FTC-North
Wildlife Undercrossing Reports

WILDLIFE MONITORING

FOOTHILL TRANSPORTATION CORRIDOR

FIRST ANNUAL REPORT

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LSA Project No. TCA930

LSA

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EXECUTIVE SUMMARY

During the first year of a five year study, LSA Associates, Inc. (LSA) documented the use of three wildlife undercrossings (UC) along the northern leg of the Foothill Transportation Corridor. Those crossings include Tijeras UC, Chiquita Creek UC, and the 54" culvert. 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 November 7 through November 13, 1999, and again from May 4, 2000, through May 11, 2000.

During this study, a number of mammals ranging from racoon, bobcat, coyote, and deer were observed in the area as well as using some of the crossings. The Tijeras Creek UC and Chiquita Creek UC were utilized the most, with most of the activity occurring during the spring season. Although this is only the first year of the study, preliminary results are promising with wildlife usage recorded at Tijeras and Chiquita crossings. Due to a possible camera malfunction, wildlife usage at the 54" culvert is inconclusive. More study is required for a more conclusive analysis.

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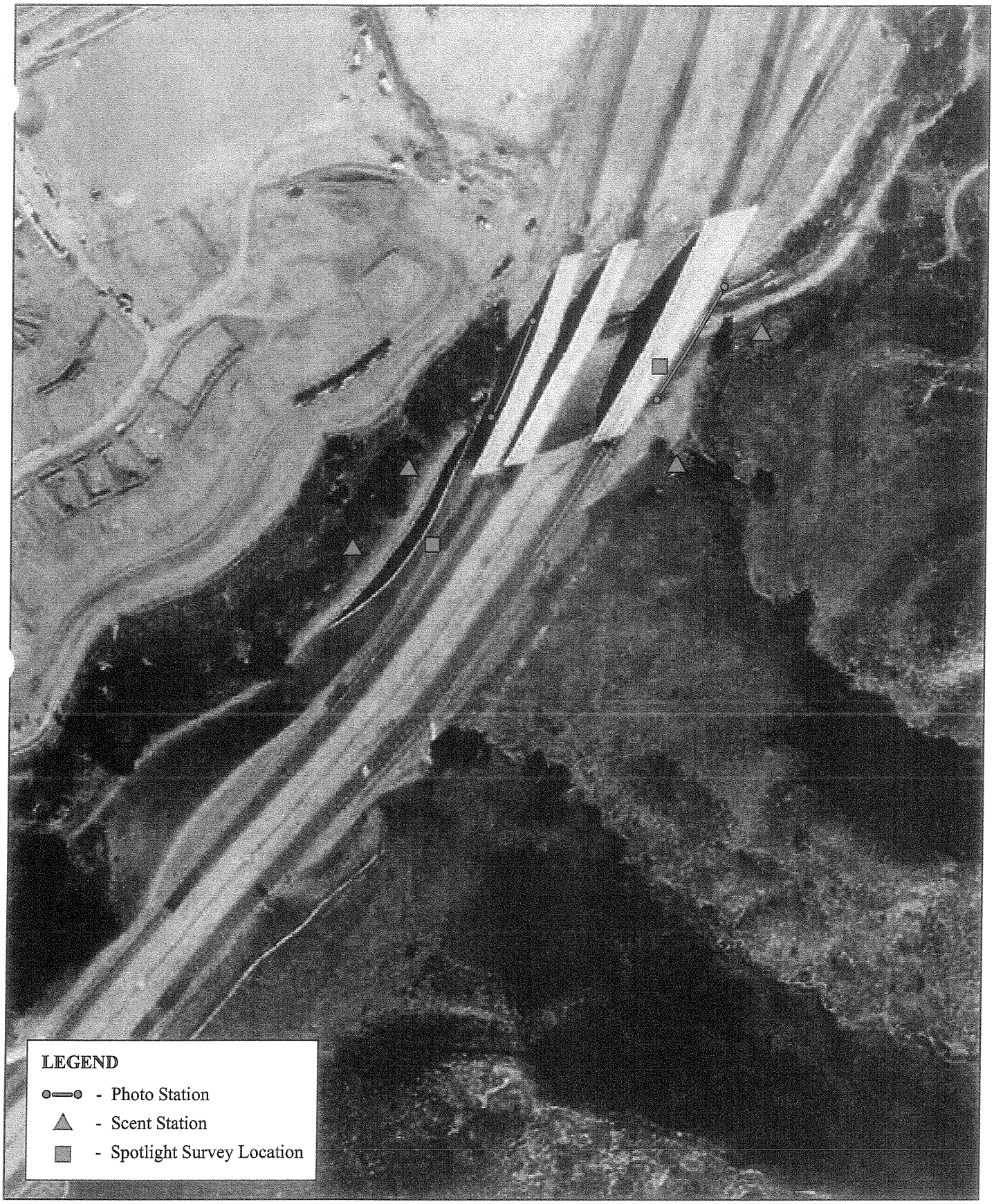
INTRODUCTION

This is the first annual report of a five year study conducted by LSA Associates, Inc. (LSA) documenting wildlife usage at three wildlife undercrossings (UC) along the northern segment of the Foothill Transportation Corridor (FTC) (Figure 1), which opened in the fall of 1999. Listed by location, from north to south, the three wildlife UCs include Tijeras Creek UC, Chiquita UC, and a 54 inch culvert. The purpose of this study to document usage of these undercrossings to ensure that they are functioning as designed. These studies are funded by the Transportation Corridor Agencies (TCA) as required in the Section 7 Biological Opinion on the Proposed Foothill Transportation Corridor North (FTCN), Antonio Parkway to Oso Parkway Section, Orange County (1-6-96-F-6).

STUDY AREA

The wildlife movement study area includes three wildlife UCs along the north segment of the FTC stretching from State Route (SR) 133 at the north to Oso Parkway at the south, in the City of Rancho Santa Margarita, California. The study also includes the surrounding areas on each side of the crossing. In general, Tijeras Creek UC and Chiquita UC were designed to allow the passage of large to medium wildlife species such as mountain lions, mule deer, and coyotes, and the 54 inch culvert was designed to allow the passage of medium to small mammals such as coyotes, bobcats, and small rodents. The UCs provide linkage from the southern end of the O'Neill Regional Park to the Cleveland National Forest via the Chiquita Preserve and General Thomas F. Riley Wilderness Park. A fence runs along the FTCN right-of-way to help funnel wildlife into the crossings as opposed to crossing over the road through traffic.

The Tijeras Creek UC is the largest of the three crossings and is located approximately 0.2 mile south of the Antonio Parkway overpass (Figure 2). The Tijeras Creek UC is a relatively large bridge spanning approximately 400 feet and supported by a number of concrete columns. The Tijeras Creek UC is made up of three bridges, including northbound lanes, southbound lanes, and the Antonio Parkway southbound on-ramp with 60 foot and 20 foot gaps between the bridges, respectively. The combination of the large span and the gaps between the bridges allows plenty of light to enter, giving the crossing an overall open feeling. Under the bridge, there is a variety of topography including a 15 foot wide trail, Tijeras Creek, and an energy dissipater. Although the creek is only approximately ten feet in width, the highly incised creek channel is approximately 30 feet in width with a ten foot vertical bank on the south. There is also a medium size concrete energy dissipater and associated riprap that drains into Tijeras Creek below the Antonio Parkway south bound bridge. Tijeras Creek flows through the crossing from east to west. The upstream side of the UC has a wide opening with gradual slopes and opens up to a large expanse of canyons and ridges bounded by the Coto De Caza development. In contrast is the narrow, steep sided canyon on the downstream side with a vertical wall bounded by the FTCN and residential development in the City of Rancho Santa Margarita until it drains into the Arroyo Trabuco. Upstream, Tijeras Creek begin at a large concrete box culvert approximately 0.4 mile upstream. A corridor of oak woodland runs along the creek surrounded by coastal sage scrub (CSS) and grassland. The approach to the crossing is easily traversed along the natural drainage or along the dirt road.



4/12/01(TCA930)

Figure 2

N

LSA

No Scale

Tijeras Creek
Wildlife Undercrossing

The Chiquita UC is located approximately 1.5 miles south of the Antonio Parkway overpass and is composed of two bridges (northbound and southbound lanes) spanning approximately 120 feet across the top of the UC with a 25 foot road across the bottom and steep earthen slopes on either side (Figure 3). The crossing is relatively narrow and opens up to the head of a steep canyon wall covered with CSS and a trail meandering up the canyon to the east and to a wide canyon with a paved road leading down to a community baseball park before it drains into Tijeras Creek west. In addition, the canyon and adjacent knolls are dominated by grassland vegetation with CSS on the slope adjacent to the road. The crossing is easily accessed by roads and trails that lead up to the crossing.

The 54" culvert is located 0.7 mile north of the Oso Parkway termination of the FTCN. The crossing is composed of a 54 " corrugated metal pipe (CMP) that crosses the 390 foot span of the FTCN road profile. The crossing opens up to a grassland meadow to the west surrounded by steep slopes of CSS to the west, a small riprap pad surrounded by a wide grassland valley to the east, and CSS covering the distant ridges. A small, ephemeral streambed (Cañada Chiquita) meanders through the center of the valley. The topography approaching the access to the crossing at either side is relatively gentle and easily approached.

METHODS

In the vicinity of each wildlife UC, 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 UCs. Surveys were conducted November 7 through November 13, 1999, and again on May 4, 2000, through May 11, 2000. During the five year study, the wildlife surveys will be conducted twice a year, in the fall and spring 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 UCs. Two scent stations were placed at each end of the three UCs, for a total of 12 scent stations, as shown in Figures 2 through 4. 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 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.

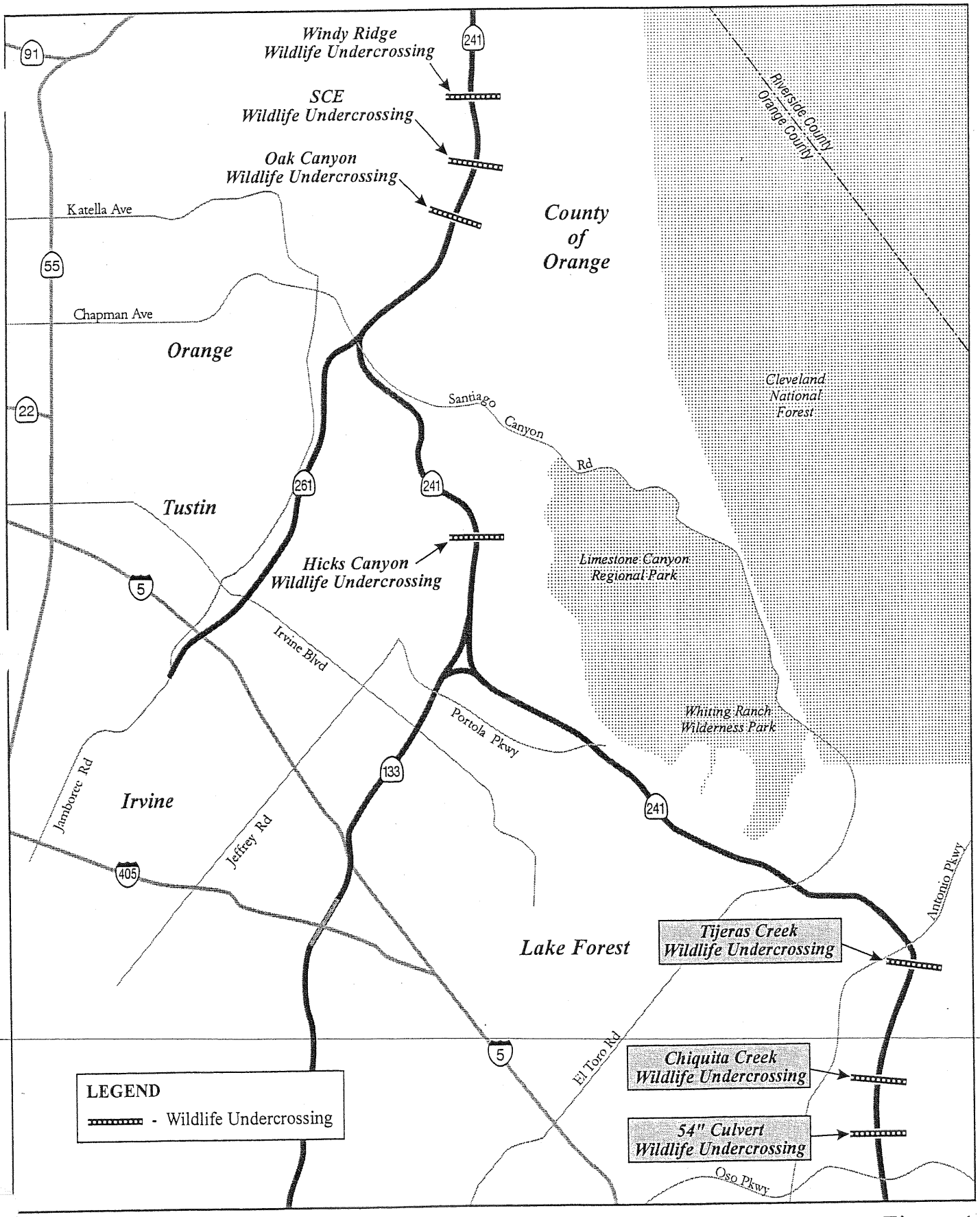


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Figure 1

N

LSA

No Scale

Wildlife Crossing Locations

4/12/01(TCA930)

Figure 3

N

LSA

No Scale

Chiquita Creek
Wildlife Undercrossing

4/12/01(TCA930)

Figure 4

N

LSA

No Scale

54" Culvert
Wildlife Undercrossing

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.

Automated Photo Stations

Automated photo stations (Trail Master Infrared Trail Monitors) were set up at each end of the wildlife UCs, as shown in Figures 2 through 4. Most of the UCs could be covered with one photo station spanning the bottom of the UC on each end; however, the uneven terrain and great expanse of the Tijeras Creek UC required a total of 11 photo stations (seven active photo stations and four passive photo stations). Each active photo 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). 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. In addition, passive photo stations were used within the Tijeras Creek channel because of the steep and highly variable terrain. The passive photo stations consisted of a sensing unit that sensed heat and movement in a detection area in the shape of a fan. The sensing unit was placed on its side so that the area of detection could cover a variety of terrain instead of horizontal area. The camera was connected to the passive sensing unit and was set up similar to that of the active photo station. The passive photo stations were place on both sides of the creek and at the east and west side of the UC.

