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1997 Labinger Bio Bird

Source USFWS Arco Spill

1997 Bird

RESULTS OF 1997 AVIAN SURVEYS AND LEAST BELL'S VIREO MONITORING: RESTORATION PHASE OF THE ARCO/FOUR CORNERS JANUARY 17, 1994 OIL SPILL ON THE SANTA CLARA RIVER, CALIFORNIA

DRAFT
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Summary

This report presents results from the fourth year of avian surveys conducted in 1997, required by USFWS after the January 17, 1994 ARCO/Four Corners oil spill on the Santa Clara River, in Los Angeles County, California. In addition to the areas immediately affected by inundation of oil, two unaffected reference sites downstream have been included to allow for comparison of bird population parameters between the affected and unaffected areas to assess any injuries to birds from the oil spill. This year three additional areas were surveyed for endangered species. Methods used to conduct the assessment included point counts, tape playback surveys, general surveys, and endangered species monitoring - which included least Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo.

Point count data in 1997 indicated that both relative abundance and species richness were significantly lower in the affected area compared to the reference sites. However, the mean relative abundance of the two most common water-related species (killdeer and spotted sandpiper) showed no differences between areas. Although overall species richness did not vary within the affected area, the diversity of sensitive riparian obligate species was significantly higher at two locations within the affected area. All bird community parameters were significantly greater at reference site I.

One yellow-billed cuckoo and at least one southwestern willow flycatcher were found during our surveys. Least Bell's vireos were present both in the affected area and reference sites - with 6 and 44 pairs, respectively, a substantial increase from 1996. At three other areas surveyed, 10 additional pairs were found. In 1997, productivity was lower in the reference sites compared to the past two years. Overall productivity was consistent with that of wild populations elsewhere in the state. Sixteen nestlings from the affected area and 122 nestlings from the reference sites were banded; one adult female from the Fillmore Fish Hatchery was captured and banded.

In an effort to assist in restoration planning, this report also contains a Discussion and Restoration Recommendation Section.

1.0 Introduction

On 17 January 1994, an earthquake caused the rupture of an ARCO/Four Corners oil pipeline in Santa Clarita, California. The oil spilled into the Santa Clara River at McBean Parkway and spread approximately 17 miles to the Piru Creek confluence. In response to the spill, the California Department of Fish and Game (CDFG) and the US Fish and Wildlife Service (USFWS) on behalf of state and federal trust resources began conducting a cooperative preassessment to determine potential natural resource injuries. In an effort to assess impacts to these resources, namely wildlife and associated habitat, the CDFG and USFWS initiated studies within the spill area on macroinvertebrates, teleost fishes, herpetofauna, and avifauna. This document reports the results from the fourth year of field studies conducted in the spring and summer of 1997.

The natural resource trustees, U.S. Fish and Wildlife Service and California Department of Fish and Game recently reached a $7.1 million dollar settlement with Arco-Four Corners Pipeline for natural resource injury from this spill. The settlement money is to be used for restoration of natural resources lost in the oil spill. In order to conduct effective restoration planning, the trustees have determined that additional monitoring of avian species is warranted. Given this shift in the project's purpose, we made specific changes to the methodology and analysis of the results, and added sections of discussion and recommendations to the 1997 report.

1.1 The Affected Area

The Santa Clara River is one of the largest undammed rivers in Southern California, stretching east-west for approximately 140 kilometers (Figure 1). The affected area is midway within the watershed and supports a variety of sensitive riparian habitats ranging in succession from emergent wetland freshwater marsh to mature willow and cottonwood forest and more disturbed areas of giant reed (*Arundo donax*), tamarisk (*tamarix sp.*) and mulefat (*Baccharis salicifolia*) scrub. Several large freshwater marsh habitats are present which contain emergent bulrush (*Juncus sp.*), cattail (*Typhus sp.*), and young willow (*Salix sp.*) and cottonwood (*Populus sp.*) trees. In addition, much of this stretch of the river is contiguous with native upland habitats such as coastal sage scrub and oak woodland.

The abundance and distribution of birds is directly related to the quality and quantity of available habitat. Since western riparian ecosystems are among the most productive habitats for birds in North America and among the rarest (Krueper 1992), it is not surprising that this part of the river supports a rich diversity of birds, including a number of endangered, threatened, and sensitive species. Some of this section of the river is included within US Fish and Wildlife Service Critical Habitat designation for the state and federally endangered least Bell's vireo (*Vireo bellii pusillus*).

