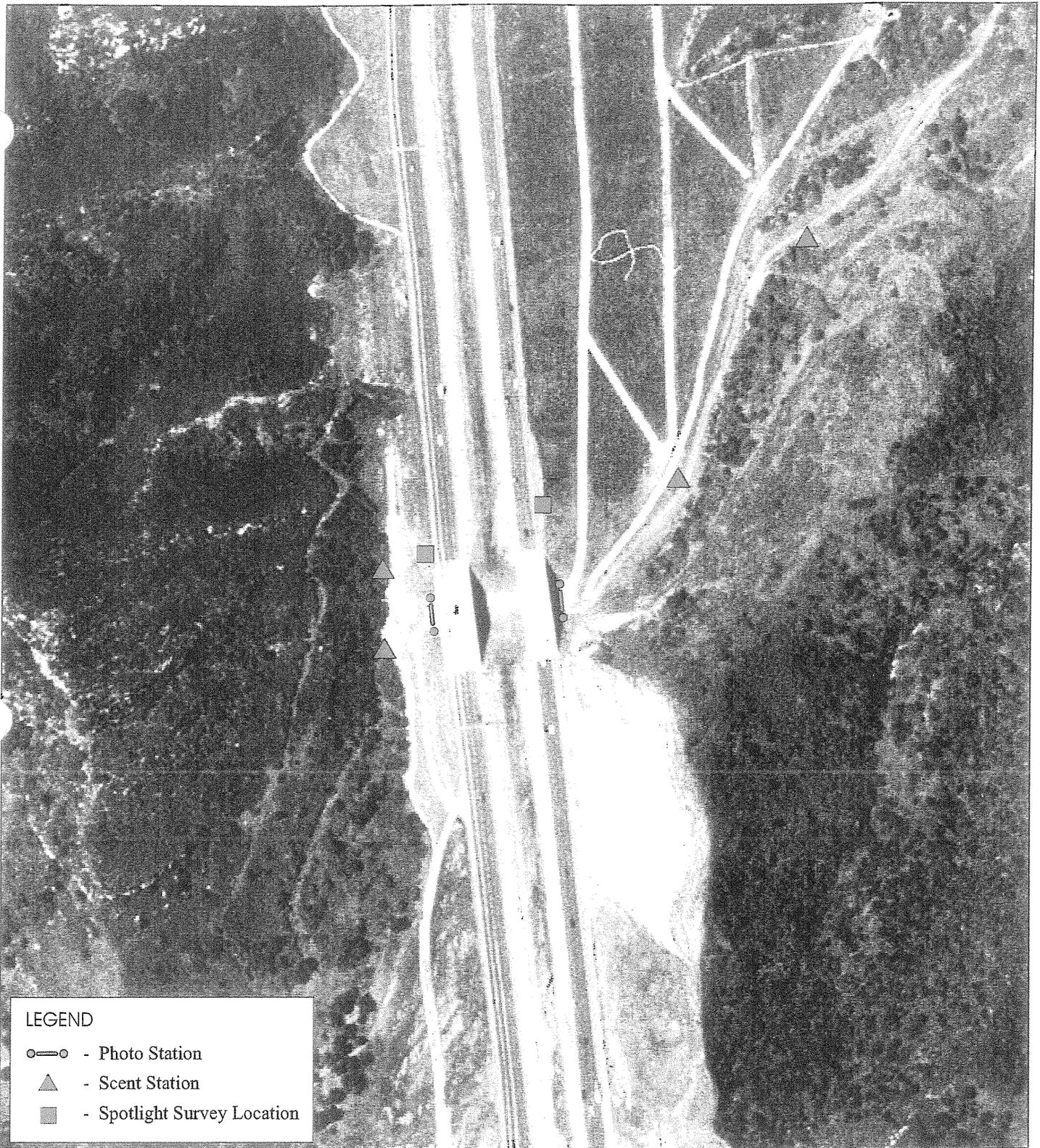
METHODS

In the vicinity of each wildlife undercrossing, the presence and diversity of wildlife were documented using scent stations, spotlight surveys, general scat and track surveys, and direct observations. In addition, photo stations were set up at the UCs to determine direct wildlife use of the undercrossings. Surveys were conducted May 29 through June 6, 2003, and again on November 3-11, 2003. During the five year study, the wildlife surveys were conducted twice a year, in the spring and fall of each year through 2003.

Scent Stations

The purpose of the scent stations is to help determine the species of wildlife in the vicinity of the UCs and the frequency with which they are present. These data will help to get an overall sense of the wildlife population that can then be compared with actual wildlife usage of the undercrossings. Two scent stations were placed at each end of the six UCs, for a total of 24 scent stations, as shown in Figures 2 through 7. An effort to attract carnivores and herbivores separately was made by the use of different baits. The scent stations locations were selected based on the topography, access, presence of game trails, and wildlife sign.

A 1x3 inch by 3 foot stake was placed in the center of each scent station. The vegetation within a three foot radius of the stake was cleared (as necessary) so that it would not interfere with making a clear track impression within the tracking medium. Diatomaceous earth (DE) was spread out within the three foot radius and smoothed to an even finish with a concrete trowel to provide a medium that aided the identification of tracks.