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

For additional information on animals in the immediate vicinity of each UC, spotlight surveys were conducted adjacent to each of the bridges overlooking each of the wildlife UCs. 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.

A layer of DE was placed at the entrance to the 54 inch culvert on both sides to provide a duplicate method of recording activity. The tracks recorded in the DE were smoothed with a trowel each day.

RESULTS

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

DISCUSSION

Data from the scent stations, spotlight surveys, and general wildlife observations show that there is a wide variety of wildlife in the vicinity of each of the three crossings and the crossings were used by a number of these animals, including mule deer, bobcat, coyote, racoon, and striped skunk (Figure 5). Tijeras Creek and Chiquita UC were the most active of the three crossings, with a large number of mule deer and coyote using the crossings. Substantially more animals were recorded by the photo stations during the spring of 2000 than during the previous fall. This may be due to seasonal variations in feeding patterns or the animals in the area becoming conditioned to use the UC on a more regular basis. During spring 2000, due to the camera malfunction, no animals were recorded at the west end of the Chiquita UC; however, data were collected at the east end of the crossing. Only one bobcat and one unidentified mammal were recorded at the 54" culvert. The 54 " culvert seems to be restrictive, due to the small size and long traverse.

Although the scent stations attracted a wide variety of animals, only a few of those recorded were the targeted medium to large mammals. Most of the animals recorded seem to be those that do not have a large range and would not necessarily use the crossings, such as Audubon cottontail, small rodents, and miscellaneous birds. The only target species recorded at the scent stations were bobcat and racoon.

Table A - Tijeras Creek Scent Station Data

	Tijeras Creek North			
	Carnivore		Herbivore	
Common Name	**Fall 1999**	**Spring 2000**	**Fall 1999**	**Spring 2000**
unidentified lizard			1	
unidentififed medium	1			
Audubon's cottontail		2	4	
unidentified rodent	3	1		
raccoon			1	
bobcat		1		
dog		1		
Total	4	5	6	0

	Tijeras Creek South			
	Carnivore		Herbivore	
Common Name	**Fall 1999**	**Spring 2000**	**Fall 1999**	**Spring 2000**
unidentified lizard				1
unidentified small bird		1		
Audubon's cottontail		1	1	2
woodrat			1	
unidentified rodent				2
dog		1		
Total	0	3	2	5

Table B - Chiquita Canyon Scent Station Data

	Chiquita Canyon North			
	Carnivore		Herbivore	
Common Name	**Fall 1999**	**Spring 2000**	**Fall 1999**	**Spring 2000**
unidentified toad		1		
unidentified small bird		1		
Audubon's cottontail		1	1	
woodrat	1			
unidentified rodent	2	5	3	3
Total	3	8	4	3

	Chiquita Canyon South			
	Carnivore		Herbivore	
Common Name	**Fall 1999**	**Spring 2000**	**Fall 1999**	**Spring 2000**
unidentified small bird		1	1	
unidentified medium bi	1			
Audubon's cottontail	2	2	6	5
woodrat			1	
unidentified rodent		7	1	5
dog			1	
Total	2	10	10	10

Table C - 54" Culvert Scent Station Data

	54" Culvert North			
	Carnivore		Herbivore	
Common Name	**Fall 1999**	**Spring 2000**	**Fall 1999**	**Spring 2000**
unidentified toad		2		
unidentified small bird	3			
unidentified large bird	1			
Audubon's cottontail			1	
unidentified rodent	3	4	1	2
bobcat	1			
Total	8	6	2	2

	54" Culvert South			
	Carnivore		Herbivore	
Common Name	**Fall 1999**	**Spring 2000**	**Fall 1999**	**Spring 2000**
unidentified frog				1
unidentified toad				1
roadrunner				1
unidentified bird				2
unidentified rodent	2		5	2
Total	2	0	5	7

Table D - Foothill North Spotlight Survey Data 1999-2000

	Chiquita Canyon		54" Culvert		Tijeras Creek	
Fall 1999	**North**	**South**	**North**	**South**	**North**	**South**
Audubon's cottontail	2	2			1	
mule deer		2				
unidentified large mammal			1			
Total	2	4	1	0	1	0

	Chiquita Canyon		54" Culvert		Tijeras Creek	
Spring 2000	**North**	**South**	**North**	**South**	**North**	**South**
owl			1			
unidentified bird					2	
Audubon's cottontail	2					
unidentified eyeshine			4		5	
deermouse			1			
mule deer		1	2			
unidentified medium mam	1		1			
Total	3	1	9	0	7	0

Table E - Photo Station Data

Winter 1999

Chiquita Canyon Under Crossing

Date	Time	East End	West End
11/10/99	0512		mule deer
11/10/99	1721	mule deer	
11/12/99	1706	mule deer	
11/14/99	0712		mule deer
11/14/99	0714	mule deer	

Spring 2000

Chiquita Canyon Under Crossing

Date	Time	East End	West End
4/6/00	0040	coyote	
4/6/00	0042	coyote	
4/6/00	0346	3 mule deer	
4/6/00	1749	mule deer	
4/7/00	0550	2 mule deer	
4/7/00	1828	mule deer	
4/7/00	1940	mule deer	
4/7/00	2006	mule deer	
4/7/00	2250	mule deer	
4/10/00	1824	mule deer	
4/11/00	0451	coyote	

Winter 1999

Tijeras Creek Under Crossing

Date	Time	East End	West End
11/7/00	1919		unidentified
11/10/99	1128	reat blue heron	
11/11/99	2332		coyote
11/11/99	2343	coyote	
11/14/00	0045		coyote

Spring 2000

Tijeras Creek Under Crossing

Date	Time	East End	West End
4/5/00	?*		2 raccoons
4/7/00	1939	unidentified	
4/7/00	0054	coyote	
4/7/00	1939		mule deer
4/7/00	2011		striped skunk
4/7/00	2012		mule deer
4/7/00	2012	mule deer	
4/7/00	2015	mule deer	
4/8/00	0245	coyote	
4/8/00	0314	coyote	
4/8/00	0316	coyote	
4/9/00	1213		California quail

?*-time unknown due to data collector malfunction

Winter 1999

54' Culvert

Date	Time	East End	West End

Spring 2000

54' Culvert

Date	Time	East End	West End
4/8/00	2256	bobcat	
4/10/00	0208		unidentified

Table F - General Wildlife and Wildlife Sign Observations
Foothill North Wildlife Data 1999-2000

		Undercrossing		
Scientific Name	**Common Name**	**Chiquita Canyon**	**54" Culvert**	**Tijeras Creek**
Canis latrans	coyote	D/O,S	D/O	
Polioptila californica californica	California gnatcatcher	D/O	D/O	
Sylvilagus audubonii	Audubon's cottontail	D/O,S	D/O,S	D/O,S
Felis rufus	bobcat	D/O	D/O	
Odocoileus hemionus	mule deer	D/O,S	D/O	
	mouse	T,S		S
Neotoma sp.	woodrat	T,S	T,S	T,S

D/O - Direct Observation
T - Tracks
S - Scat
SC - Scent

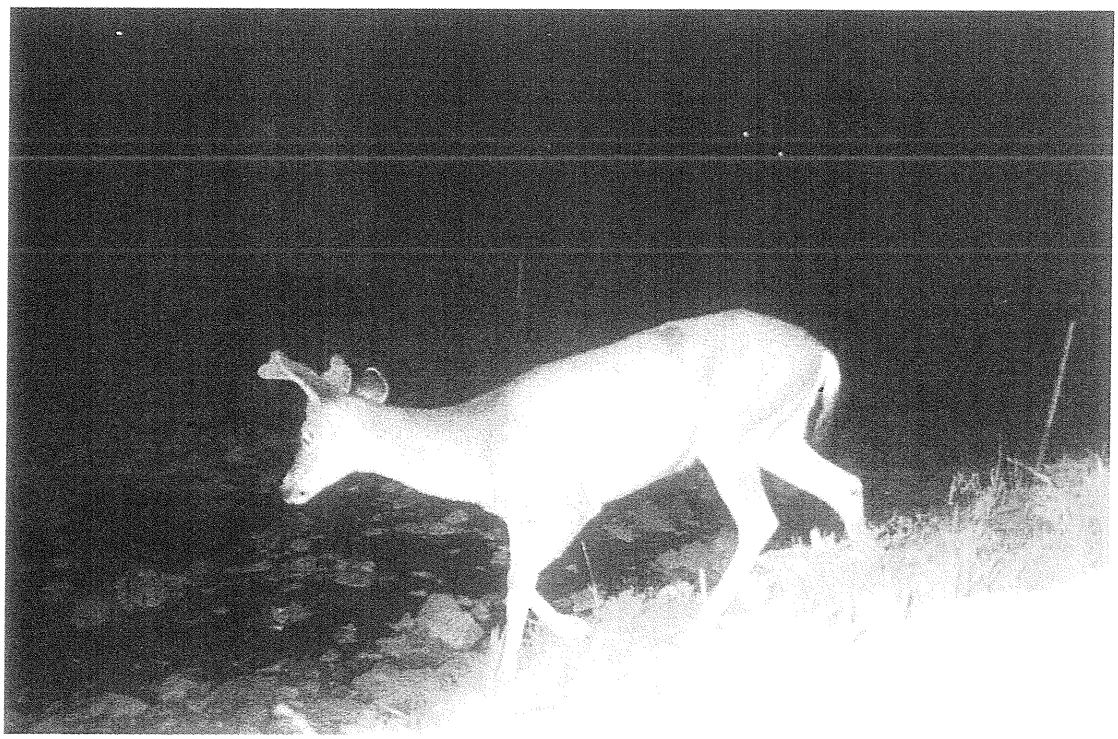
Other Wildlife Species Observed in the Area

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
Flaucopsyche lygdamus	southern blue

Reptilia	**Reptiles**
Iguanidae	**Iguanids**
Sceloporus occidentalis	western fence lizard
Uta stansburiana	side-blotched lizard
Anguidae	**Alligator Lizards**
Gerrhonotus multicarinatus	southern aligator 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**

A coyote, apparently startled by the flash, moves through the Tijeras Creek undercrossing.



A mule deer visits Tijeras Creek under the 241/Tijeras Creek overpass.

4/18/01(TCA930)

Figure 5

LSA

Site Photos

The spotlight surveys found primarily mule deer in the vicinity of the UC, and primarily at Chiquita UC and 54" UC. This may be due to the fact that the areas directly adjacent to these crossings are more open, as opposed to the heavy oak tree canopy and narrow canyon of the Tijeras Creek UC. The number and diversity of animals recorded in the vicinity of the crossing by the scent stations, spotlight survey, and general observations does not appear to correlate with that recorded using the UC by the photo stations. The photo stations recorded a higher number of coyote, mule deer, and bobcat than the other methods. This may indicate that the medium to large mammals using the UC are using them more for movement and may not spend much time investigating the scent stations in the vicinity. In addition, a large number of hikers, bikers, and horse back riders (and associated dogs) use the UC for recreational purposes (Figure 6). This activity may deter the larger animals from spending time investigating around the UC.

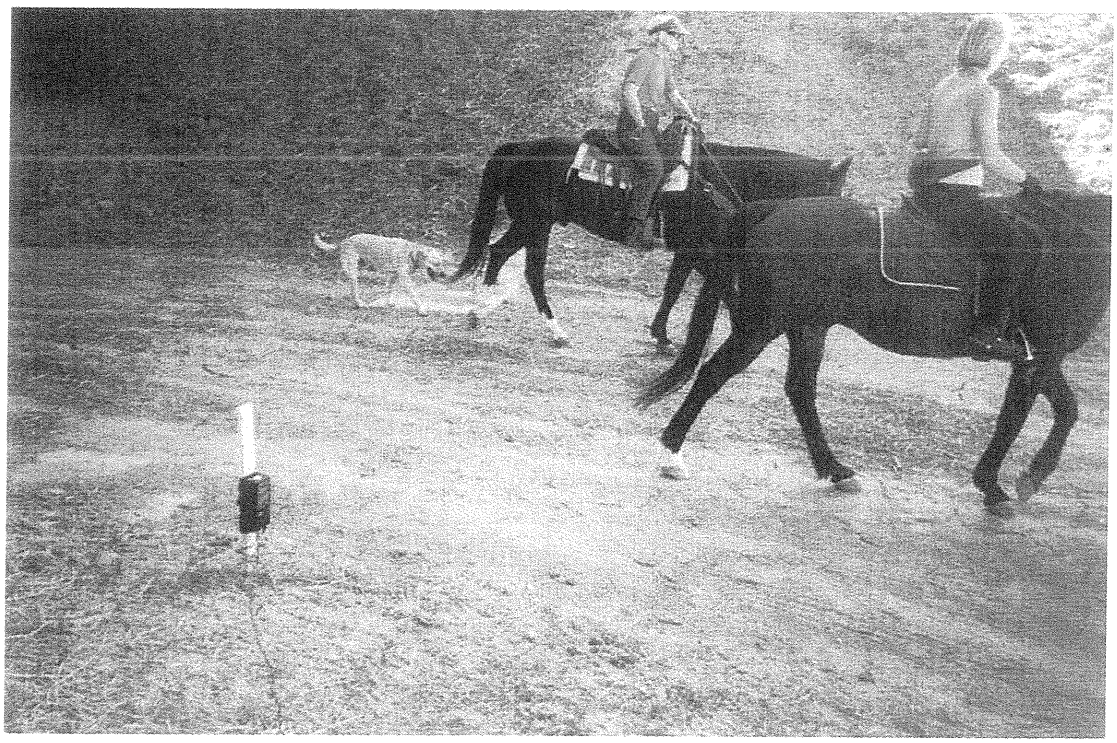
Although two animals (one bobcat and one unidentified) were recorded at the 54 inch culvert, neither one of the animals traversed the entire crossing. The bobcat was observed during the spotlight survey and was apparently startled by either the camera flash or the spotlight surveyor and retreated to a nearby drainage in Canada Chiquita. This individual may have returned later, but could not be identified in the photo. There were several nights and mornings with heavy fog that seemed to obscure the photos. In addition, a layer of DE was placed at the entrance of each end of the 54 inch culvert to record tracks entering and exiting the culvert. The DE recorded a large number of mouse tracks (too many to count) traveling back and forth at the entrance. It is unclear whether the mice traverse the entire length of the culvert.