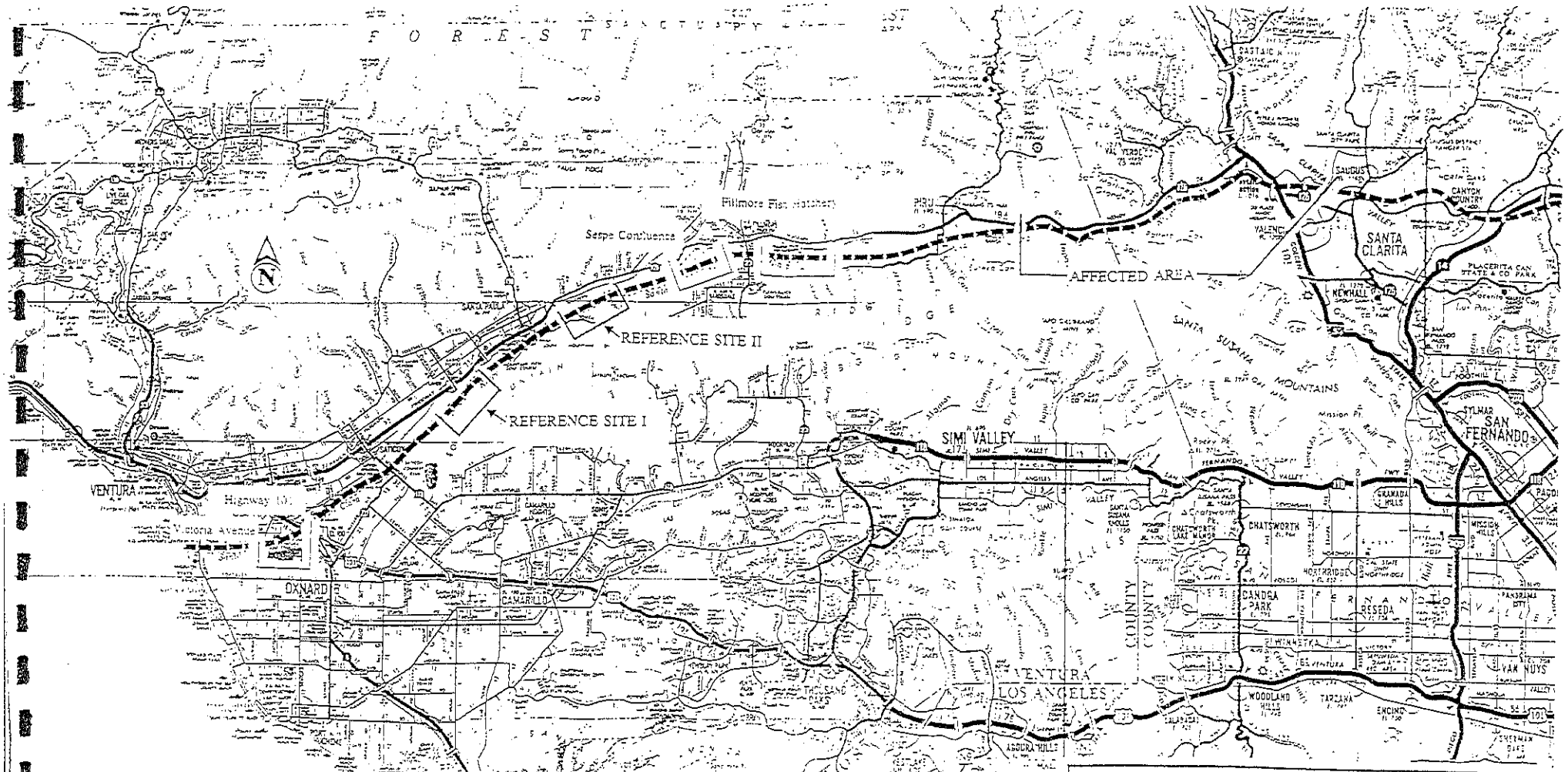

Figure 1. The Santa Clara River showing the Affected Area and the Reference Sites, Ventura and Los Angeles Counties, California.

Santa Clara River

Scale: 1 inch = 3 miles

2.0 Methods

In 1994, two reference sites were chosen as control areas for comparison to the spill area (affected area). The reference sites are located downstream of the spill area near Santa Paula approximately 20 and 25 miles, respectively (Figure 1). Each site is 4.5 km long and combined (9 km) they are exactly half the size of the affected area. Reference sites were chosen according to several criteria: 1) vegetation composition was similar to that found within major portions of the affected area; 2) both sites supported least Bell's vireos, allowing for species specific comparisons; 3) they were in close proximity geographically; and, 4) they were topographically similar to the affected area (i.e. east-to-west river flow within the same river valley). Sites were not chosen up river from the spill area due to the absence of comparable habitat. Although the reference sites were located downstream of the spill, the sites should have been uncontaminated since the oil was contained by several earthen dams 20 miles upstream, and most of the oil was cleaned from the river before heavy rains could wash it past the affected area (T. Abajian, USFWS, pers. com.). The location of all counting points is presented in Figures 2, 3, 4, and 5.

The overall study design in 1997 was similar to the previous three years (Labinger et al. 1994). In general the study was composed of two parts: 1) impacts to the avian community, and 2) impacts to endangered species, including monitoring of known least Bell's vireo sub-populations (Labinger et al. 1994). Project design emphasized comparisons between points within the affected area, and between the affected area and non-affected areas. This approach allowed us to test the hypothesis that bird population parameters vary with respect to degree of habitat damage. Testing the validity of such a hypothesis forms the basis of many damage assessments (USDI 1994).

Methods employed in the study included point counts, tape playback surveys for three endangered species (western yellow-billed cuckoo *Coccyzus americanus occidentalis*, southwestern willow flycatcher *Empidonax traillii extimus*, and least Bell's vireo, general surveys, and least Bell's vireo population monitoring. The 1997 surveys and monitoring began in mid May.

This year we increased our survey area to better understand the distribution of endangered species and subsequent restoration planning. Three additional areas were chosen based on their high quality riparian habitat and prior history of supporting breeding least Bell's vireos (SEB 1993). The locations of these additional areas are: 1) between Highway 101 and Victoria Avenue; 2) at the confluence of Sespe Creek and the Santa Clara River; and 3) the California Fish and Game Fish Hatchery area east of Fillmore (Figure 1). Methods employed in these surveys included tape playback for the three endangered species, general surveys, and least Bell's vireo monitoring.