LEGEND

- - Photo Station
- ▲ - Scent Station
- - Spotlight Survey Location

LSA



SCALE

Source: Eagle Aerial, 2002

I:\TCA930\G\Windy.cdr (1/19/04)

FIGURE 5

ETC Wildlife Study
 Aerial Layout
 Windy Ridge

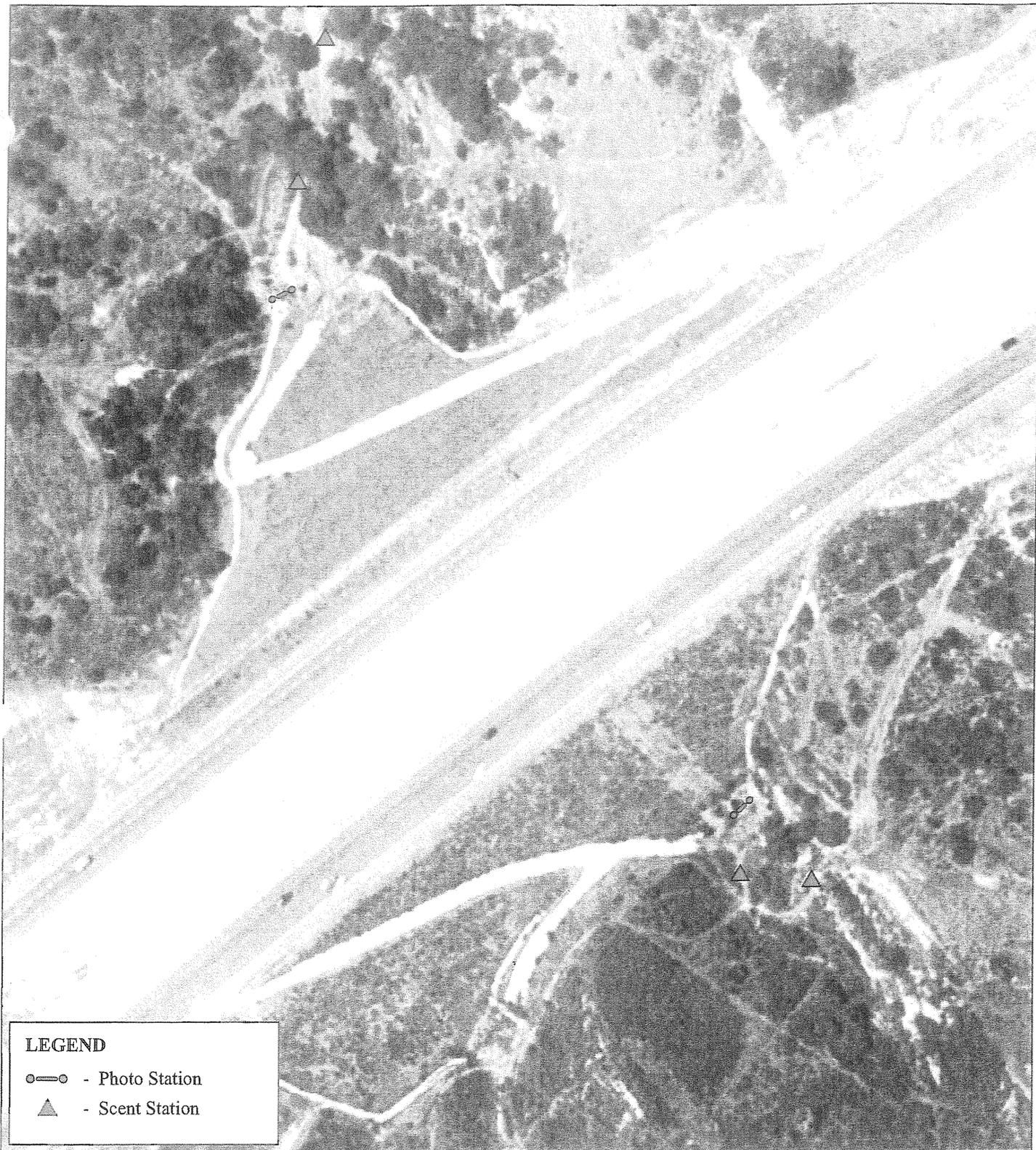


FIGURE 6

LSA

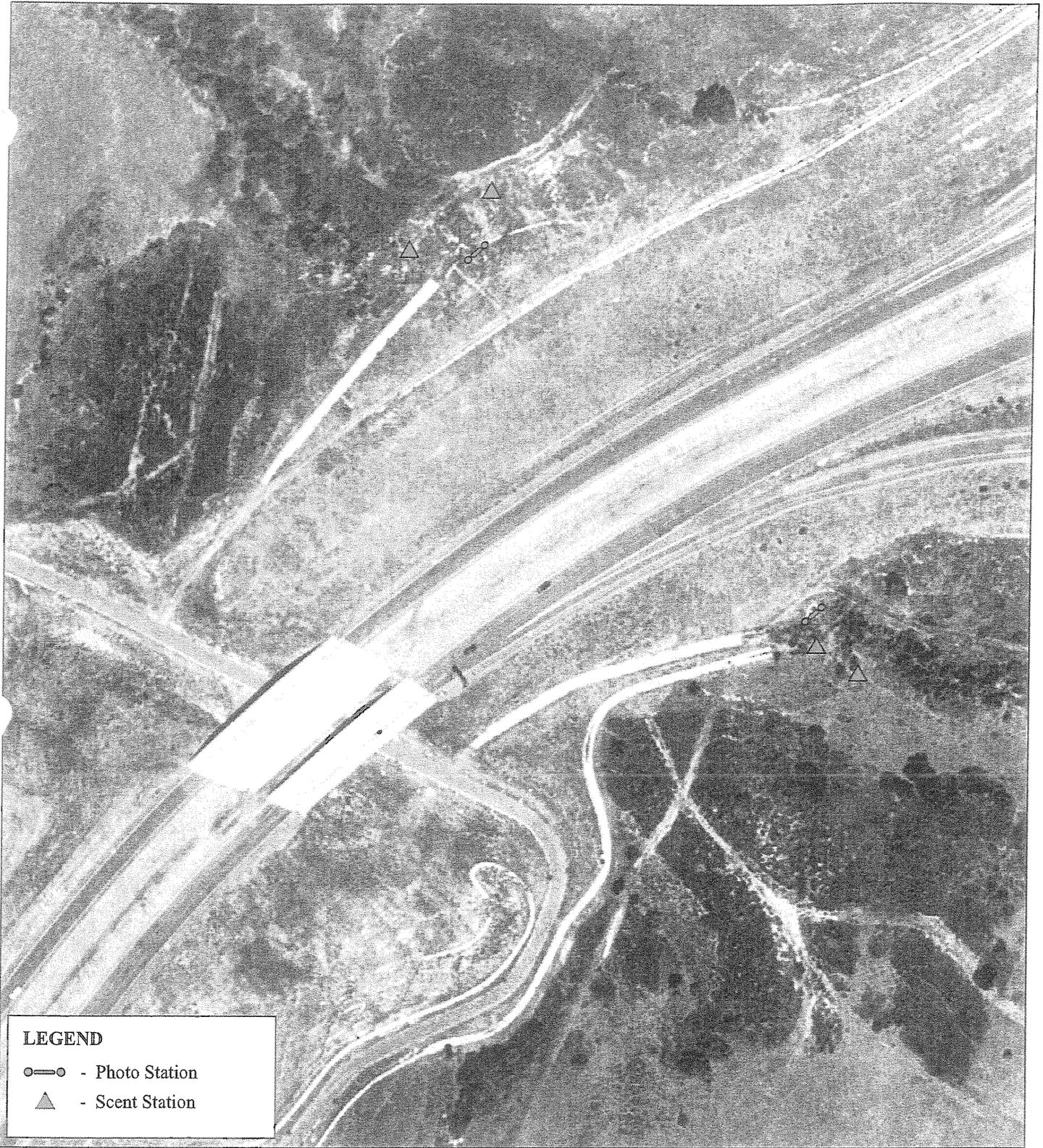


NO SCALE

Source: Eagle Aerial, 2002

I:\TCA930\G\Santiago Clvrt.cdr (12/16/03)

ETC Wildlife Study
 Aerial Layout
 Santiago Creek Culvert



LEGEND

- - Photo Station
- ▲ - Scent Station

LSA



NO SCALE

Source: Eagle Aerial, 2002

IATCA930\G\Handy Clvrt.cdr (12/16/03)

FIGURE 7

ETC Wildlife Study
 Aerial Layout
 Handy Creek Culvert

The bait was placed in a 12x12 inch bag constructed of a fine meshed metal screen. The bait was replaced on an as needed basis, as the bait dried or lost its scent. The bait bag was fastened to the stake using bailing wire. The bait targeting herbivores consisted of cut apple, banana, and carrot. The bait targeting carnivores consisted of canned chicken and seafood flavored cat food and cow liver. Each scent station was checked every morning during the survey period, and all clearly identifiable tracks at each station were recorded to genus and species, where possible. Once all tracks were recorded, the DE was smoothed and additional DE was added when necessary. Fresh bait was added to the bait bags as necessary to maintain a strong scent. Also, several automated, motion triggered cameras were placed at the more active scent stations during the fall survey for further documentation of wildlife use.