CONCLUSION AND RECOMMENDATIONS

Overall, the first year's results indicate that the wildlife UCs are being used by a variety of large to medium mammals, including mule deer, coyote, bobcat, racoon, and striped skunk. Since trails run through the Tijeras Creek and Chiquita UC as part of the southern end of the O'Neill Regional Park, human activity (i.e., hikers, bikers, horseback riders, and accompanying dogs) is relatively common and may be a factor in the amount of wildlife usage in the vicinity. However, the amount of human activity is independent of the design of the UC. Although several animals were recorded at the 54" culvert, there is not yet evidence that they traverse the entire crossing. Wildlife activity through the UCs may increase in subsequent years due to the following factors: 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.

Both the Tijeras Creek and Chiquita UCs are functioning by providing wildlife linkage underneath the FTCN. It is still unclear whether or not the 54" culvert is large enough to provide linkage due to the lack of evidence. More study is required to determine long-term patterns. Results of the first year's survey are promising, and results from subsequent years' surveys will allow a more complete summary of wildlife use of UCs on the FTCN.

Two racoons crossing under the 241 at Tijeras Creek.



Equestrians, pedestrians, cyclists and their pets frequent the undercrossings (Chiquita Canyon).

4/18/01(TCA930)

Figure 6

LSA

Site Photos

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

WILDLIFE MONITORING

FOOTHILL TRANSPORTATION CORRIDOR

SECOND ANNUAL REPORT

Fall 2000 - Spring 2001

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June 17, 2002

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EXECUTIVE SUMMARY

During the second year of a three year study, LSA Associates, Inc. (LSA) documented the use of three wildlife undercrossings (UC) along the northern leg of the Foothill Transportation Corridor. Those crossings include Tijeras UC, Chiquita Creek UC, and the 54 inch culvert. 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 documented wildlife that actually used the crossings. The study was conducted from November 1 through 8, 2000, and again from April 27 through May 4, 2001.

During this study, a number of mammals ranging from bobcat, coyote, and deer were observed in the area as well as using some of the crossings. The Tijeras Creek UC and Chiquita Creek UC were utilized the most, with most of the activity occurring during the spring season. Although this is only the second year of the study, preliminary results are promising, with wildlife usage recorded at Tijeras and Chiquita crossings. Although animals were photographed at the entrance of the 54 inch culvert, no animals were documented traversing the entire length of the culvert. More study is required for a more conclusive analysis.

INTRODUCTION

This is the second annual report of a three year study conducted by LSA Associates, Inc. (LSA) documenting wildlife usage at three wildlife undercrossings (UC) along the northern segment of the Foothill Transportation Corridor (FTC) (Figure 1), which opened in the fall of 1999. Listed by location from north to south, the three wildlife UCs include Tijeras Creek UC, Chiquita UC, and a 54 inch culvert. The purpose of this study is to document usage of these undercrossings and to ensure that they are functioning as designed. These studies are funded by the Transportation Corridor Agencies (TCA) as required in the Section 7 Biological Opinion on the Foothill Transportation Corridor North (FTCN), Antonio Parkway to Oso Parkway Section, Orange County (1-6-96-F-6).

STUDY AREA

The wildlife movement study area includes three wildlife UCs along the north segment of the FTC stretching from State Route (SR) 133 at the north to Oso Parkway at the south, in the City of Rancho Santa Margarita, California. The study also includes the surrounding areas on each side of the crossing. In general, Tijeras Creek UC and Chiquita UC were designed to allow the passage of large to medium wildlife species such as mountain lions, mule deer, and coyotes, and the 54 inch culvert was designed to allow the passage of medium to small mammals such as coyotes, bobcats, and rodents. The UCs provide linkage from the southern end of O'Neill Regional Park to the Cleveland National Forest via the Chiquita Preserve and General Thomas F. Riley Wilderness Park. A fence runs along the FTCN right-of-way to help funnel wildlife into the crossings as opposed to crossing over the road through traffic.

The Tijeras Creek UC is the largest of the three crossings and is located approximately 0.2 mile south of the Antonio Parkway overpass (Figure 2). Tijeras Creek flows through the crossing from east to west. Upstream (east) from the crossing, Tijeras Creek begins at a large concrete box culvert approximately 0.4 mile upstream. A corridor of oak woodland runs along the creek surrounded by coastal sage scrub (CSS) and grassland. The upstream side of the UC has a wide opening with gradual slopes and opens up to a large expanse of canyons and ridges bounded by the Coto De Caza development. In contrast, the downstream side is a narrow, steep sided canyon bounded by the FTCN on one side and residential development in the City of Rancho Santa Margarita on the other. West of the UC, the riparian corridor continues in this constricted canyon until it drains into the Arroyo Trabuco. The Tijeras Creek UC, itself, is a set of large bridges spanning approximately 400 feet and supported by a number of concrete columns. It is made up of three bridges, including northbound lanes, southbound lanes, and the Antonio Parkway southbound on-ramp with 60 foot and 20 foot gaps between the bridges, respectively. The combination of the large span and the gaps between the bridges allows plenty of light to enter, giving the crossing an overall open feeling. Under the bridge, there is a variety of topography including a 15 foot wide trail, Tijeras Creek, and an energy dissipater. Urban runoff flows from the medium size concrete energy dissipater and associated riprap drain into Tijeras Creek below the southbound Antonio Parkway bridge. Although the creek is only approximately ten feet in width, the highly incised creek channel is approximately 30 feet in width with a ten foot vertical bank on the south. The approach to the crossing is easily traversed along the natural drainage or along the dirt road.

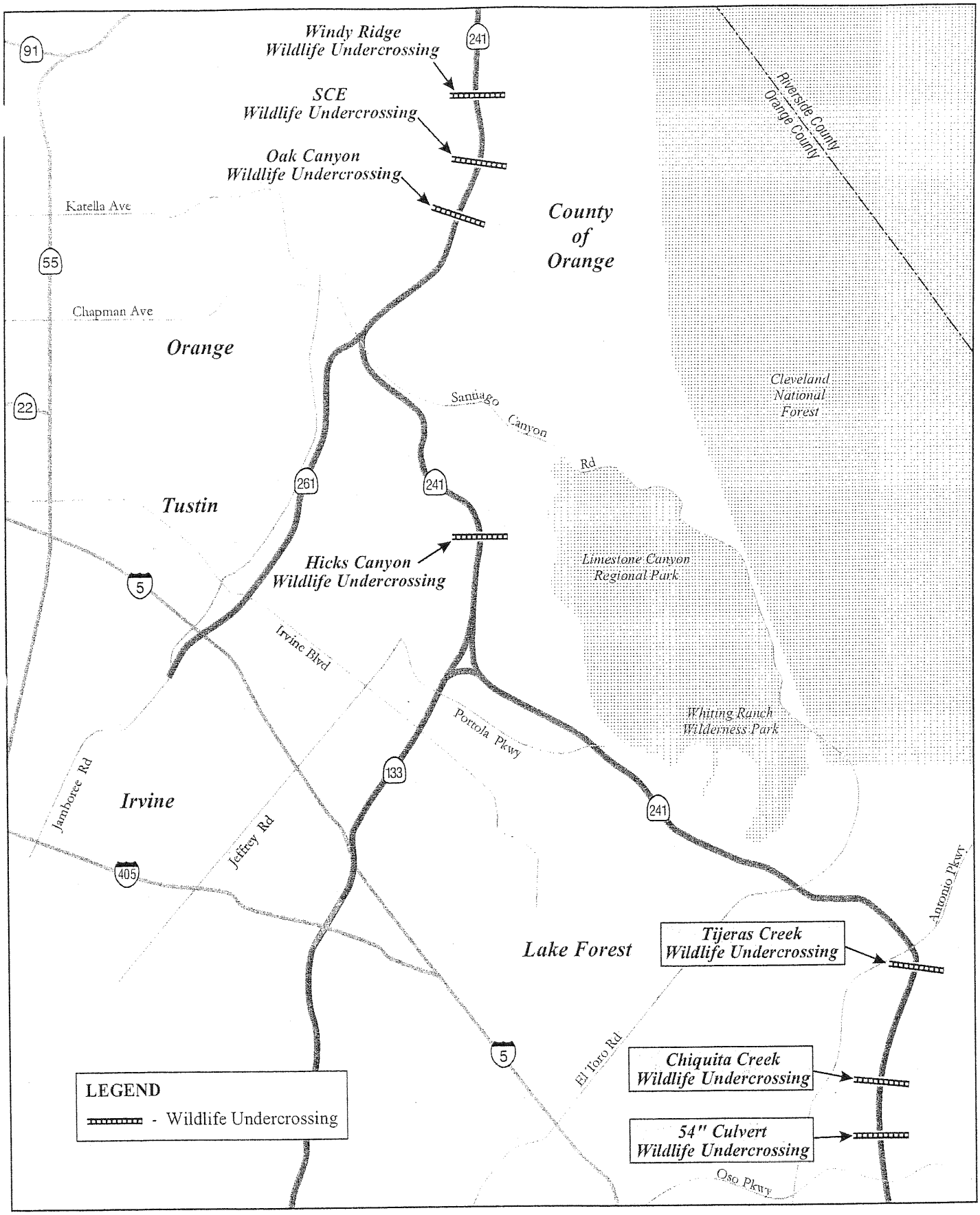

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Figure 1

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Wildlife Crossing Locations

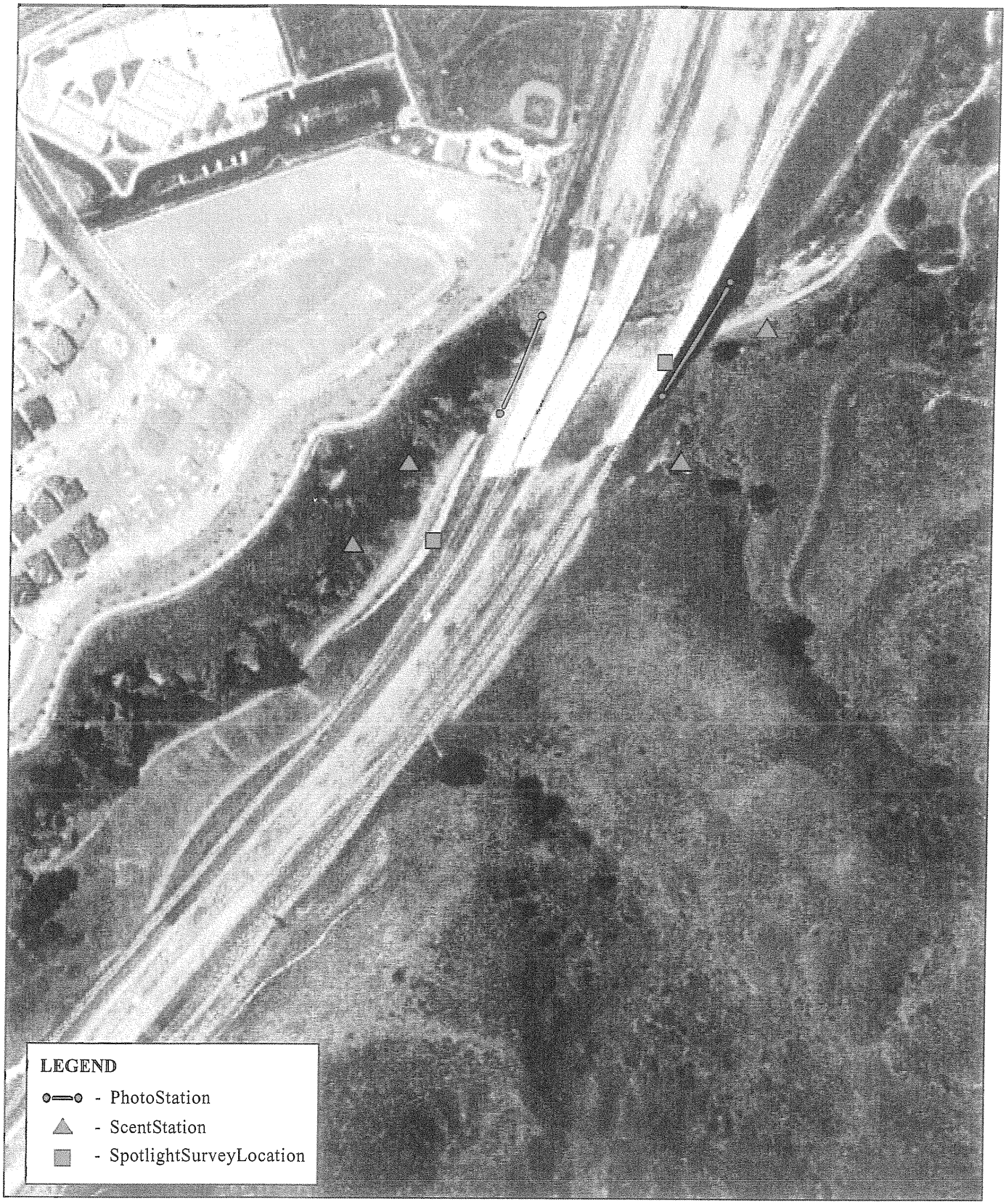

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Figure 2

Tijeras Creek
Wildlife Undercrossing

The Chiquita UC is located approximately 1.5 miles south of the Antonio Parkway overpass and is composed of two bridges (northbound and southbound lanes) spanning approximately 120 feet across the top of the UC with a 25 foot road across the bottom and steep earthen slopes on either side (Figure 3). The crossing is narrow and opens up to the head of a steep canyon wall covered with CSS and a trail meandering up the canyon to the east and to a wide canyon with a paved road leading down to a community baseball park before it drains into Tijeras Creek to the west. The canyon and adjacent knolls are dominated by grassland vegetation with CSS on the slope adjacent to the road. The crossing is easily accessed by roads and trails that lead up to the crossing.

The 54 inch culvert is located 0.7 mile north of the Oso Parkway terminus of the FTCN. The crossing is composed of a 54 inch diameter corrugated metal pipe that crosses the 390 foot span of the FTCN road profile. To the west, the crossing opens up to a grassland meadow surrounded by steep slopes of CSS; to the east, the crossing leads to a small riprap pad surrounded by a wide grassland valley with CSS covering the distant ridges. A small, ephemeral streambed (Cañada Chiquita) meanders through the center of the valley. The topography approaching the access to the crossing at either side is gentle, and the crossing is easily accessible.