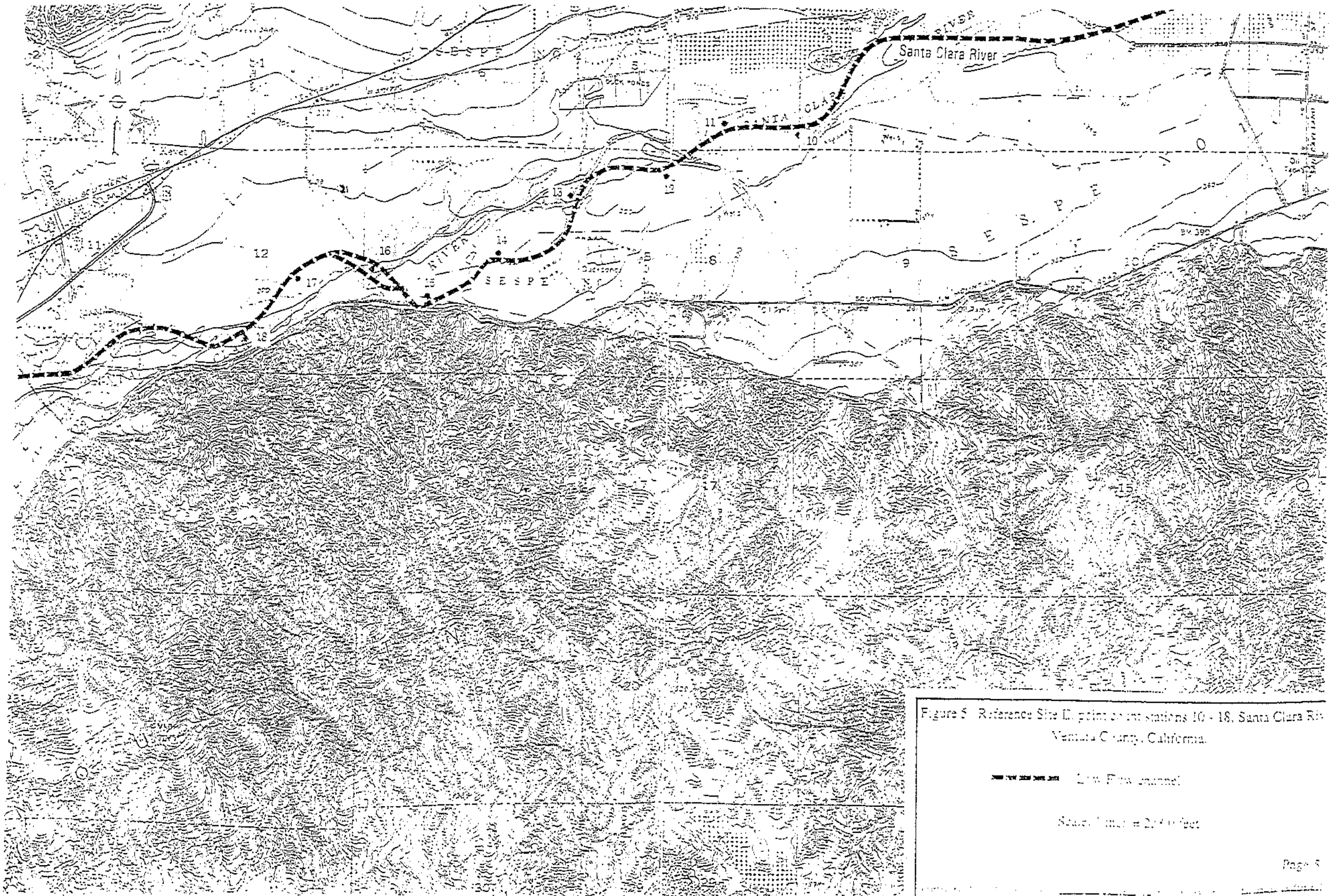

Figure 5 Reference Site [illegible] stations 10 - 18, Santa Clara Ri[illegible]
Ventura County, California.

Low Flow channel

Scale: [illegible]