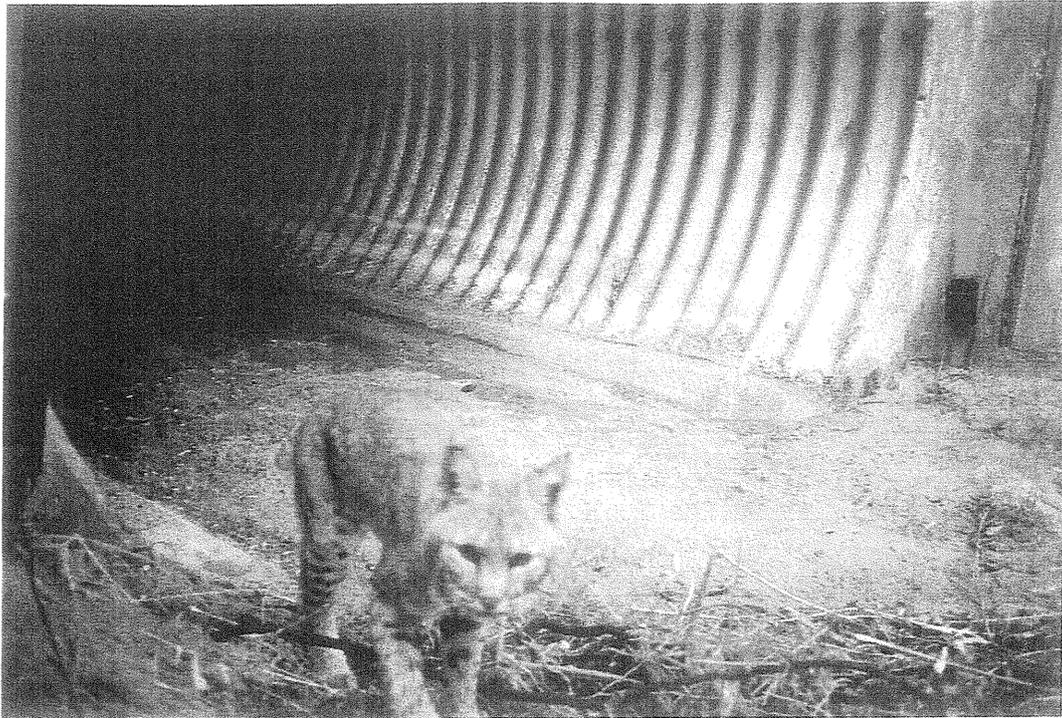
Automated Photo Stations

Automated photo stations (Trail Master Infrared Trail Monitors) were set up at each end of the wildlife undercrossings, as shown in Figures 2 through 7. Most of the UCs could be covered with one photo station spanning the bottom of the undercrossing on each end; however, the uneven terrain at the SCE UC required two photo stations at each end. Each station consisted of an infrared sensing unit (transmitter and receiver) and a camera with a cord connected to the sensing unit. Since the spans of the crossings are so extensive, a laser was used to aid in aligning the invisible infrared beam on the transmitter units. Both pieces of the sensing unit and the camera were mounted to 1x3 inch by 3 foot wooden stakes, which were positioned to detect movement entering and exiting the UC. In addition, both pieces of the sensing unit were adjusted to a height of approximately 18 inches, to target medium to large mammals (e.g., raccoons, bobcats, deer, mountain lions, etc.). The camera was positioned behind and upslope of the receiver unit, so that both units were in the frame of the camera viewfinder and offset so that the flash did not overexpose the receiver unit in the foreground, diminishing the clarity of the background. Excess cord connecting the receiving unit and the camera was securely fastened to the stakes to prevent disturbance by animals or wind.

Each photo station was checked each morning during the study to ensure that it was functioning properly and that enough film was remaining to record any activity during the following 24 hour period.

Spotlight Survey

Spotlight surveys were conducted adjacent to the bridges overlooking each of the wildlife undercrossings. Although they offered a relatively short time frame for observance of wildlife, they were conducted so as to provide another method for collecting information on animals in the immediate vicinity of each undercrossing. Each side of the bridge was surveyed each night for approximately five minutes. A two million candlepower spotlight was used for the surveys. The surveys were conducted at least one hour following sunset. The survey was conducted by first scanning the area directly below, then away in a sweeping, side to side motion. This sequence was repeated until the time elapsed. The survey time was extended, if additional time was required to identify any animals observed. The genus and/or species of each sighting was recorded. If sighted animals could not be identified due to vegetative cover and the limited range of the spotlight, the



A bobcat inspects the monitoring equipment at the west side of the Handy Creek culvert.



A coyote emerges from the east side at the Handy Creek culvert during the 2003 fall study.

LSA

FIGURE 8

ETC Wildlife Study
Wildlife Monitoring Photos



A mountain lion is captured on film at the Windy Ridge under crossing during the Spring 2003 study.



A gray fox stands at the carnivore scent station located on the west side of the SCE under crossing. The diatomaceous earth is disturbed and few clear tracks can be distinguished.

LSA

FIGURE 9

ETC Wildlife Study
Wildlife Monitoring Photos

approximate location was recorded so that other signs, if any, could be used the following day to identify the sighting.

General Track and Scat Surveys

General surveys for tracks and scat were conducted throughout the study area each morning as the scent stations and photo stations were checked. These surveys consisted of a biologist meandering throughout the study area, locating game trails, and observing tracks and scat. The surveyor was also on the alert for direct observations of wildlife. Since the study area is so extensive and much of the substrate is hard, the tracks were not cleared each day.

RESULTS

The results of the scent station, photo station, and spotlight surveys are summarized in Tables A through H. Wildlife and sign that were observed away from the scent stations, but within the vicinity of the study area, are provided in Table I.

DISCUSSION

The data collected during the 2003 study from scent stations and general observations indicate that there continues to be a variety of wildlife in the vicinity of all six crossings and that medium to large mammals are using the various UCs. Wildlife photographed at UCs included mountain lion, mule deer, coyote, and bobcat. The amount of wildlife traffic experienced at the individual UCs remained relatively consistent in 2003 when comparing the spring and fall studies.