METHODS

In the vicinity of each wildlife UC, 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 UCs. Surveys were conducted November 1 through 8, 2000, and again on April 27 through May 4, 2001. During the three year study, the wildlife surveys will be conducted twice a year, in the fall and spring of each year through spring, 2002.

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 of their presence. These data will help to get an overall sense of the wildlife population that can then be compared with actual wildlife usage of the UCs. Two scent stations were placed at each end of the three UCs, for a total of 12 scent stations, as shown in Figures 2 through 4. 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 1x3 inch by three 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.

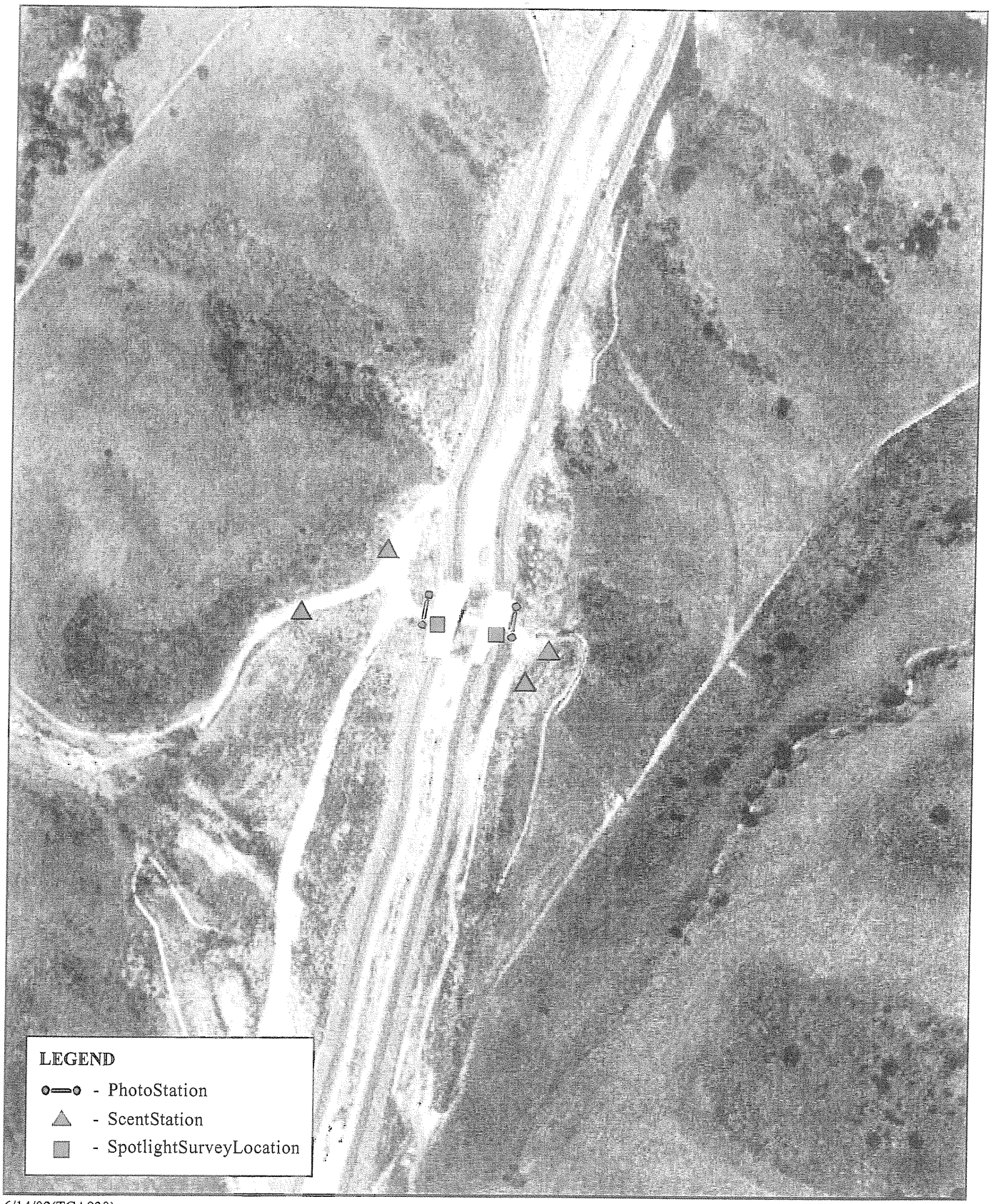

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Figure 3

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Chiquita Creek
Wildlife Undercrossing

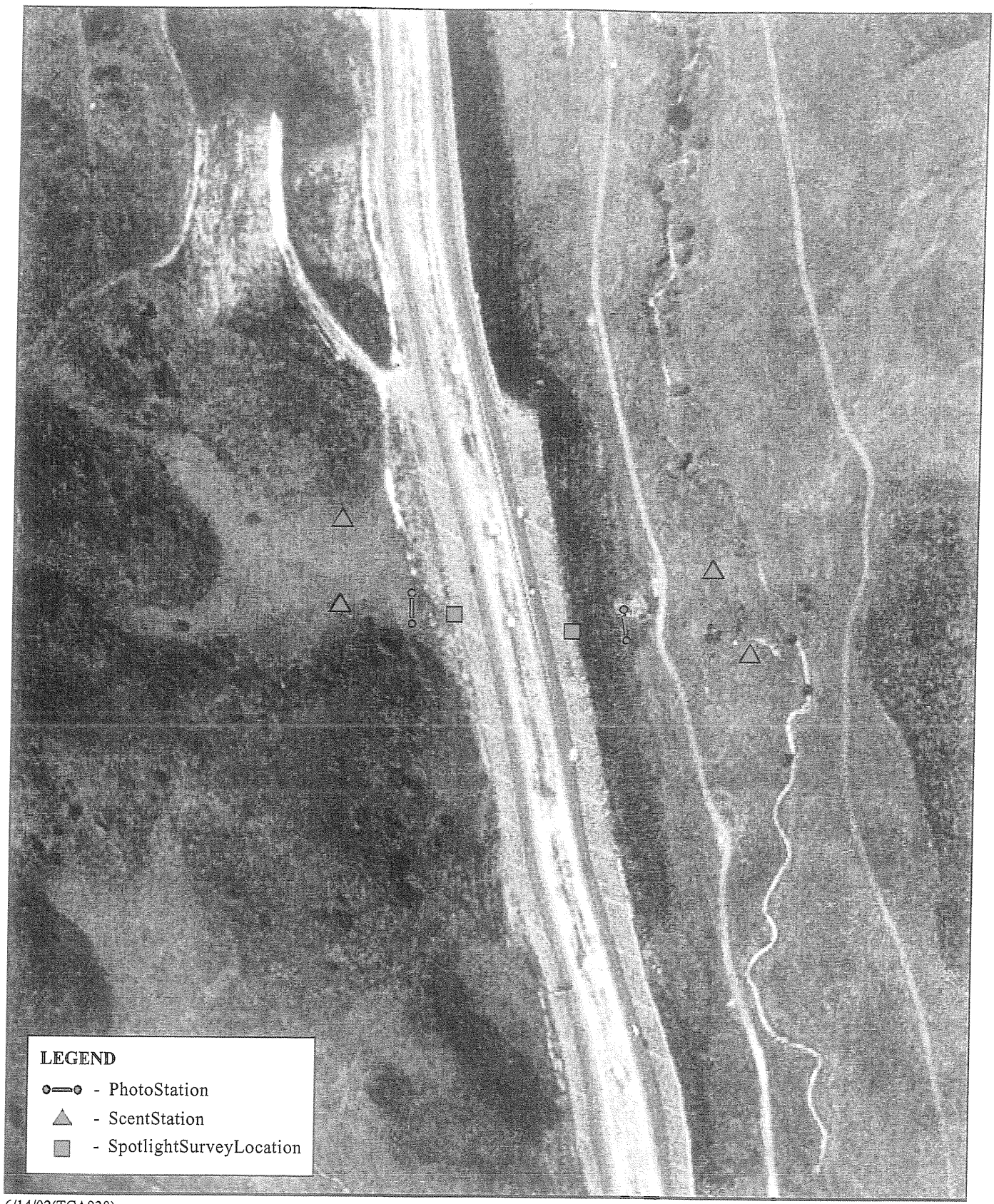

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Figure 4

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54" Culvert
Wildlife Undercrossing

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.

Automated Photo Stations

Automated photo stations (Trail Master Infrared Trail Monitors) were set up at each end of the wildlife UCs, as shown in Figures 2 through 4. Most of the UCs could be covered with one photo station spanning the bottom of the UC on each end; however, the uneven terrain and great expanse of the Tijeras Creek UC required a total of 11 photo stations (seven active photo stations and four passive photo stations). Each active photo station consisted of an infrared sensing unit (transmitter and receiver) and a camera with a cord connected to the sensing unit. In the active sensing systems, the transmitters constantly sent a beam of infrared light to the receivers. When the beam of infrared light was interrupted (i.e., by a passing animal), a photograph was taken. 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 three 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). 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. In addition, passive photo stations were used within the Tijeras Creek channel because of the steep and highly variable terrain. The passive photo stations consisted of a sensing unit that sensed heat and movement in a detection area in the shape of a fan. The sensing unit was placed on its side so that the area of detection could cover a variety of terrain instead of horizontal area. The camera was connected to the passive sensing unit and was set up similar to that of the active photo station. The passive photo stations were placed on both sides of the creek and at the east and west side of the UC.

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

For additional information on animals in the immediate vicinity of each UC, spotlight surveys were conducted adjacent to each of the bridges overlooking each of the wildlife UCs. 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 when 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.

A layer of DE was placed at the entrance to the 54 inch culvert on both sides to provide a duplicate method of recording activity. The tracks recorded in the DE were smoothed with a trowel each day.

RESULTS

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

DISCUSSION

Data from the scent stations, spotlight surveys, and general wildlife observations show that there continues to be a wide variety of wildlife in the vicinity of each of the three crossings and that medium to large mammals continue to use Tijeras Creek and Chiquita UCs. The animals utilizing the crossings are primarily, mule deer, bobcat, and coyote (Figures 5 and 6). Contrary to the fall 1999/spring 2000 photo station data, more animals were recorded in the fall of 2000 than in the spring of 2001. These data may reflect yearly population fluctuations rather than seasonal movement patterns, since considerably more animals were recorded by the photo stations during the 2000 year than during the previous fall of 1999 or following spring of 2001.

Due to a camera malfunction, the times were not recorded for two of the Tijeras Creek crossing cameras; however, the dates were recorded and shown in Table E. In addition, three rolls of film were stolen from the cameras at Tijeras Creek during the spring of 2001 resulting in the loss of two days worth of data. The photo station at the 54 inch culvert recorded two bobcats, and two coyotes on the north end during the fall of 2000. However, no tracks were recorded in the DE placed at both entrances to the culvert, indicating these individuals did not enter or traverse the culvert Small rodents in the vicinity of the 54 inch culvert use the culvert frequently; the number of tracks found in

FTC Wildlife Monitoring-Fall 2000-Spring 2001
Table A - Tijeras Creek Scent Station Data

	Tijeras Creek North			
	Carnivore		Herbivore	
Common Name	**Fall 2000**	**Spring 2001**	**Fall 2000**	**Spring 2001**
unidentified frog/toad				3
unidentified bird	3			1
Audubon's cottontail	2	1		2
Beechey ground squirrel	1			
mouse	3	3	1	5
bobcat			2	1
Total	**9**	**4**	**3**	**12**

	Tijeras Creek South			
	Carnivore		Herbivore	
Common Name	**Fall 2000**	**Spring 2001**	**Fall 2000**	**Spring 2001**
unidentified lizard			1	
unidentified bird	1	1		
Audubon's cottontail	1			1
Beechey ground squirrel		1		4
mouse	4			1
woodrat	1			
spotted skunk		2	1	
bobcat		1		
Total	**7**	**5**	**2**	**6**

FTC Wildlife Monitoring-Fall 2000-Spring 2001
Table B - Chiquita Canyon Scent Station Data

	Chiquita Canyon North			
	Carnivore		Herbivore	
Common Name	**Fall 2000**	**Spring 2001**	**Fall 2000**	**Spring 2001**
unidentified bird			1	
Audubon's cottontail		7	1	4
mouse		5	2	3
woodrat				3
Total	**0**	**12**	**4**	**10**

	Chiquita Canyon South			
	Carnivore		Herbivore	
Common Name	**Fall 2000**	**Spring 2001**	**Fall 2000**	**Spring 2001**
unidentified frog/toad	1	1		
unidentified bird	2		3	
greater roadrunner	1		1	1
Audubon's cottontail	2	6	3	6
mouse	2	5	7	2
woodrat		1		
striped skunk			1	
bobcat			1	
Total	**8**	**13**	**16**	**9**

FTC Wildlife Monitoring-Fall 2000-Spring 2001
Table C - 54" Culvert Scent Station Data

	54" Culvert North					
	Carnivore		Herbivore		Culvert	
Common Name	**Fall 2000**	**Spring 2001**	**Fall 2000**	**Spring 2001**	**Fall 2000**	**Spring 2001**
unidentified snake		1				
unidentified bird	5		2		2	
Audubon's cottontail		2				
pocket gopher			1			
mouse	7			3	6	5
woodrat	3	1				1
coyote					1	
Total	**15**	**4**	**3**	**3**	**9**	**6**

	54" Culvert South					
	Carnivore		Herbivore		Culvert	
Common Name	**Fall 2000**	**Spring 2001**	**Fall 2000**	**Spring 2001**	**Fall 2000**	**Spring 2001**
unidentified frog/toad					1	
unidentified bird	1	1			2	1
Audubon's cottontail	3	1				1
mouse	1	3	1		4	5
woodrat	1	1			1	3
coyote					1	
bobcat	1					1
Total	**7**	**6**	**1**	**0**	**9**	**11**

FTC Wildlife Monitoring-Fall 2000-Spring 2001
Table D - Foothill North Spotlight Survey Data

	Chiquita Canyon		54" Culvert		Tijeras Creek	
Fall 2000	**North**	**South**	**North**	**South**	**North**	**South**
Audubon's cottontail			1			
mouse			1			
coyote		1	2	1		
mule deer				4		
unidentified			1			
Total	**0**	**1**	**5**	**5**	**0**	**0**