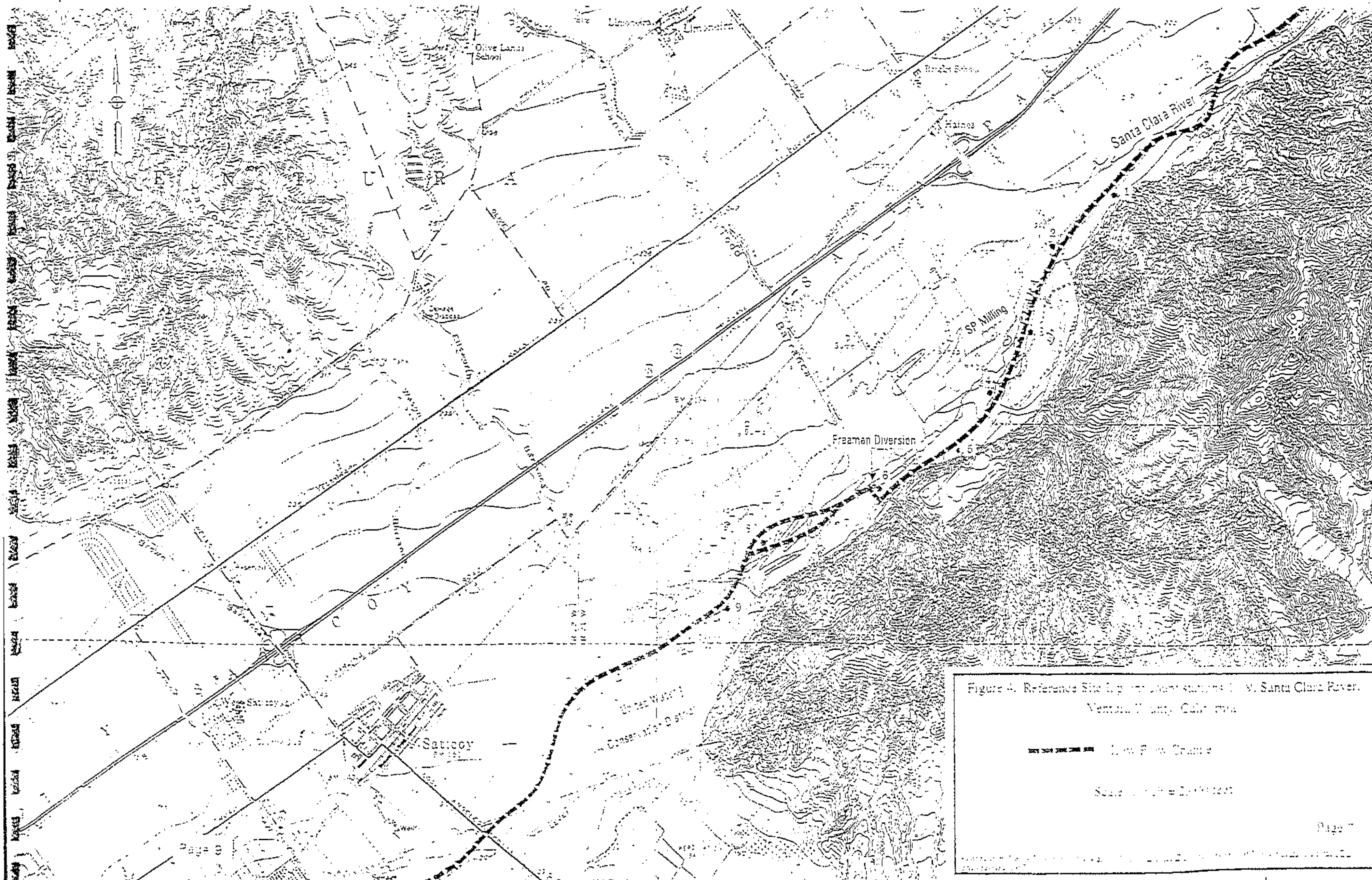

Figure 4. Reference Site [illegible] Santa Clara River, Ventura County, California

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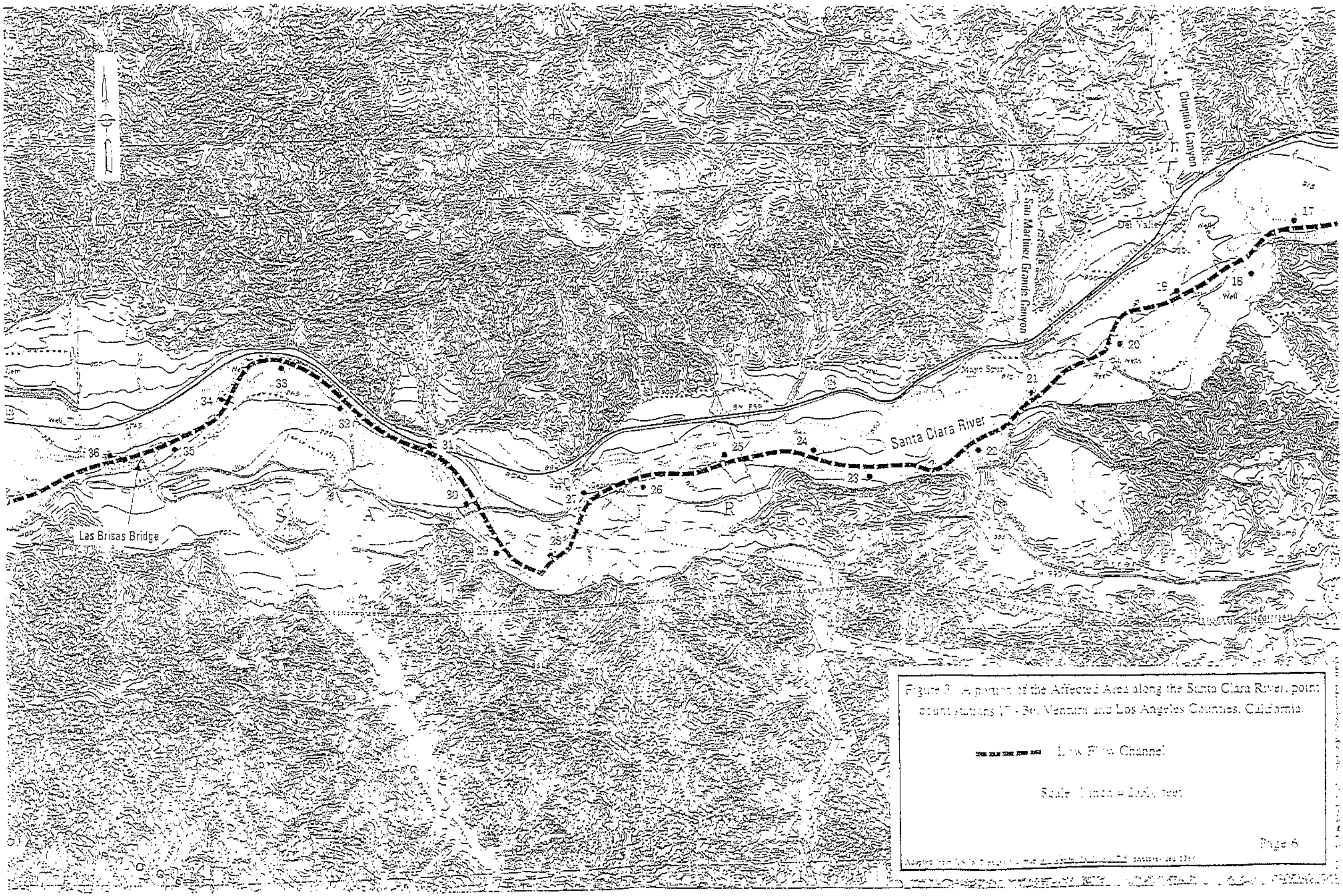

Figure [illegible]. A portion of the Affected Area along the Santa Clara River, point count stations 17 - 36, Ventura and Los Angeles Counties, California.