The diversity and frequency of wildlife recorded at the Hicks Canyon Haul Road UC during the 2003 study were similar to what had been documented in the past four years' studies at that location. Data collected at scent stations and via general observations indicated that bobcat, gray fox, and other medium sized mammals were in the vicinity of the UC; however, mule deer and coyote were the only wildlife to be photographed using the UC during both the spring and fall study. Tracks detected at scent stations and through general observations indicate that mountain lion, mule deer, coyote, and bobcat are in the vicinity of the Oak Canyon, SCE, and Windy Ridge UCs. Wildlife conclusively determined to be using the UCs via photographs included mule deer and coyote at the Oak Canyon UC, a single bobcat at the SCE UC, and mountain lion and mule deer at the Windy Ridge UC (Figure 9). Mule deer, coyote, and bobcat were determined to be in the vicinity of both the Santiago Creek tributary and Handy Creek culverts. Throughout the spring and fall 2003 study, bobcat were the only wildlife photographed at the Santiago Creek tributary culvert. Both coyote and bobcat were photographed at the Handy Creek culvert.

During the fall 2003 study, the camera stations mounted at Hick's Canyon UC (West) and Santiago Creek tributary (West) malfunctioned resulting in the time and date not being recorded on the photographs.

Similar to previous years, the carnivore and herbivore baited scent stations did not appear to be target specific, but animals seem to visit either regardless of whether they were a carnivore or herbivore. The scent stations recorded a diversity of wildlife, including frog, bird, grey fox, bobcat, coyote, and mule deer. Several of the bait bags were removed by wildlife throughout the course of the 2003 study. Scent station bags that could not be recovered in the general vicinity of the original location were replaced and new bait was added. During spring and fall studies, passive trail monitors and 35mm cameras were installed in locations where bags were removed or the DE was disturbed leaving no interpretable tracks. The camera installed at the carnivore scent station on the west side of the SCE UC captured several photographs of wildlife, including a gray fox which apparently had taken the bait bag on several occasions (Figure 9). Another camera setup was installed at the carnivore scent station located on the east side of the Oak Canyon UC. Adult and juvenile mountain lion prints were observed in the proximity of this setup; however, no photographs of wildlife were taken at this station.

Only two instances of wildlife, non-target species (two large raptors), were recorded by the spotlight survey during the 2003 spring and fall studies. Although the number of animals recorded is relatively low compared to other methods, the lower numbers are probably due to the relatively short sampling period and the random chance of observing an animal. Over the duration of the study, the spotlight survey has been the least effective in accumulating quality data on the wildlife in the local area of each UC. Factors such as the day to day weather, the impact of a surge of bright light into the habitat, the short sampling period, and the dangers associated with parking at night along the side of a highway have all had an effect on the efficiency of this sampling method.

There are wildlife guzzlers (catch basin/watering devices) and salt licks at each side of the UCs, with the exception of Hicks Canyon which has only one guzzler on the east side. The culverts located at Santiago Creek tributary and Handy Creek do not have guzzlers. The guzzlers contained water in the spring and were dry or nearly dry in the fall. Mostly birds, small rodents, and frogs frequented the guzzlers, but occasionally medium to larger animals, such as coyote, fox, and mule deer, would visit the guzzlers. The guzzlers are only filled by rainfall; therefore, the data collected is dependent on the amount of rain received and the amount of water available from other sources in the area. After last year's period of low rainfall during peak periods, precipitation was again back to average levels. Precipitation data received from the Tustin Irvine Ranch, CA weather station indicate that from November 2002 through May 2003 the local area received 15.55 inches of rain compared to the average of 12.05 inches for that time period.

CONCLUSIONS

The data collected during the fifth and final year of the study were relatively consistent with prior year's studies, and it appears that the UCs are continuing to be used by both medium and large mammals. Through tracks observed at scent stations and via general observations by field biologists, it was determined that a variety of wildlife, including mountain lion, mule deer, coyote, and bobcat can be found throughout the habitat adjacent to the crossings. A positive result of the 2003 study is that all of the aforementioned target species were photographed in at least one of the UCs. Although there were typically no more than two target species photographed at any given UC during either the 2003 spring or fall study, when data from this year's study are compared to prior year's data it can be

seen that the various UCs are being used by most of the species that can be found in the vicinity of the crossings.

Over the five years the study was conducted, various patterns have emerged with regard to the type of wildlife and frequency of use at each UC. Target species, aside from mountain lion, have consistently been determined to be in the habitat adjacent to the UCs through either scent station or general observation data. Although during some study periods there were seemingly significant differences in the amount of wildlife traffic recorded from UC to UC, the data collected at an individual UC over the five year study period was relatively consistent from year to year. When considering seasonal differences in wildlife data throughout the past five years, more wildlife traffic has been recorded at scent stations and via camera stations at the individual UCs during the spring study than during the fall of that same year. The amount of precipitation received, seasonal winds, individual species migratory patterns, and the relative short length of the study period could all have differing impacts on the observed seasonal fluctuations in wildlife traffic.

The Hick's Canyon UC has been the most consistent of all of the UCs when considering type of wildlife using the crossing and frequency of use. From the fall of 1999 to the conclusion of this study in the fall of 2003, mule deer and coyote have consistently been photographed using the Hick's Canyon UC during both day and night. Mule deer, coyote, bobcat, and gray fox have been determined to be in the area via scent station or general observation data for most years of the study, and in 2000, mountain lion tracks were found at one of the carnivore scent stations. One photograph of a bobcat at the crossing was taken in 1999, but for the most part, there has been less documentation of either bobcat or mountain lion at this crossing than the other UCs. The patterns of use observed here may be attributed to the fact that this UC is the only one out of the six where there is a paved road and comparably higher amounts of automobile traffic; therefore, it is expected that wildlife such as mule deer and coyote that are known to occupy populated areas would use the UC while wildlife such as bobcat and mountain lion, known for their seclusive nature, would be less inclined to do so. In addition, when compared to the other UCs, the Hick's Canyon UC has considerably less natural open space along with more development southwest of the crossing; therefore, it would be unlikely that mountain lion would traverse the corridor to access a limited territory with a higher probability of human contact.