	Chiquita Canyon		54" Culvert		Tijeras Creek	
Spring 2001	**North**	**South**	**North**	**South**	**North**	**South**
Audubon's cottontail		1			1	
coyote			3			
unidentified					1	3
mule deer				2		
Total	**0**	**1**	**3**	**2**	**2**	**3**

FTC Wildlife Monitoring- Fall 2000-Spring 2001
Table E - Photo Station Data

Fall 2000
Chiquita Canyon Undercrossing

Date	Time	North End	South End
11/1/00	18:23	mule deer	
11/1/00	18:27		mule deer
11/1/00	19:15		coyote
11/1/00	19:32		coyote
11/2/00	1:34		coyote
11/2/00	6:20		coyote
11/2/00	16:58	coyote	
11/2/00	18:32	coyote	
11/2/00	23:58	coyote	
11/5/00	4:57		mule deer
11/7/00	17:40	mule deer	
11/7/00	18:44		coyote
11/8/00	5:34	mule deer	
11/8/00	5:34		mule deer

Spring 2001
Chiquita Canyon Undercrossing

Date	Time	North End	South End
5/1/01	1:24	mule deer	
5/1/01	1:57		mule deer
5/4/01	5:10		mule deer

Fall 2000
Tijeras Creek Undercrossing

Date	Time	North End	South End
11/1/00			coyote
11/1/00			coyote
11/1/00			coyote
11/1/00			coyote
11/1/00			bobcat
11/2/00	0:54		bobcat
11/2/00	1:02		bobcat
11/3/00	4:38		bobcat
11/3/00		coyote	
11/4/00	3:06		unidentified eyeshine
11/4/00	6:09		coyote
11/5/00	16:36	2 snowy egrets	
11/5/00	22:55	coyote	
11/6/00	14:32	snowy egret	
11/6/00	14:34	snowy egret	

Spring 2001
Tijeras Creek Undercrossing

Date	Time	North End	South End
4/29/01	1:15	bobcat	
4/29/01	19:44	coyote	
4/29/01	20:12	coyote	
5/1/01		2 northern rough winged swallows	
5/1/01		1 northern rough winged swallow	
5/1/01		2 northern rough winged swallows	
5/1/01		2 northern rough winged swallows	
5/1/01		1 northern rough winged swallow	
5/1/01		1 northern rough winged swallow	
5/1/01		1 northern rough winged swallow	
5/1/01			2 northern rough winged swallows
5/1/01			coyote
5/2/01	0:29	bobcat	
5/2/01	1:32	bobcat	
5/3/01	20:16	bobcat	

Fall 2000
54" Undercrossing

Date	Time	North End	South End
11/6/00	4:04	bobcat	
11/2/00	4:43	bobcat	
11/2/00	21:58	coyote	
11/1/00	22:40	coyote	

Spring 2001
54" Undercrossing

Date	Time	North End	South End
5/4/01	2:37		unidentified
5/4/01	2:39		unidentified

FTC Wildlife Monitoring-Fall 2000-Spring 2001
Table F: General Wildlife and Wildlife Sign Observations

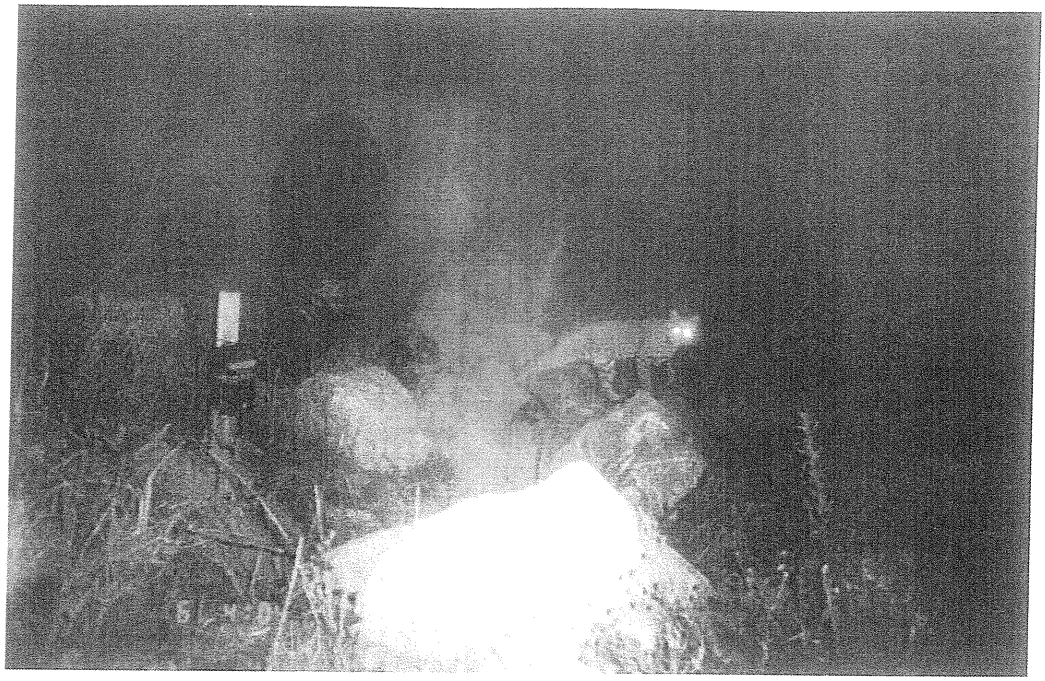
		Crossing		
Scientific Name	**Common Name**	**Chiquita Canyon**	**54" Culvert**	**Tijeras Creek**
Sylvilagus auduboni	Audubon's cottontail	D/O, S	D/O, S	
	mouse		D/O	
Neotoma sp.	woodrat		D/O	
Canis latrans	coyote	S	D/O, S	S
Felis rufus	bobcat			D/O
Odocoileus hemionus	mule deer	S	D/O, S	S

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 virgulti	Behr's metalmark
Callophrys perplexa	perplexing hairstreak
Flaucopsyche lygdamus austalis	southern blue
Reptilia	**Reptiles**
Iguanidae	**Iguanids**
Sceloporus occidentalis	western fence lizard
Anguidae	**Alligators**
Gerrhonotus multicarinatus	southern aligator lizard
Aves	**Birds**
Cathartidae	**New World Vultures**
Cathartes aura	turkey vulture
Accipitridae	**Kites, Hawks, Eagles, and Ospreys**
Buteo jamaicensis	red-tailed hawk
Falconidae	**Falcons**
Falco sparverius	American kestrel
Odontophoridae	**New World Quail**
Callipepla californica	California quail

Aves	Birds
Columbidae	**Pigeons and Doves**
Zenaida macroura	mourning dove
Cuculidae	**Cuckoos and Roadrunners**
Geococcyx calfornianus	greater roadrunner
Tytontidae	**Barn Owls**
Tyto alba	barn owl
Apodidae	**Swifts**
Aeronautes saxatalis	white-throated swift
Trochilidae	**Hummingbirds**
Archilochus aliexandri	black-chinned hummingbird
Calypte anna	Anna's hummingbird
Tyrannidae	**Tyrant Flycatchers**
Sayornis nigricans	black phoebe
Tyrannus vociferans	Cassin's kingbird
Tyrannus verticalis	western kingbird
Corvidae	**Jays, Magpies, and Crows**
Aphelocoma californica	western scrub-jay
Corvus corax	common raven
Hirundinidae	**Swallows**
Petrochelidon pyrrhonota	cliff swallow
Stelgidopteryx serripennis	northern rough-winged swallow
Aegithalidae	**Bushtits**
Psaltriparus minimus	bushtit
Troglodytidae	**Wren**
Troglodytes aedon	house wren
Sylviidae	**Gnatcatchers**
Polioptila californica californica	California gnatcatcher
Mimidae	**Mimic Thrushes**
Toxostoma redivivium	California thrasher
Mimus polyglottos	northern mockingbird
Emberizidae	**New World Sparrows**
Pipilo maculatus	spotted towhee
Pipilo crissalis	California towhee
Zonotrichia leucophrys	white- crowned sparrow
Aimophila ruficeps canescens	rufous-crowned sparrow
Melospiza melodia	song sparrow
Sturnella neglecta	western meadowlark
Fringillidae	**Fringillid Finches**
Carpodacus mexicanus	house finch
Carduelis psaltria	lesser goldfinch



Bobcat in the vicinity of the 54 inch culvert.

Coyote traveling in the downstream direction through the Tijeras undercrossing.

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Figure 5

LSA

Site Photos

Buck mule deer exiting the north side of the Chiquita undercrossing at 5:34 am, November 8, 2000.

Buck mule deer exiting the Chiquita undercrossing from the south at 5:34 am, November 8, 2000.

6/17/02(TCA930)

Figure 6

LSA

Site Photos

the DE are too numerous to count. It is unclear whether the mice traverse the entire length of the culvert. Because the culvert is small and confined, the animals may be more skittish when surprised by the photo station camera flash.

Although the scent stations attracted a wide variety of animals, only a few of those recorded were the targeted medium to large mammals. Most of the animals recorded, seem to be those that do not have a large range and would not necessarily use the crossings on a regular basis, such as Audubon cottontail, small rodents, and miscellaneous birds. The only target species recorded at the scent stations were coyote and mule deer, with most of the individuals being recorded at the 54 inch culvert.

The spotlight surveys found primarily mule deer and coyote in the vicinity of the 54 inch UC. This may be due to the fact that the 54 inch culvert is the only UC surrounded by open grassland. In addition, the 54 inch culvert has less human activity in the vicinity than the other crossings that are part of the County trail system.

At the Chiquita and Tijeras UCs, the number and diversity of animals recorded in the vicinity of the crossing by the scent stations, spotlight survey, and general observations do not appear to correlate with those recorded using the UCs by the photo stations. The photo stations recorded a higher number of coyote, mule deer, and bobcat than the other methods. This may indicate that the medium to large mammals using the UCs are using them more for movement and may not spend much time investigating the scent stations in the vicinity. A large number of hikers, bikers, and horse back riders (and associated dogs) use the UCs for recreational purposes. This human activity may deter the larger animals from spending time investigating around the UCs, but does not seem to deter them from going through the UCs.

CONCLUSION AND RECOMMENDATIONS

The second year's data appear to be consistent with the first year's data, which indicates that the Tijeras Creek and Chiquita wildlife UCs continued to be used by large to medium size mammals, including mule deer, coyote, and bobcat. The 54 inch culvert tended to be used primarily by small animals, such as rodents and birds. Medium size animals were recorded in the immediate vicinity of the culvert; however, no medium size animals have been recorded passing through the culvert. It is becoming increasingly apparent that the size of the crossing dictates the maximum size animal that is comfortable using the UC.

Tijeras Creek and Chiquita tended to be used mostly as daily movement corridors, through which the animals moved fairly directly to get to and from areas used for hunting, foraging, or shelter. This judgment is based on the fact that in many cases the same individual animal was photographed in the late afternoon going one direction and later the same evening returning. This theory is further bolstered by the fact that fewer medium to large animals were documented by data from the scent stations and spotlight surveys at the Chiquita and Tijeras UCs than at the 54 inch culvert area. However, a number of other factors may also be involved, including terrain, adjacent habitat types, and proximity to development.

Since trails run through the Tijeras Creek and Chiquita UC as part of the southern end of O'Neill Regional Park, human activity (i.e., hikers, bikers, horseback riders, and accompanying dogs) is relatively common and may be a factor in the amount of wildlife usage in the vicinity. However, the amount of human activity is independent of the design of the UC. Although several animals were recorded at the 54 inch culvert, there continues to be no evidence that they traverse the entire crossing. Wildlife activity through the UCs may increase in subsequent years due to the following factors: increased vegetative cover created by habitat restoration at the UCs, acclimation to human activity, increased road traffic, an increased learned behavior related to UC usage, and habitat or linkage loss in surrounding areas.

Both the Tijeras Creek and Chiquita UCs are functioning by providing a linkage for wildlife of all sizes to pass underneath the FTCN. It is still unclear whether the 54 inch culvert is large enough to provide linkage for medium size wildlife due to the lack of evidence; evidence is present however, that small animals do take advantage of the 54 inch culvert. As patterns begin to emerge, it is clear that more study is required to determine long-term efficacy. Results of the second year's survey are promising, and results from subsequent years' surveys will allow a more complete summary of wildlife use of UCs on the FTCN.

WILDLIFE MONITORING

FOOTHILL TRANSPORTATION CORRIDOR

THIRD ANNUAL REPORT

FALL 2001–SPRING 2002

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EXECUTIVE SUMMARY

During this third and final year of the study, LSA Associates, Inc. (LSA) documented the use of three wildlife undercrossings (UC) along the northern leg of the Foothill Transportation Corridor. Those crossings include Tijeras UC, Chiquita Creek UC, and the 54-inch culvert. 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 surveys documented wildlife in the vicinity of the crossing, and the photo stations document wildlife that actually use the crossings. The study was conducted from November 14–23, 2001, and again on May 7–14, 2002.

Results from the third and final year of the study indicate that the wildlife UCs continue to be used by a variety of mammals, including mule deer, coyote, and bobcat. The Tijeras Creek UC and Chiquita Creek UC were utilized the most, with most of the activity occurring during the spring season. As in previous years, mule deer and bobcat were photographed in proximity to the entrance of the 54 inch culvert; however, the only conclusive evidence that the crossing is being used by wildlife were coyote tracks found along the length of the culvert.

Data collected over the past three years of the study show that wildlife do utilize the Tijeras Creek and Chiquita Creek UCs as a linkage between habitats on either side of the Foothill Transportation Corridor. Mule deer and coyote represent the majority of wildlife traffic; however, bobcat have been documented traversing the Tijeras Creek UC in the spring of 2001. Throughout the duration of the study, the camera set-up at the 54 inch culvert has photographed wildlife at the entrances to the culvert, but not entering or exiting the UC. During the set-up of the 2002 study, coyote tracks were found along the entire length of the interior of the culvert. This remains the only definitive evidence that the culvert is being used as a corridor for wildlife. The restrictive size of the 54 inch culvert would most likely prohibit larger wildlife such as mule deer from traversing the entire length; however, because of their considerably smaller size, it is possible that bobcat may utilize the culvert.