Low Flow Channel

Scale 1 inch = [illegible] feet

Adapted from U.S.G.S. [illegible]

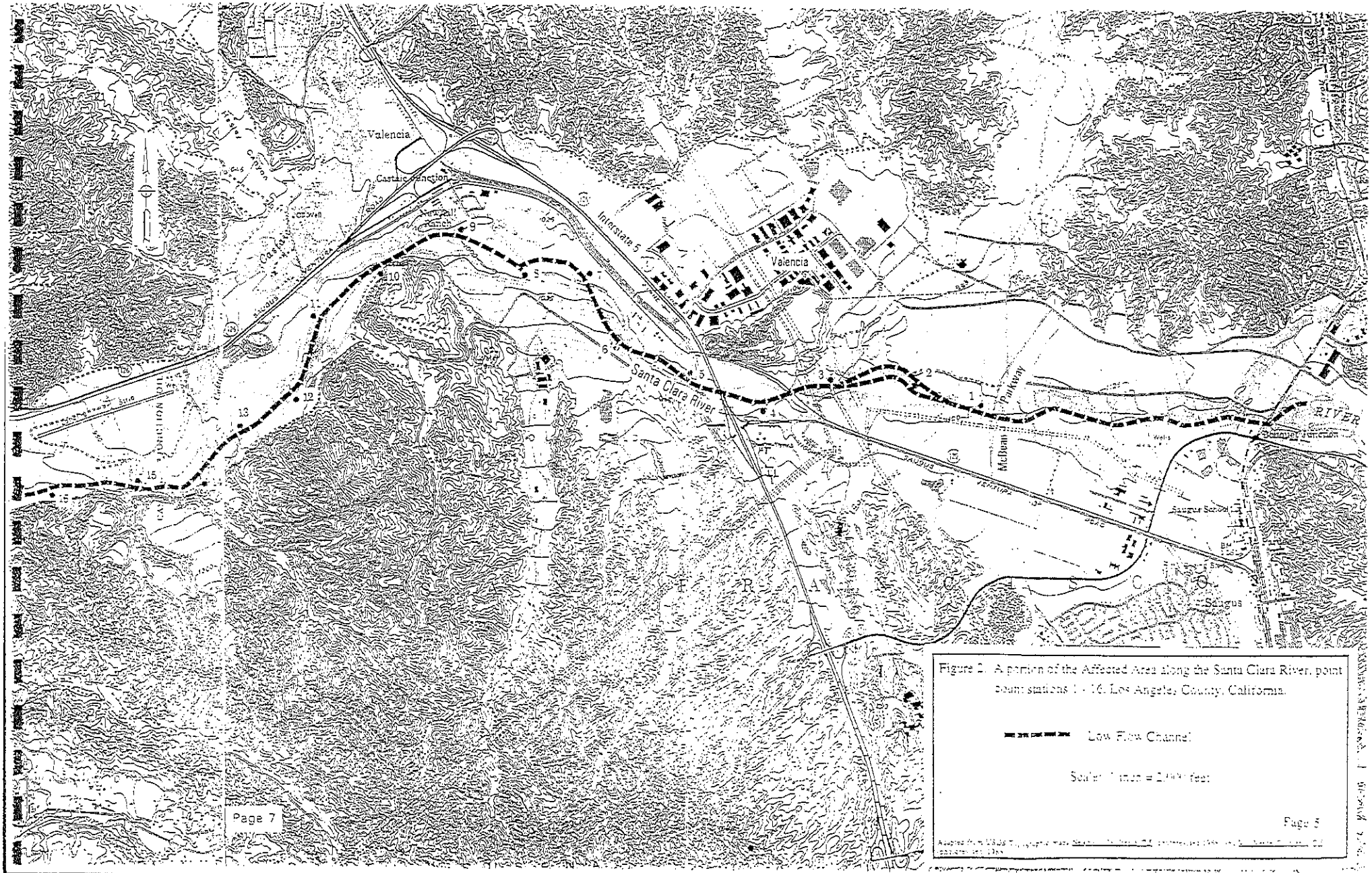

Figure 2. A portion of the Affected Area along the Santa Clara River, point count stations 1 - 16, Los Angeles County, California.

Low Flow Channel

Scale: 1 inch = 2,000 feet

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The study was further extended to include an assessment of habitat parameters at count points. Habitat data was collected at each of the 54 points used for counting birds. Percent coverage of each habitat parameter was estimated visually within a 100 meter radius around each point. Parameters included: standing water; open ground; ruderal; forb; emergent wetland; shrubs - willow sp. < 2m high, cottonwood sp. < 2m high, mulefat, giant reed, tamarisk, miscellaneous sp.; and trees - willow sp., Fremont cottonwood (*Populus fremontii*), black cottonwood (*Populus trichocarpa*).

2.1 Quality Control

All field work was conducted by Z. Labinger and J. Greaves. Both of these biologists have over 15 years of professional experience in field ornithology, including experience with the methods employed here.

Specific training procedures were conducted prior to data collection and are outlined in Labinger et al. (1994). Field data were inspected daily for accuracy and completeness.

2.2 Statistical Analysis

All pertinent data were entered into IBM-compatible computers by J. Greaves. After all data were entered, hard copies were printed and compared with original data sheets by reading data aloud to a second biologist.

Statistical analysis concentrated mostly on point count data. We calculated mean relative abundance for each species from combined data of the two observers. Relative abundance and species richness (number of species) were determined for each point. Relative abundance data deviated slightly from a normal distribution; whereas, species richness followed a normal distribution. To be conservative, we used the nonparametric Mann-Whitney U method to test the relationships between points within the affected area, and between the affected area and reference sites (Ryan et al. 1985). In this report we have not statistically analyzed the results in relation to data from previous years; however, comparisons are discussed in the Discussion section.