Data collected during the 2003 study indicate that mountain lion, mule deer, coyote, and bobcat were in the vicinity of the Oak Canyon, SCE, and Windy Ridge UCs. This marks the first time since the study began in 1999 that mountain lion have been determined to be in the area of all three crossings during one year long study period. Data from this year and from the previous four years the study was conducted indicate that all three of these crossings have been used by mountain lion, mule deer, coyote, and bobcat. Mule deer and coyote were photographed traversing the Oak Canyon UC during the 2003 study, and during all five years of the study mule deer have been photographed at the Oak Canyon UC, with mountain lion, coyote, and gray fox showing up on a less frequent basis. The wildlife photographed over the course of the 2003 study at the SCE UC was limited to a single bobcat during the spring. No wildlife were photographed during the fall study. Mule deer, coyote, and bobcat have been documented using the SCE UC relatively consistently throughout the duration of the project, each showing up in photographs at least three out of the five years the study was conducted. Although mountain lion were determined to be in the general vicinity of the SCE UC during 2003, they have only been photographed at this UC during the 1999 study. Mountain lion

and mule deer were documented using the Windy Ridge UC in 2003. This marks the first time that a mountain lion has been photographed at this crossing. Throughout the study, the Windy Ridge UC has had relatively light wildlife traffic compared to data collected at other crossings, with only two wildlife occurrences from the beginning of the study in the spring of 1999 up through the fall 2001 study. Overall, these three UCs appear to be effectively serving as corridors for a variety of mammals. The areas they are located in are relatively secluded and thus provide a means of traversing the length of the crossing with little or no human interaction. This may be why target species such as mountain lion and bobcat are using these UCs more frequently than at the Hick's Canyon UC.

The final year of the study marked the second year that the Santiago Creek tributary and Handy Creek culverts were surveyed. The surrounding habitat and terrain of these culverts is similar to that which is found in proximity to the original four UCs, and through either scent stations or general observations, mule deer, coyote, and bobcat were determined to be in the vicinity of both. As in 2002, what appears to be the same bobcat shows up repeatedly on photographs during both the spring and fall studies at the Santiago Creek tributary. No other wildlife were photographed at this location. Bobcat were documented again this year along with a single coyote at the Handy Creek culvert. Although the surrounding habitat and wildlife in the vicinity are similar to the other UCs, these crossings are very different structurally. The overall length and constrictive nature of these culverts may deter some larger animals, such as mule deer and mountain lion from using them as corridors.

Although the study data varied from year to year, and from crossing to crossing, variations in the wildlife documented are expected as the window for data collection was limited to the two weeks the study was conducted. When considering the data collected over the duration of the five year study, it is evident that the Hick's Canyon, Oak Canyon, SCE, and Windy Ridge UCs are all functioning as linkages between habitat on both east and west sides of the SR-241 for a variety of wildlife including mule deer, coyote, and bobcat. Although on a less frequent basis, mountain lion have been documented utilizing the Oak Canyon, SCE, and Windy Ridge UCs at various times between 1999-2003. The Santiago Creek tributary and Handy Creek culverts were studied for only two years, yet it appears from data collected that they too are being used by medium sized mammals, including coyote and bobcat.

Table A - Hicks Canyon Scent Station Data

Common Name	Hicks Canyon East					
	Carnivore		Herbivore		Guzzler	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audubon's cottontail	2		5	1	1	
bobcat			1		1	
coyote				1		
grey fox			1		1	
mouse	4	1	3		4	2
mule deer				1	1	1
opossum				3		
raccoon				1		
Road Runner			2			
squirrel			2			
unidentified bird	2	1	2		2	1
unidentified frog/toad					1	
unidentified lizard			1			
woodrat			1			
Total	8	2	18	7	11	4

Common Name	Hicks Canyon West			
	Carnivore		Herbivore	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audubon's cottontail	2		6	1
bobcat	1	1	1	
grey fox		1		2
lizard	3		3	
mouse	3	2		3
Opossum	1			
Road runner	1			
squirrel			1	
unidentified frog/toad	1	1		
unidentified small bird	2		1	
unidentified snake	1			
woodrat	1		1	
Total	16	5	13	6

Table B - Oak Canyon Scent Station Data

Common Name	Oak Canyon East					
	Carnivore		Herbivore		Guzzler	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audobon Cottontail	1		2	1		
Beechy's Ground Squirrel					2	1
bobcat	3		2			
coyote		1				
grey fox		3		1		
lizard	1					1
mouse				1	2	2
rat			1		1	
skunk						1
unidentified bird	1				5	1
unidentified frog/toad	1					1
Total	7	4	5	3	10	7