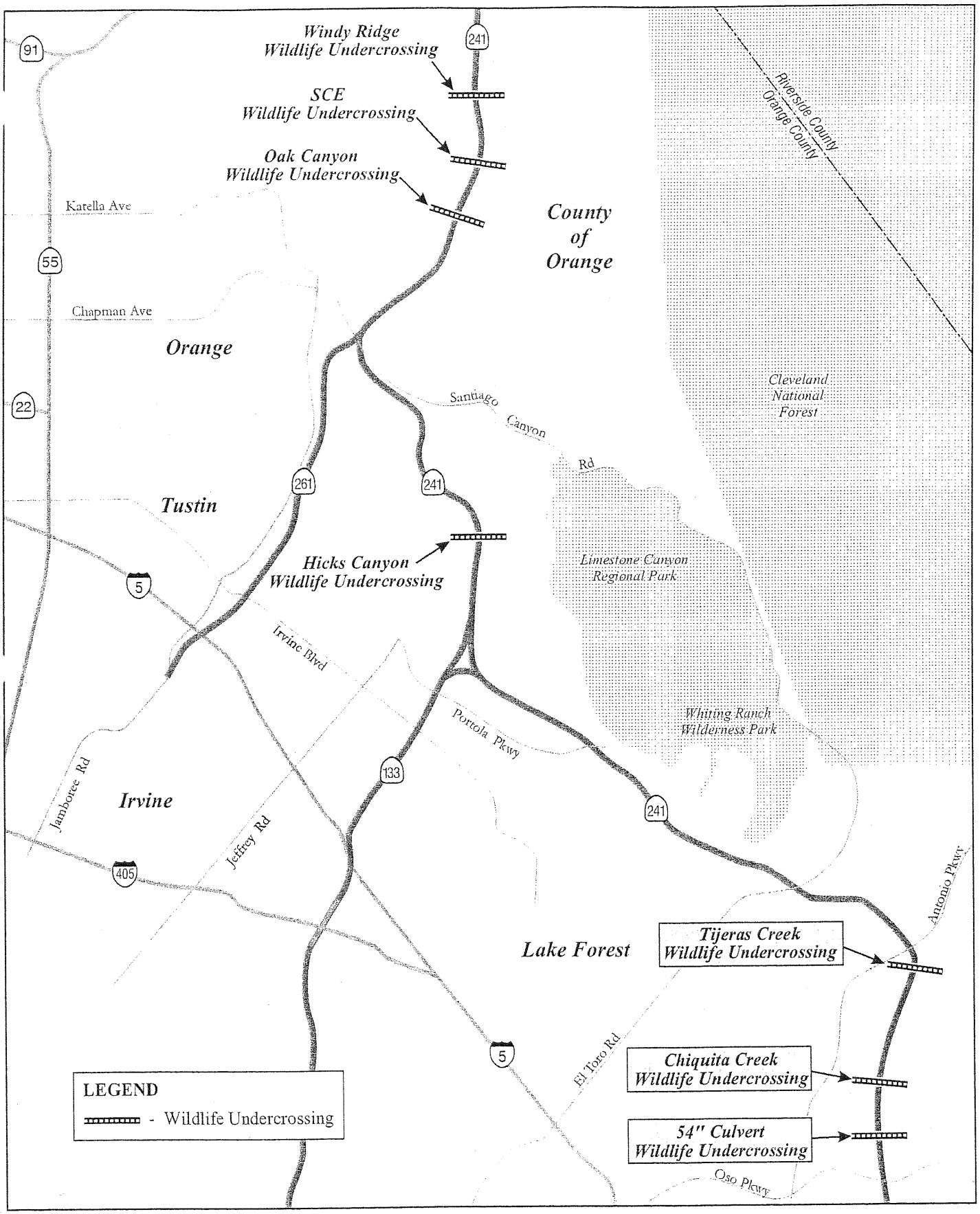
INTRODUCTION

This is the third and final year of the study conducted by LSA Associates, Inc. (LSA) documenting wildlife usage at three wildlife undercrossings (UC) along the northern segment of the Foothill Transportation Corridor (FTC) (Figure 1), which opened in the fall of 1999. Listed by location, from north to south, the three wildlife UCs include Tijeras Creek UC, Chiquita UC, and a 54-inch culvert. The purpose of this study is to document usage of these undercrossings and to ensure that they are functioning as designed. These studies are funded by the Transportation Corridor Agencies (TCA) as required in the Section 7 Biological Opinion for the Foothill Transportation Corridor North (FTCN), Antonio Parkway to Oso Parkway Section, Orange County (1-6-96-F-6).

STUDY AREA

The wildlife movement study area includes three wildlife UCs along the north segment of the FTC stretching from State Route (SR) 133 at the north to Oso Parkway at the south, in the City of Rancho Santa Margarita, California. The study also includes the surrounding areas on each side of the crossing. In general, Tijeras Creek UC and Chiquita UC were designed to allow the passage of large to medium wildlife species such as mountain lions, mule deer, and coyotes, and the 54-inch culvert was designed to allow the passage of medium to small mammals such as coyotes, bobcats, and rodents. The UCs provide linkage from the southern end of the O'Neill Regional Park to the Cleveland National Forest via the Chiquita Preserve and General Thomas F. Riley Wilderness Park. A fence runs along the FTCN right-of-way to help funnel wildlife into the crossings as opposed to crossing over the road through traffic.

The Tijeras Creek UC is the largest of the three crossings and is located approximately 0.2 mile south of the Antonio Parkway overpass (Figure 2). Tijeras Creek flows through the crossing from east to west. Upstream (east) from the crossing, Tijeras Creek begins at a large concrete box culvert approximately 0.4 mile upstream. A corridor of oak woodland runs along the creek, surrounded by coastal sage scrub (CSS) and grassland. The upstream side of the UC has a wide opening with gradual slopes and opens up to a large expanse of canyons and ridges bounded by the Coto De Caza development. In contrast, the downstream side is a narrow, steep sided canyon bounded by the FTCN on one side and residential development in the City of Rancho Santa Margarita on the other. West of the UC, the riparian corridor continues in this relatively constricted canyon until it drains into the Arroyo Trabuco. The Tijeras Creek UC itself is a set of relatively large bridges spanning approximately 400 feet and supported by a number of concrete columns. It is made up of three bridges, including northbound lanes, southbound lanes, and the Antonio Parkway southbound on-ramp with 60-foot and 20-foot gaps between the bridges, respectively. The combination of the large span and the gaps between the bridges allows plenty of light to enter, giving the crossing an overall open feeling. Under the bridge, there is a variety of topography, including a 15-foot-wide trail, Tijeras Creek, and an energy dissipater. Urban runoff flows from the medium-size concrete energy dissipater and associated riprap drain into Tijeras Creek below the southbound Antonio Parkway bridge. Although the creek is only approximately ten feet in width, the highly incised creek channel is approximately 30 feet in width, with a ten-foot vertical bank on the south. The approach to the crossing is easily traversed along the natural drainage or along the dirt road.



6/25/01(TCA930)

Figure 1

N

LSA

No Scale

Wildlife Crossing Locations

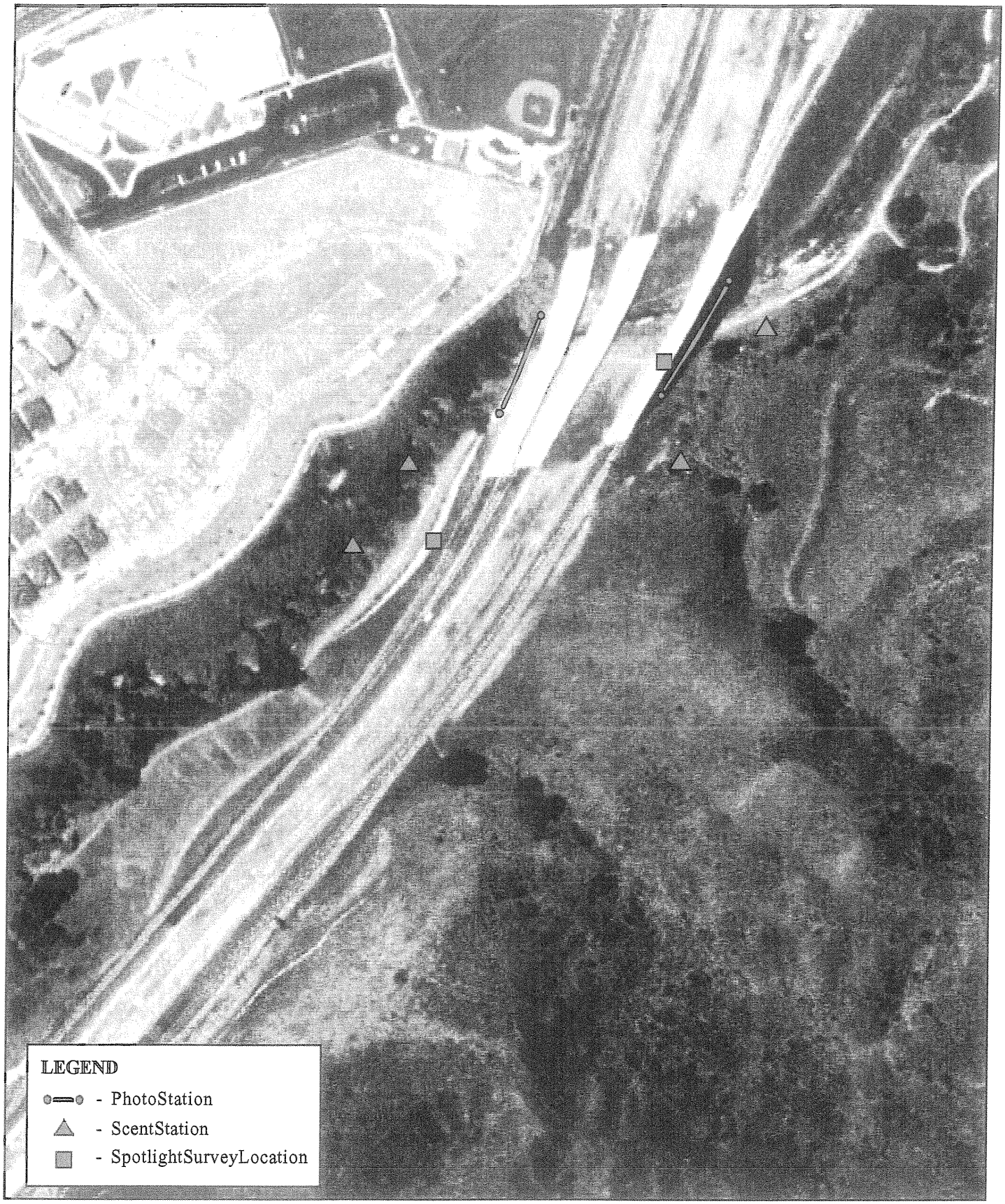


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Figure 2

Tijeras Creek
Wildlife Undercrossing

The Chiquita UC is located approximately 1.5 miles south of the Antonio Parkway overpass and is composed of two bridges (northbound and southbound lanes) spanning approximately 120 feet across the top of the UC, with a 25-foot road across the bottom and steep earthen slopes on either side (Figure 3). The crossing is relatively narrow and opens up to the head of a steep canyon wall covered with CSS and a trail meandering up the canyon to the east and to a wide canyon with a paved road leading down to a community baseball park before it drains into Tijeras Creek to the west. The canyon and adjacent knolls are dominated by grassland vegetation with CSS on the slope adjacent to the road. The crossing is easily accessed by roads and trails that lead up to the crossing.

The 54-inch culvert is located 0.7 mile north of the Oso Parkway terminus of the FTCN. The crossing is composed of a 54 inch diameter corrugated metal pipe that crosses the 390-foot span of the FTCN road profile. To the west, the crossing opens up to a grassland meadow surrounded by steep slopes of CSS; to the east, the crossing leads to a small riprap pad surrounded by a wide grassland valley with CSS covering the distant ridges. A small, ephemeral streambed (Cañada Chiquita) meanders through the center of the valley. The topography approaching the access to the crossing at either side is relatively gentle; the crossing is easily accessible.

METHODS

In the vicinity of each wildlife UC, 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 UCs. Surveys were conducted November 14–23, 2001, and again on May 7–14, 2002. During the three-year study, the wildlife surveys were conducted twice a year, in the fall and spring of each year through the spring of 2002.

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 UCs. Two scent stations were placed at each end of the three UCs, for a total of 12 scent stations, as shown in Figures 2 through 4. 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' 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. During the spring of 2002, gypsum powder was used as the tracking medium.