The estimated percent cover of the habitat parameters were compared between points within the affected area and between the affected area and reference sites. Some parameters were combined such as shrub and tree cover and used as one statistical parameter. Multiple regression analysis was employed to examine possible correlations between habitat parameters and avian point count data (relative abundance and species richness).

The scope of this study did not include exhaustive literature search of historical data for the study area. Most of this information is in private documents since all the affected area is

private property. Much of the information that is available can not be used for statistical comparisons due to differences in data collection methodology.

3.0 Results

3.1 General Surveys

All species detected during general surveys and point counts are listed in Table I. A total of 107 species were detected throughout the study area. Of these, 24 species (representing approximately 25% of the total) were detected only during the general surveys.

Productivity data were not collected in a consistent manner and with comparable effort, and therefore are difficult to analyze statistically. Highly detectable species such as the waterbirds may yield more reliable data. Juveniles were observed for each of the following waterbird species: green heron, black-crowned night heron, and killdeer. Fewer nests of the ground nesting species (killdeer and spotted sandpiper) were found compared to previous years. This was the first year that spotted sandpiper juveniles were not observed despite at least two known nests. This may be the result of a less intensive survey effort (only two observers), low food availability or a delayed breeding cycle due to late rains. The data do not indicate any significant differences in the number of juveniles of other species between the affected area and reference sites.

3.2 Point Counts

The mean relative abundance for each species is presented by study area section and reference site in Table I. Species richness and total mean relative abundance is presented in Table II. Mean relative abundance of all species combined was significantly greater at the reference sites than at the affected area ($P=0.028$). Species richness was also significantly greater at the reference sites than at the affected area ($P=0.000$). Of the entire study area, reference site I had the highest mean relative abundance and number of species. No trends were found between points within the affected area in relative abundance or species richness. In other words, these parameters did not increase or decrease in relation to distance from the initial spill area.

Relative abundance of the three most abundant species is presented in Table III. As with most census methods, point counts tend to be more accurate for abundant species (Verner 1985). Therefore, three of the most abundant species were analyzed separately (common yellowthroat, song sparrow, and house finch). None of the three species showed a significant difference in mean relative abundance between the affected area and the reference sites.

Table I. Mean relative abundance of bird species detected during 1997 surveys along the affected area and reference sites (mean in bold, standard error in normal font; species detected not during a point count are noted with " * ").

		AFFECTED AREA (SECTIONS)								REFERENCE SITES			
SPECIES		1		2		3		4		I		II	
Pied-billed Grebe	*Podilymbus podiceps*									*			
Double-crested Cormorant	*Phalacrocorax auritus*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00
Great Blue Heron	*Ardea herodias*	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.11	0.07
Great Egret	*Casmerodius albus*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.17	0.12
Snowy Egret	*Egretta thula*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.17	0.00	0.00
Cattle Egret	*Bubulcus ibis*											*	
Green Heron	*Butorides virescens*	0.06	0.06	0.00	0.00	0.00	0.00	0.22	0.15	0.28	0.15	0.11	0.07
Black-crowned Night-Heron	*Nycticorax nycticorax*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.08
White-faced Ibis*	*Plegadis chihi*												
Mallard	*Anas platyrhynchos*	0.00	0.00	0.00	0.00	1.06	0.88	0.06	0.06	0.94	0.60	0.89	0.64
Cinnamon Teal	*Anas cyanoptera*							*				*	
Turkey Vulture	*Cathartes aura*	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.00	0.06	0.06	0.06	0.06
White-tailed Kite	*Elanus leucurus*	0.11	0.11	0.11	0.11	0.00	0.00	0.00	0.00	0.11	0.11	0.11	0.07
Cooper's Hawk	*Accipter cooperii*	0.11	0.07	0.00	0.00	0.06	0.06	0.06	0.06	0.00	0.00	0.06	0.06
Red-shouldered Hawk	*Buteo lineatus*	0.61	0.14	0.22	0.12	0.00	0.00	0.22	0.12	0.06	0.06	0.22	0.12
Red-tailed Hawk	*Buteo jamaicensis*	0.11	0.11	0.28	0.15	0.11	0.07	0.00	0.00	0.28	0.12	0.17	0.12
American Kestrel	*Falco sparverius*	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00
California Quail	*Callipepla californica*	0.17	0.12	0.89	0.49	0.22	0.12	0.11	0.11	0.39	0.16	0.67	0.26
Killdeer	*Charadrius vociferus*	0.00	0.00	0.50	0.29	2.28	0.61	0.28	0.19	1.39	0.51	0.44	0.24
Black-necked Stilt*	*Himantopus mexicanus*												
Greater Yellowlegs	*Tringa melanoleuca*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00
Spotted Sandpiper	*Actitis macularia*	0.00	0.00	0.00	0.00	1.06	0.32	0.56	0.18	0.67	0.30	0.11	0.07
Least Sandpiper	*Calidris minutilla*					*				*		*	
Bonaparte's Gull	*Larus philadelphia*	*		*						*		*	
Heermann's Gull	*Larus heermanni*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06
Western Gull	*Larus occidentalis*	0.06	0.06	0.61	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Common Ground-dove	*Columbina passerina*									*			
Rock Dove	*Columba livia*	0.11	0.07	0.06	0.06	0.00	0.00	0.00	0.00	1.39	1.39	0.06	0.06
Spotted Dove	*Streptopelia chinensis*									*		*	
Mourning Dove	*Zenaida macroura*	0.22	0.12	1.11	0.45	1.00	0.24	0.94	0.19	4.83	2.39	0.83	0.25
Yellow-billed Cuckoo	*Coccyzus americanus*	*											
Greater Roadrunner	*Geococcyx californianus*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00
Common Barn-Owl	*Tyto alba*	*						*		*		*	
Great Horned Owl	*Bubo virginianus*			*						*			
Lesser Nighthawk	*Chordeiles acutipennis*									*			
White-throated Swift	*Aeronautes saxatalis*	0.00	0.00	0.78	0.57	0.17	0.17	0.00	0.00	0.17	0.17	0.17	0.12
Costa's Hummingbird	*Calyptae costae*	*		*		*				*			
Black-chinned Hummingbird	*Archilochus alexandri*	0.00	0.00	0.06	0.06	0.11	0.07	0.00	0.00	0.00	0.00	0.06	0.06
Anna's Hummingbird	*Calypte anna*	0.50	0.20	0.11	0.07	0.22	0.12	0.22	0.17	0.11	0.07	0.06	0.06
Selashporus sp.	*Selasphorus sp.*												
Hummingbird sp		0.11	0.07	0.11	0.07	0.44	0.10	0.22	0.12	0.22	0.09	0.28	0.09