Common Name	Oak Canyon West					
	Carnivore		Herbivore		Guzzler	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audobon's Cottontail					1	
bobcat	1		2		1	
coyote	1		1			
gray fox				2		
mouse		1			5	1
mule deer	1					1
Rat					2	
Snake			1			
Spotted skunk					1	
Squirrel					4	
unidentified bird			1		4	
unidentified frog/toad					1	
unidentified lizard		1	3			
Total	3	2	8	2	19	2

Table C - SCE Scent Station Data

Common Name	SCE East					
	Carnivore		Herbivore		Guzzler	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audubon's cottontail			1	2		
bobcat	3	2	3			
coyote	1		1			
gray fox		1	1		2	
mouse						
Mtn. Lion			1			
raccoon			1			
squirrel				1		
unidentified frog/toad					1	
Total	4	3	8	3	3	0

Common Name	SCE West					
	Carnivore		Herbivore		Guzzler	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003	Spring 2003	Fall 2003
bobcat	3	1	4	2		
coyote		1	1			
gray fox	3	4	2	3		
Lizard	3		2			
mouse	1			1	1	
snake	1					
unidentified bird	1					
woodrat			1			
Total	12	6	10	6	1	0

Table D - Windy Ridge Scent Station Data

Common Name	Windy Ridge East					
	Carnivore		Herbivore		Guzzler	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audubon's cottontail		2	1		2	
Beechey ground squirrel					4	
bobcat		1				
coyote		1				
lizard			1			
mouse	1	2		2	1	
striped skunk					1	
unidentified bird			1			
unidentified frog/toad	1	1				
woodrat	1		1			
Total	3	7	4	2	8	0

Common Name	Windy Ridge West					
	Carnivore		Herbivore		Guzzler	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audobon's Cottontail			1		2	
Beechey ground squirrel						
bobcat			1			
Lizard	1		1		2	
mouse			5		1	2
Mtn. Lion	1					
mule deer			1			
snake	1					
unidentified bird					1	
Total	3	0	9	1	5	2

Table E- Santiago Culvert Scent Station Data

Common Name	Santiago Culvert East			
	Carnivore		Herbivore	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audubon's Cottontail			2	
bobcat		1	1	3
coyote			2	1
mouse	1		6	1
roadrunner				
snake			1	
unidentified bird	3		6	
woodrat			1	
Total	4	1	19	5

Common Name	Santiago Culvert West			
	Carnivore		Herbivore	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audubon's Cottontail			1	
bobcat		0		
frog	1			
mouse	3	1		
roadrunner				
snake			2	
unidentified bird	1			
Total	5	1	2	0

Table F- Handy Creek Scent Station Data

Common Name	Handy Creek East			
	Carnivore		Herbivore	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audubon's Cottontail	3		2	1
bobcat		4		1
coyote		1		
lizard	1			
Long tailed weasel		1		
mouse	2		5	1
mule deer				1
unidentified bird	2			
Total	8	6	7	4

Common Name	Handy Creek West			
	Carnivore		Herbivore	
	Spring 2003	Fall 2003	Spring 2003	Fall 2003
Audubon's Cottontail	2			3
bobcat		2		
Frog			1	
ground squirrel	1			
Lizard			2	
roadrunner	1		1	
snake			1	
unidentified bird			1	
Total	4	2	6	3

Table G - Spot Light Survey Data
ETC Spring 2003 Wildlife Data

Spring 2003	Hicks Canyon		Oak Canyon		SCE UC		Windy Ridge		Handy creek		Santiago Culvert	
	East	West	East	West	East	West	East	West	East	West	East	West
great horned owl												1
barn owl												
cottontail												
mouse												
gray fox												
coyote												
bobcat												
mule deer									1			
Total	0	0	0	0	0	0	0	0	0	1	0	0

ETC Fall 2003 Wildlife Data

Fall 2003	Hicks Canyon		Oak Canyon		SCE UC		Windy Ridge		Handy creek		Santiago Culvert	
	East	West	East	West	East	West	East	West	East	West	East	West
great horned owl												1
barn owl												
cottontail												
mouse												
gray fox												
coyote												
bobcat												
mule deer												
bird												
Total	0	0	0	0	0	0	0	0	0	1	1	0

Table H - Photo Station Data

Spring 2003

Hicks Canyon Undercrossing

Date	Time	East End	West End
5/30/2003	21:59		Coyote
5/30/2003	22:39		Mule Deer
6/2/2003	4:42	Coyote	
6/2/2003	5:07		Coyote
6/2/2003	5:08	Mule Deer	
6/5/2003	15:37	Coyote	
6/5/2003	15:46	Coyote	
6/6/2003	2:46	Coyote	
6/6/2003	3:13	Coyote	
6/6/2003	23:49	Coyote	

Oak Canyon Undercrossing

Date	Time	East End	West End
6/4/2003	2:23		Coyote

Windy Ridge Undercrossing

Date	Time	East End	West End
5/31/2003	0:07	Mountain Lion	
5/31/2003	0:12	Mountain Lion	
6/3/2003	22:16	Mountain Lion	