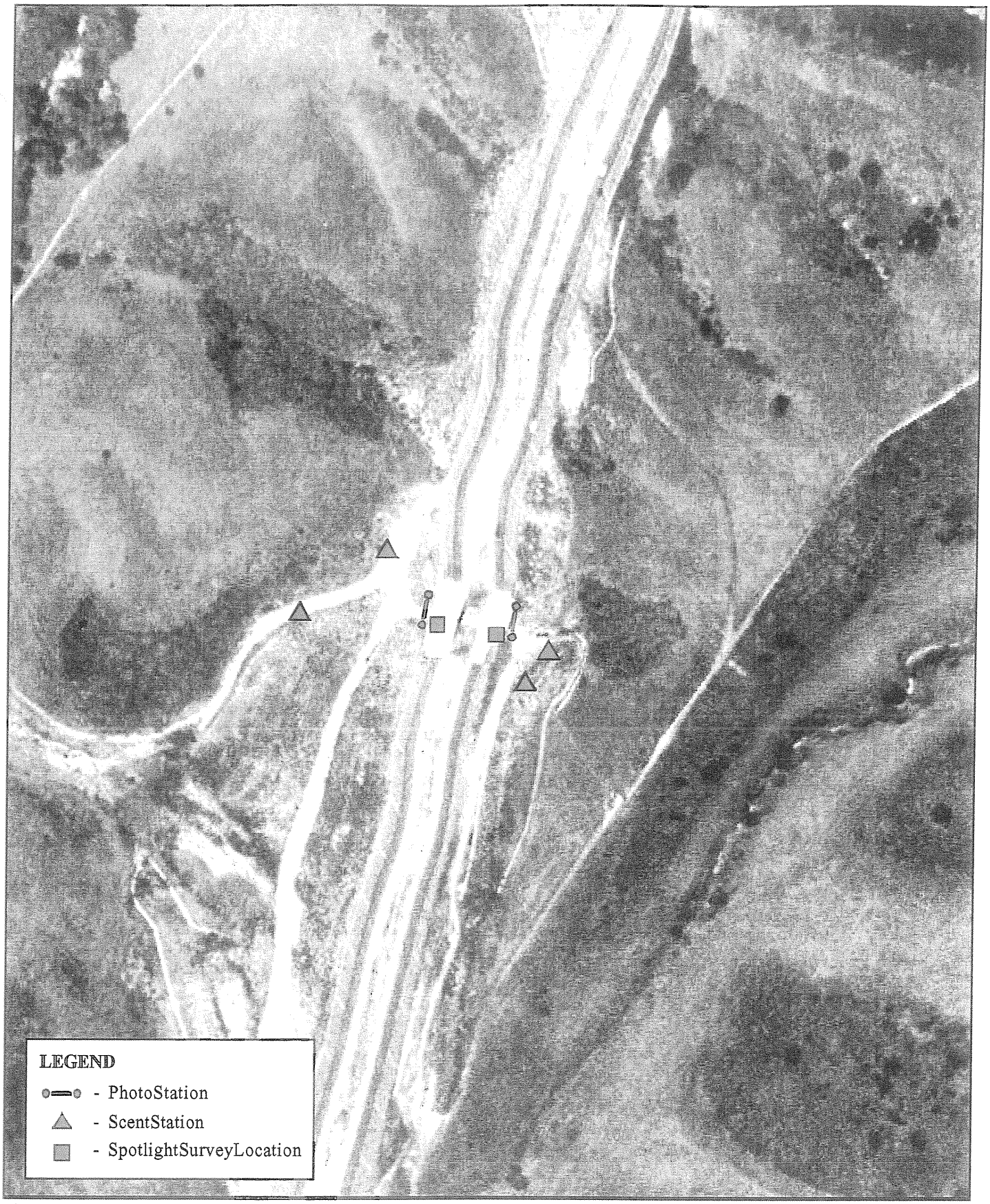

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Figure 3

N

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Chiquita Creek
Wildlife Undercrossing

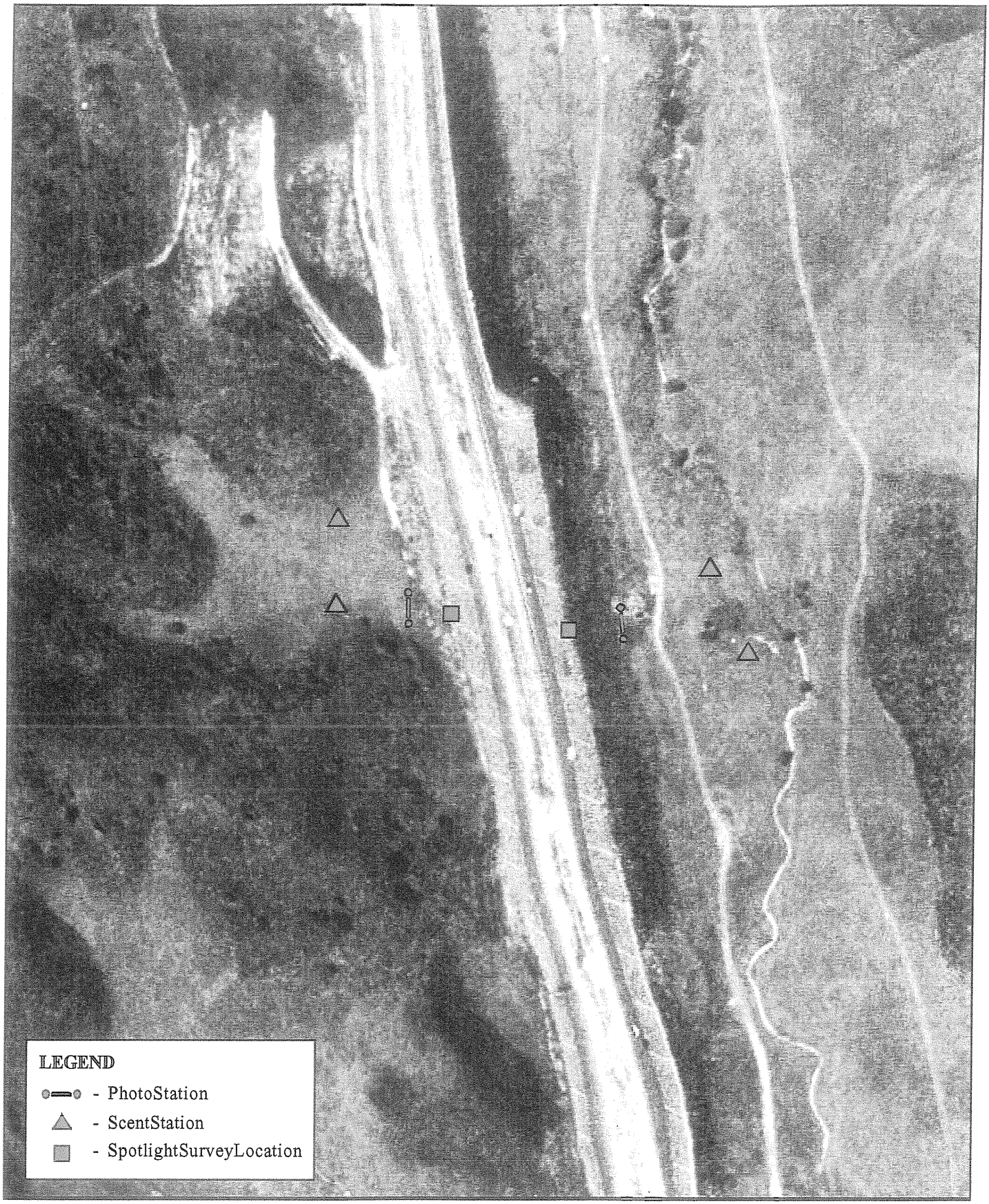

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Figure 4

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54" Culvert
Wildlife Undercrossing

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 and banana, carrot, and peanut butter. The bait targeting carnivores consisted of canned cat food, cut fish, and beef 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 tracking medium was smoothed and additional tracking medium was added when necessary. Fresh bait was added to the bait bags as necessary to maintain a strong scent..

Automated Photo Stations

Automated photo stations (Trail Master Infrared Trail Monitors) were set up at each end of the wildlife UCs, as shown in Figures 2 through 4. Most of the UCs could be covered with one photo station spanning the bottom of the UC on each end; however, the uneven terrain and great expanse of the Tijeras Creek UC required a total of 11 photo stations (seven active photo stations and four passive photo stations). Each active photo station consisted of an infrared sensing unit (transmitter and receiver) and a camera with a cord connected to the sensing unit. In the active sensing systems, the transmitters constantly sent a beam of infrared light to the receivers. When the beam of infrared light was interrupted (i.e., by a passing animal), a photograph was taken. 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"x5' 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). 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. In addition, passive photo stations were used within the Tijeras Creek channel because of the steep and highly variable terrain. The passive photo stations consisted of a sensing unit that sensed heat and movement in a detection area in the shape of a fan. The sensing unit was placed on its side so that the area of detection could cover a variety of terrain instead of horizontal area. The camera was connected to the passive sensing unit and was set up similar to that of the active photo station. The passive photo stations were placed on both sides of the creek and at the east and west side of the UC.

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

For additional information on animals in the immediate vicinity of each UC, spotlight surveys were conducted adjacent to each of the bridges overlooking each of the wildlife UCs. 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.

Tracking medium was placed at the entrance to the 54-inch culvert on both sides to provide a duplicate method of recording activity. The tracks recorded in the tracking medium were smoothed with a trowel each day.

RESULTS

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

DISCUSSION

Data from the scent stations, spotlight surveys, and general wildlife observations show that there continues to be a wide variety of wildlife in the vicinity of each of the three crossings, and that medium to large mammals continue to use Tijeras Creek and Chiquita UCs. The animals utilizing the crossings during this study period were primarily mule deer and coyote (Figure 5). Mule deer were photographed at the entrance of the 54-inch culvert during the 2002 spring study, although none were documented traversing the length of the culvert.

A set of tracks in the 54-inch culvert indicated that a coyote traversed the entire length of the crossing; however, the tracks were observed at the beginning of the study period, just prior to set-up of monitoring equipment. Similarly, bobcat tracks were observed at both ends of the crossing, but bobcat were not recorded via the 35mm camera setup. Small rodents in the vicinity of the 54-inch culvert use the culvert frequently; the number of tracks found in the tracking medium are too numerous to count. It is unclear whether the mice traverse the entire length of the culvert. Because the culvert is small and confined, the animals may be more skittish when surprised by the photo station camera flash.

On November 17, 2001, eight photo stations were stolen from Tijeras Creek by local teenagers. A mountain biker was able to recover all of the cameras and data loggers, and only one night of data

FTC Wildlife Monitoring-Fall 2001-Spring 2002
Table A - Tijeras Creek Scent Station Data

	Tijeras Creek North			
	Carnivore		Herbivore	
Common Name	**Fall 2001**	**Spring 2002**	**Fall 2001**	**Spring 2002**
unidentified frog/toad		1		
unidentified bird		1		3
greater roadrunner		1		
Audubon's cottontail	4	1		7
Beechey ground squirrel		1		1
mouse	6	5	6	6
woodrat		1		
opossum		1		
raccoon	1			
spotted skunk		1		3
striped skunk				1
Total	11	13	6	21

	Tijeras Creek South			
	Carnivore		Herbivore	
Common Name	**Fall 2001**	**Spring 2002**	**Fall 2001**	**Spring 2002**
unidentified frog/toad	1	2	1	
unidentified lizard		1		
Audubon's cottontail		2		
Beechey ground squirrel	1	1	1	2
mouse		2	1	3
woodrat				1
opossum	1			3
raccoon		1		3
spotted skunk		2	3	1
striped skunk		1		2
bobcat	1			
Total	4	12	6	15

FTC Wildlife Monitoring-Fall 2001-Spring 2002
Table B - Chiquita Canyon Scent Station Data

	Chiquita Canyon North			
	Carnivore		Herbivore	
Common Name	**Fall 2001**	**Spring 2002**	**Fall 2001**	**Spring 2002**
unidentified bird	3	1	2	2
greater roadrunner				1
Audubon's cottontail	1	6	4	7
Beechey ground squirrel				1
mouse	5	6	4	4
woodrat		1		1
spotted skunk	1			
striped skunk				1
Total	10	14	10	17

	Chiquita Canyon South			
	Carnivore		Herbivore	
ɔmmon Name	**Fall 2001**	**Spring 2002**	**Fall 2001**	**Spring 2002**
ınidentified frog/toad		1		
unidentified snake		1		
unidentified bird	3	1		1
Audubon's cottontail	2	7	3	7
mouse	7	4	3	2
woodrat	4	2	1	
gray fox		1		
spotted skunk	1			
Total	17	17	7	10

FTC Wildlife Monitoring-Fall 2001-Spring 2002
Table C - 54" Culvert Scent Station Data

	54" Culvert North					
	Carnivore		Herbivore		Culvert	
Common Name	Fall 2001	Spring2002	Fall 2001	Spring 2002	Fall 2001	Spring 2002
unidentified frog/toad				1		2
unidentified lizard					1	
unidentified bird				1	7	3
greater roadrunner				1		
Audubon's cottontail	3		2	3		3
mouse	1	1	4		7	7
woodrat					2	3
coyote						1
raccoon					1	
striped skunk						1
bobcat					1	
Total	4	1	6	6	19	20

	54" Culvert South					
	Carnivore		Herbivore		Culvert	
Common Name	Fall 2001	Spring 2002	Fall 2001	Spring 2002	Fall 2001	Spring 2002
unidentified lizard				1		1
unidentified bird					1	3
Audubon's cottontail	1	4	3	7		4
mouse		1	2	4	6	7
coyote						2
raccoon					1	1
striped skunk						1
bobcat					1	
mule deer				1		
Total	1	5	5	13	9	19

FTC Wildlife Monitoring-Fall 2001-Spring 2002
Table D - Foothill North Spotlight Survey Data

Fall 2001

	Chiquita Canyon		54" Culvert		Tijeras Creek	
Common Name	**North**	**South**	**North**	**South**	**North**	**South**
unidentified frog/toad					5	
barn owl				1		
short eared owl				1		
mule deer				4		
unidentified animal					1	
unidentified eyeshine					3	
Total	0	0	0	6	9	0

Spring 2002

	Chiquita Canyon		54" Culvert		Tijeras Creek	
Common Name	**North**	**South**	**North**	**South**	**North**	**South**
gopher snake						1
barn owl			1			
great-horned owl		1				
opossum						1
mule deer				2		
Total	0	1	1	2	0	2

FTC Wildlife Monitoring-Fall 2001-Spring 2002
Table E-Photo Station Data

Fall 2001
Chiquita Canyon Undercrossing

Date	Time	North End	South End
11/15/01	5:47	coyote	
11/18/01	17:55	mule deer	
11/19/01	4:30	mule deer	
11/20/01	16:30		mule deer

Spring 2002
Chiquita Canyon Undercrossing

Date	Time	North End	South End
5/8/02	20:48	mule deer	
5/8/02	20:48		mule deer
5/10/02	5:13	mule deer	
5/10/02	5:08		mule deer
5/10/02	5:11		mule deer
5/10/02	22:39		mule deer
5/11/02	5:49	mule deer	
5/11/02	5:48		mule deer
5/12/02	23:31		mule deer
5/13/02	20:09		mule deer
5/14/02	5:19		mule deer

Fall 2001
Tijeras Creek Undercrossing

Date	Time	North End	South End
11/14/01	1:17	coyote	
11/16/01	23:19		coyote
11/17/01	21:36		coyote
11/18/01	0:42		coyote
11/19/01	2:46		coyote
11/20/01	3:04	coyote	
11/20/01	3:01		coyote

Spring 2002
Tijeras Creek Undercrossing

Date	Time	North End	South End
5/8/02	22:17		bobcat
5/8/02	23:19		unidentified eyeshine
5/8/02	8:37		mule deer
5/9/02	22:46	coyote	
5/10/02	5:14	mule deer	
5/11/02	4:13		mule deer
5/11/02	23:43		coyote
5/11/02	1:04	coyote	
5/11/02	1:37		coyote
5/12/02	1:46	coyote	
5/12/02	2:41	coyote	
5/13/02	22:46	coyote + eyeshine	
5/13/02	0:51		coyote