		AFFECTED AREA (SECTIONS)								REFERENCE SITES			
SPECIES		1		2		3		4		I		II	
Belted Kingfisher	*Ceryle alcyon*	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Nuttall's Woodpecker	*Picoides nuttallii*	0.28	0.17	0.61	0.11	0.50	0.14	0.22	0.09	0.00	0.00	0.22	0.09
Downy Woodpecker	*Picoides pubescens*	0.11	0.07	0.17	0.08	0.06	0.06	0.33	0.22	0.17	0.12	0.39	0.18
Hairy Woodpecker	*Picoides villosus*	0.11	0.11	0.11	0.07	0.00	0.00	0.22	0.12	0.06	0.06	0.00	0.00
Northern Flicker	*Colaptes auratus*	0.17	0.08	0.17	0.08	0.00	0.00	0.06	0.06	0.22	0.12	0.56	0.21
Western Wood-Pewee	*Contopus sordidulus*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06
Pacific-slope Flycatcher	*Empidonax difficilis*	0.00	0.00	0.00	0.00	0.11	0.11	0.11	0.07	0.06	0.06	0.22	0.15
Willow Flycatcher	*Empidonax traillii*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00
Black Phoebe	*Sayornis nigricans*	0.28	0.12	0.28	0.17	0.56	0.10	0.67	0.25	1.22	0.38	0.50	0.14
Say's Phoebe	*Sayornis saya*									*			
Ash-throated Flycatcher	*Myiarchus cinerascens*	1.17	0.29	0.94	0.23	1.00	0.19	0.72	0.21	0.33	0.12	1.00	0.30
Cassin's Kingbird	*Tyrannus vociferans*	0.00	0.00	0.00	0.00	0.17	0.17	0.06	0.06	0.39	0.16	0.06	0.06
Western Kingbird	*Tyrannus verticalis*	0.06	0.06	0.11	0.11	0.17	0.17	0.00	0.00	0.00	0.00	0.11	0.11
Kingbird sp.		0.11	0.07	0.00	0.00	0.00	0.00	0.06	0.06	0.06	0.06	0.00	0.00
Horned Lark	*Eremophila alpestris*	*											
Tree Swallow	*Tachycineta bicolor*	0.28	0.28	0.61	0.29	0.33	0.19	0.06	0.06	2.89	0.93	1.44	0.61
Violet-green Swallow	*Tachycineta thalassina*	0.00	0.00	0.11	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.12
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	1.72	0.49	0.78	0.28	0.33	0.17	0.06	0.06	1.94	0.39	1.89	0.52
Cliff Swallow	*Petrochelidon pyrrhonota*	0.44	0.27	7.06	3.01	0.72	0.32	8.22	7.73	2.39	0.88	3.67	0.87
Barn Swallow	*Hirundo rustica*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.32	0.00	0.00
Swallow sp.		1.28	0.87	0.28	0.19	0.11	0.07	0.06	0.06	0.28	0.28	0.00	0.00
Western Scrub Jay	*Aphelocoma coerulescens*	1.17	0.20	1.83	0.28	0.94	0.32	0.56	0.31	0.00	0.00	0.22	0.09
American Crow	*Corvus brachyrhynchos*	3.94	1.43	1.06	0.33	1.17	0.56	0.44	0.19	0.39	0.29	0.39	0.26
Common Raven	*Corvus corax*	0.44	0.23	1.00	0.28	1.11	0.45	0.22	0.12	0.61	0.20	0.28	0.15
Oak Titmouse	*Baeolophus inornatus*	1.22	0.29	0.67	0.30	0.50	0.19	0.67	0.29	0.00	0.00	0.00	0.00
Bushtit	*Psaltriparus minimus*	1.00	0.33	0.22	0.15	0.94	0.63	0.44	0.23	1.44	0.44	0.72	0.40
White-breasted Nuthatch	*Sitta carolinensis*	*											
Bewick's Wren	*Thryomanes bewickii*	1.44	0.27	1.22	0.19	1.06	0.21	1.11	0.31	1.28	0.28	1.50	0.24
House Wren	*Troglodytes aedon*	0.00	0.00	0.11	0.07	0.00	0.00	0.06	0.06	0.00	0.00	0.06	0.06
Wren sp.		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06
Western Bluebird	*Sialia mexicana*	0.17	0.17	0.39	0.23	0.17	0.08	0.06	0.06	0.00	0.00	0.00	0.00
Swainson's Thrush	*Catharus ustulatus*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.08
American Robin	*Turdus migratorius*	0.06	0.06	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.07
Wrentit	*Chamaea fasciata*	0.22	0.17	0.61	0.25	0.56	0.15	0.67	0.24	0.94	0.24	0.61	0.20
Northern Mockingbird	*Mimus polyglottos*	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00
California Thrasher	*Toxostoma redivivum*	0.06	0.06	0.44	0.23	0.28	0.15	0.17	0.12	0.22	0.09	0.22	0.09
Phainopepla	*Phainopepla nitens*	0.00	0.00	0.11	0.11	0.22	0.09	0.50	0.50	0.00	0.00	0.00	0.00
Loggerhead Shrike	*Lanius ludovicianus*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.12	0.00	0.00
European Starling	*Sturnus vulgaris*	0.11	0.07	0.11	0.07	0.44	0.23	0.39	0.26	1.00	0.58	0.00	0.00
Least Bell's Vireo	*Vireo bellii pusillus*	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.19	1.50	0.30	0.28	0.15
Hutton's Vireo	*Vireo huttoni*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.07	0.06	0.06
Warbling Vireo	*Vireo gilvus*	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Nashville Warbler	*Vermivora ruficapilla*											*	
Townsend's Warbler	*Dendroica townsendii*			*									
Wilson's Warbler	*Wilsonia pusilla*									*		*	