SCE Undercrossing

Date	Time	East End	West End
6/2/2003	3:04	Bobcat	
6/4/2003	16:52	Bird	

Fall 2003

Hicks Canyon Undercrossing

Date	Time	East End	West End
11/3/2003	19:37	Eyeshine	
11/4/2003	1:39	Mule Deer	
11/4/2003	1:56	Eyeshine	
11/5/2003	8:41	Mule Deer	
11/7/2003	6:05	Mule Deer	
11/3/2003	??		Mule Deer
11/4/2003	??		Mule Deer
11/4/2003	??		Coyote
11/7/2003	??		Mule Deer
11/7/2003	??		Coyote
11/8/2003	??		Mule Deer
11/9/2003	??		Mule Deer
#####	**		Coyote

**Data Loss Due to Camera Malfunction

Oak Canyon Undercrossing

Date	Time	East End	West End
11/5/2003	0:12	Coyote	
11/5/2003	3:38	Coyote	
11/5/2003	3:40		Coyote
11/8/2003	0:26	Coyote	
#####	23:56		Coyote
**	**		Mule Deer

**Data Loss Due to Camera Malfunction

Windy Ridge Undercrossing

Date	Time	East End	West End
11/6/2003	18:34		Mule Deer
11/6/2003	18:38		Mule Deer
11/6/2003	18:42		Eyeshine
11/6/2003	18:46		Mule Deer
11/6/2003	18:48	Mule Deer	
11/6/2003	18:49		Mule Deer

SCE Undercrossing

Date	Time	East End	West End
			No Observations

Table H - Photo Station Data (continued)

Spring 2003

Santiago Culvert			
Date	Time	East End	West End
5/29/2003	23:09		Bobcat
6/1/2003	6:48		Bobcat
6/1/2003	21:59		Bobcat
6/2/2003	14:36		Bobcat
6/2/2003	15:32		Bobcat
6/3/2003	0:56		Bobcat
6/3/2003	7:39		Bobcat
6/4/2003	5:23		Bobcat
6/5/2003	5:43	Bobcat	

Fall 2003

Santiago Culvert			
Date	Time	East End	West End
11/3/2003	14:57	Bobcat	
11/4/2003	19:31	Bobcat	
11/5/2003	4:53	Bobcat	
11/6/2003	18:09	Bobcat	
11/6/2003	20:40	Bobcat	
11/9/2003	5:40	Bobcat	
11/9/2003	**		Bobcat

**Data Loss Due to Camera Malfunction

Handy Canyon

Date	Time	East End	West End
6/1/2003	7:30	Bird	
5/30/2003	14:41	Bird	
5/31/2003	13:54		Bobcat
6/1/2003	3:25		Bobcat
6/1/2003	21:07		Bobcat
6/3/2003	0:17		Bobcat
6/3/2003	0:22		Bobcat
6/4/2003	16:48		Bobcat

Handy Canyon

Date	Time	East End	West End
11/3/2003	10:55		Bobcat
11/5/2003	23:23		Bobcat
11/5/2003	23:29		Bobcat
11/6/2003	8:28		Bobcat
11/6/2003	19:33		Bobcat
11/7/2003	0:56		Coyote
11/7/2003	0:59		Coyote
11/7/2003	1:02	Coyote	

Table 1 - ETC Spring to Fall 2003 General Wildlife and Wildlife Sign Observations

Scientific Name	Common Name	Undercrossing				
		Hicks Canyon	Oak Canyon	SCE	Windy	Handy Creek/Santiago Tributary
<i>Sylvilagus audubonii</i>	Audubon's cottontail					T
<i>Felis concolor</i>	Mountain Lion		T		T	
<i>Felis rufus</i>	bobcat					T
<i>Canis latrans</i>	coyote	T		T		S, T
<i>Odocoileus hemionus</i>	mule deer	T	DO, T		DO, T	T
<i>Urocyon cinereoargenteus</i>	gray fox			T		T
<i>Didelphis virginiana</i>	opossum	T				

D/O - Direct Observation

T - Tracks

S - Scat

SC - Scent

Other wildlife species observed in the area

<i>Reptilia</i>	Reptiles
<i>Iguanidae</i>	Iguanids
<i>Sceloporus occidentalis</i>	western fence lizard
<i>Anguidae</i>	Alligator Lizards
<i>Gerrhonotus multicarinatus</i>	southern alligator lizard

<i>Aves</i>	Birds
<i>Accipitridae</i>	Kites, Hawks, Eagles, and Ospreys
<i>Buteo jamaicensis</i>	kestrel
<i>Odontophoridae</i>	New World Quail
<i>Callipepla californica</i>	California quail
<i>Columbidae</i>	Pigeons and Doves
<i>Zenaidura macroura</i>	mourning dove
<i>Cuculidae</i>	Cuckoos and Roadrunners
<i>Geococcyx californianus</i>	greater roadrunner
<i>Trochilidae</i>	Hummingbirds
<i>Calypte anna</i>	Anna's hummingbird
<i>Tyrant Flycatchers</i>	Tyrannidae
<i>Sayornis nigricans</i>	black phoebe
<i>Corvidae</i>	Jays, Magpies, and Crows
<i>Aphelocoma californica</i>	western scrub-jay
<i>Corvus corax</i>	common raven
<i>Hirundinidae</i>	Swallows
<i>Petrochelidon pyrrhonota</i>	cliff swallow
<i>Aegithalidae</i>	Bushtits
<i>Psaltriparus minimus</i>	bushtit
<i>Muscicapidae</i>	Kinglets and Gnatcatchers
<i>Polioptila californica californica</i>	Coastal California gnatcatcher