Fall 2001
54" Undercrossing

Date	Time	North End	South End

Spring 2002
54" Undercrossing

Date	Time	North End	South End
5/8/02	8:05		mule deer
5/8/02	8:07		mule deer
5/8/02	8:00		mule deer
5/8/02	8:07		2 mule deer
5/8/02	8:13		2 mule deer
5/8/02	8:22		mule deer
5/10/02	22:38		raccoon
5/13/02	3:42		bobcat
5/13/02	3:49		bobcat

FTC Wildlife Monitoring-Fall 2001-Spring 2002
Table F: General Wildlife and Wildlife Sign Observations

		Crossing		
Scientific Name	**Common Name**	**Chiquita Canyon**	**54" Undercrossing**	**Tijeras Creek**
Sylvilagus auduboni	Audubon's cottontail	D/O, S	D/O, S	D/O,S
	mouse	S	T,S	S
Neotoma sp.	woodrat	S		S
Didelphis virginiana	opossum			D/O
Canis latrans	coyote	S	D/O, S,T	S,T
Felis rufus	bobcat		T	
Odocoileus hemionus	mule deer	S	D/O, S	S,T

D/O - Direct Observation
T - Tracks
S - Scat

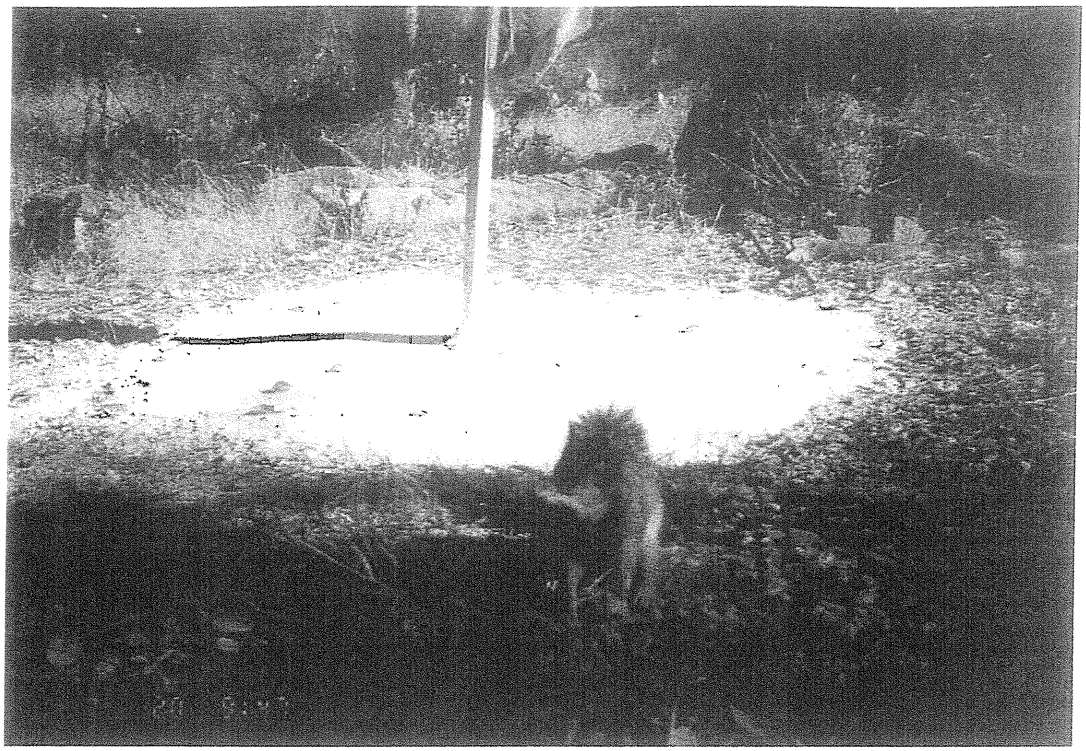
Other wildlife species observed in the area

Lepidoptera	**Butterflies**
Nymphalidae	**Brush-footed Butterflies**
Coenonympha californica	California ringlet
Lycaenidae	**Metalmarks, hairstreaks, Coppers, and Blues**
Apodemia mormo virgulti	Behr's metalmark

Reptilia	**Reptiles**
Iguanidae	**Iguanids**
Sceloporus occidentalis	western fence lizard
Anguidae	**Alligators**
Gerrhonotus multicarinatus	southern aligator lizard
Pituophis catenifer	gopher snake

Aves	**Birds**
Cathartidae	**New World Vultures**
Cathartes aura	turkey vulture
Accipitridae	**Kites, Hawks, Eagles, and Ospreys**
Buteo jamaicensis	red-tailed hawk
Buteo lineatus	red-shouldered hawk
Falconidae	**Falcons**
Falco sparverius	American kestrel
Odontophoridae	**New World Quail**
Callipepla californica	California quail

Columbidae	**Pigeons and Doves**
Zenaida macroura	mourning dove
Cuculidae	**Cuckoos and Roadrunners**
Geococcyx calfornianus	greater roadrunner
Tytontidae	**Barn Owls**
Bubo virginianus	great horned owl
Tyto alba	barn owl
Apodidae	**Swifts**
Aeronautes saxatalis	white-throated swift
Trochilidae	**Hummingbirds**
Calypte anna	Anna's hummingbird
Tyrannidae	**Tyrant Flycatchers**
Sayornis nigricans	black phoebe
Tyrannus vociferans	Cassin's kingbird
Corvidae	**Jays, Magpies, and Crows**
Aphelocoma californica	western scrub-jay
Picidae	**Woodpeckers and Flickers**
Colaptes auratus	northern flicker
Corvus corax	common raven
Hirundinidae	**Swallows**
Petrochelidon pyrrhonota	cliff swallow
Stelgidopteryx serripennis	northern rough-winged swallow
Aegithalidae	**Bushtits**
Psaltriparus minimus	bushtit
Troglodytidae	**Wren**
Chamaea fasciata	wrentit
Troglodytes aedon	house wren
Sylviidae	**Gnatcatchers**
Polioptila californica californica	California gnatcatcher
Mimidae	**Mimic Thrushes**
Toxostoma redivivium	California thrasher
Mimus polyglottos	northern mockingbird
Emberizidae	**New World Sparrows**
Pipilo maculatus	spotted towhee
Pipilo crissalis	California towhee
Dendroica coronata	yellow-rumped warbler
Aimophila ruficeps canescens	rufous-crowned sparrow
Geothlypis trichas	common yellowthroat
Melospiza melodia	song sparrow
Guiraca caerulea	blue grosbeak
Agelaius phoeniceus	red-winged blackbird
Sturnella neglecta	western meadowlark
Fringillidae	**Fringillid Finches**
Carpodacus mexicanus	house finch
Carduelis psaltria	lesser goldfinch



Beechey ground squirrel eating some apple taken from the Tijeras West Herbivore Scent Station on 11/20/01

Bobcat traversing near the Tijeras UC on 5/9/02

LSA

FIGURE 5

FTC Wildlife Monitoring

Site Photos

A mule deer utilizing the Chiquita undercrossing on 5/18/02.

Coyote startled by the camera flash at the Tijeras UC on 11/14/01

LSA

FIGURE 6

FTC Wildlife Monitoring

Site Photos

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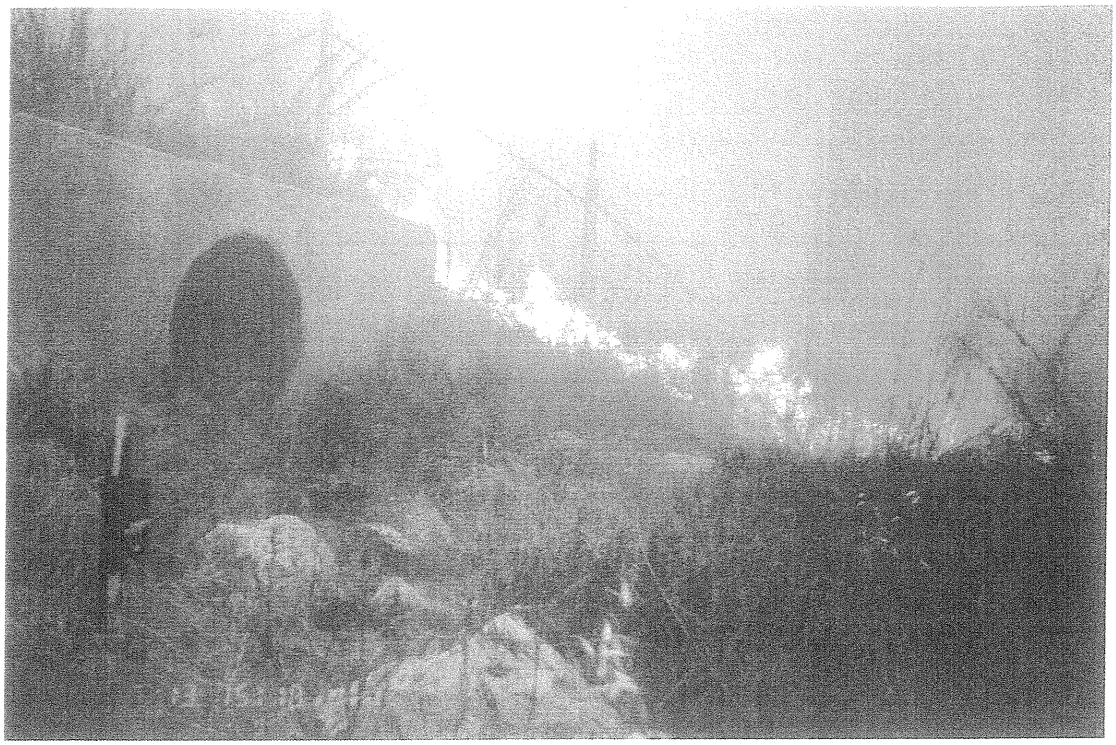

A fire burning through the 54" west culvert site triggers the camera. 5/13/02.

Scorched earth as the fire burns through the 54" west culvert site. 5/13/02.

LSA

FIGURE 7

ETC Wildlife Monitoring

Site Photos

was lost. The survey was extended by one day to make up for the loss of survey time. In addition, one of the passive cameras was stolen and the data logger was vandalized on May 12, 2002. A substitute camera and sensor were set up the following day. Finally, during the last day of the spring 2002 survey (May 6, 2002), the Chiquita Preserve burned as a result of an arson fire. The cameras and data loggers were destroyed at the 54-inch crossing; however, the film was salvaged. Other damages to monitoring equipment included several camera cables that were eaten by rodents. This is the first time that camera cords were damaged by animals.

Consistent with last year's results, the scent stations attracted a wide variety of animals with only a few of those recorded being the targeted medium to large mammals. Most of the animals recorded seem to be those that do not have a large range and would not necessarily use the crossings on a regular basis, such as Audubon cottontail, small rodents, and miscellaneous birds. The only target species recorded at the scent stations were coyote, bobcat, and mule deer, with most of the individuals being recorded at the 54-inch culvert.

The spotlight surveys found primarily mule deer in the vicinity of the 54-inch UC. This may be due to the fact that the 54-inch culvert is the only UC surrounded by open grassland, and that it provides a good place for deer to bed down at night. In addition, the 54-inch culvert has less human activity in the vicinity than the other crossings that are part of the County trail system.

At the Chiquita and Tijeras UCs, the number and diversity of animals recorded in the vicinity of the crossing by the scent stations, spotlight survey, and general observations do not appear to correlate with those recorded using the UCs by the photo stations. The photo stations recorded a higher number of coyote, mule deer, and bobcat than the other methods. This may indicate that the medium to large mammals using the UCs are using them more for movement and may not spend much time investigating the scent stations in the vicinity. A large number of hikers, bikers, and horseback riders (and associated dogs) use the UCs for recreational purposes. This human activity may deter the larger animals from spending time investigating around the UCs, but does not seem to deter them from going through the UCs.

CONCLUSION AND RECOMMENDATIONS

Data collected during this third and final year appear to be consistent with the previous two years, which indicates that the Tijeras Creek and Chiquita wildlife UCs continue to be used by large to medium mammals, including mule deer, coyote, and bobcat. For the first time since the study commenced, the 54 inch culvert also showed evidence of use by coyote and possibly bobcat.

Throughout the three years the study was conducted, the data collected at the Tijeras Creek and Chiquita UCs have remained relatively consistent with regards to variety of wildlife photographed and frequency of use. Mule deer, coyote, and bobcat have been photographed utilizing these two UCs throughout the course of the study. Tijeras Creek and Chiquita tended to be used mostly as daily movement corridors, through which the animals moved fairly directly to get to and from areas used for hunting, foraging, or shelter. This judgement is based on the fact that in many cases the same individual animal was photographed in the late afternoon, going one direction, and then photographed later the same evening, returning. This theory is further bolstered by the fact that fewer medium to large animals were documented by data from the scent stations and spotlight surveys at the Chiquita

and Tijeras UCs than at the 54 inch culvert area. However, a number of other factors may also be involved including terrain, adjacent habitat types, and proximity to development.

During the three-year study, the amount of target species photographed at the 54-inch culvert has slightly increased from year to year. Mule deer, coyote, and bobcat have been photographed in the vicinity of the culvert entrance; however, none have been documented at both ends of the culvert in a time frame that would indicate that the culvert had been utilized. During the set-up of the 2002 study, coyote tracks were found along the entire length of the interior of the culvert. This remains the only definitive evidence that the 54-inch culvert is being used as a corridor by target species. The restrictive size of the 54 inch culvert would most likely prohibit larger wildlife such as mule deer from traversing the entire length; however, because of their considerably smaller size, it is possible that bobcat may utilize the culvert.

Since trails run through the Tijeras Creek and Chiquita UC as part of the southern end of the O'Neill Regional Park, human activity (i.e., hikers, bikers, horseback riders, and accompanying dogs) is relatively common and may be a factor in the amount of wildlife usage in the vicinity. However, the amount of human activity is independent of the design of the UC. Although coyote were determined to use the 54-inch culvert, this crossing is more restrictive than the other two because of its size. Wildlife activity through the UCs may increase in subsequent years due to the following factors: increased vegetative cover created by habitat restoration at the UCs, acclimation to human activity, increased road traffic, an increased learned behavior related to UC usage, and habitat or linkage loss in surrounding areas.

Results of the third year's survey in conjunction with data from the two previous year's studies indicate that the Tijeras Creek and Chiquita UCs are functioning by providing a linkage for wildlife of all sizes to pass underneath the FTCN, while the 54-inch culvert provides some linkage for medium-sized wildlife.