SPECIES		AFFECTED AREA (SECTIONS) 1		2		3		4		REFERENCE SITES I		II	
Orange-crowned Warbler	*Vermivora celata*	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.07
Yellow Warbler	*Dendroica petechia*	0.50	0.29	0.11	0.11	0.00	0.00	0.78	0.29	2.06	0.39	0.78	0.30
Common Yellowthroat	*Geothlypis trichas*	1.89	0.35	1.78	0.26	1.33	0.40	2.33	0.35	1.61	0.34	2.83	0.55
Yellow-breasted Chat	*Icteria virens*	0.50	0.20	0.00	0.00	0.00	0.00	1.06	0.38	0.94	0.18	1.17	0.32
Western Tanager	*Piranga ludoviciana*			*									
Black-headed Grosbeak	*Pheucticus melanocephalus*	0.61	0.25	0.78	0.19	1.67	0.25	1.11	0.16	1.11	0.11	0.67	0.22
Blue Grosbeak	*Guiraca caerulea*	0.67	0.22	0.72	0.21	0.83	0.26	0.44	0.13	0.72	0.19	0.78	0.25
Lazuli Bunting	*Passerina amoena*	0.17	0.12	0.61	0.14	0.44	0.24	0.28	0.12	0.39	0.14	0.72	0.28
Indigo Bunting	*Passerina cyanea*	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.11	0.11
Spotted Towhee	*Pipilo erthrophthalmus*	1.22	0.17	0.61	0.22	0.78	0.22	0.72	0.24	1.06	0.18	0.67	0.20
California Towhee	*Pipilo crissalis*	1.00	0.29	0.39	0.18	0.94	0.28	0.39	0.14	0.39	0.20	0.33	0.14
Rufous-crowned Sparrow	*Aimophila ruficeps*	0.00	0.00	0.06	0.06	0.11	0.07	0.00	0.00	0.00	0.00	0.00	0.00
Lark Sparrow	*Chondestes grammacus*	0.00	0.00	0.28	0.28	0.17	0.08	0.00	0.00	0.00	0.00	0.00	0.00
Song Sparrow	*Melospiza melodia*	2.78	0.25	2.44	0.34	2.00	0.45	2.00	0.36	1.67	0.35	2.39	0.50
Red-winged Blackbird	*Agelaius phoeniceus*	2.06	1.19	0.94	0.77	1.39	0.69	0.67	0.36	3.72	2.98	0.50	0.14
Brewer's Blackbird	*Euphagus cyanocephalus*	0.00	0.00	0.17	0.17	0.28	0.15	0.11	0.11	0.39	0.39	0.06	0.06
Brown-headed Cowbird	*Molothrus ater*	0.50	0.22	0.61	0.27	0.44	0.10	0.67	0.20	0.06	0.06	0.06	0.06
Great-tailed Grackle	*Quiscalus mexicanus*											*	
Blackbird sp.		0.00	0.00	0.00	0.00	0.17	0.17	0.00	0.00	0.28	0.28	0.00	0.00
Hooded Oriole	*Icterus cucullatus*	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Bullock's Oriole	*Icterus bullocki*	0.17	0.12	0.22	0.12	0.44	0.18	0.11	0.11	0.61	0.37	0.11	0.11
Oriole sp.		0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Purple Finch	*Carpodacus purpureus*	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.06	0.06	0.17	0.08
House Finch	*Carpodacus mexicanus*	2.50	0.45	1.22	0.40	0.44	0.18	0.61	0.18	1.61	0.84	0.78	0.26
Lesser Goldfinch	*Carduelis psaltria*	1.67	0.66	0.67	0.49	1.33	0.33	2.17	0.43	2.17	0.40	1.11	0.40
Lawrence's Goldfinch	*Carduelis lawrencei*	0.11	0.11	0.00	0.00	0.00	0.00	0.06	0.06	0.33	0.17	0.06	0.06
American Goldfinch	*Carduelis tristis*	0.17	0.12	0.06	0.06	0.00	0.00	0.33	0.17	0.89	0.31	1.28	0.34
House Sparrow	*Passer domesticus*	*								*			

* White-faced Ibis - 13 observed at Sespe Creek and Santa Clara River confluence
Black-necked Stilt- 2 observed at Sespe Creek and Santa Clara River confluence

The relative abundance of water-related species was also examined separately (Table III). All of these species spend a majority of their time foraging and/or nesting on the ground near water, and therefore, were more likely to be directly affected by the oil spill. The relative abundance of the two most common water-related species, spotted sandpiper and killdeer, did not vary significantly between the affected area and reference sites. The relative abundance of the less common waterbirds (all fish-eaters: great egret, great-blue heron, snowy egret, green heron, black-crowned night-heron, and belted kingfisher) were pooled for analysis to increase the sample size. Relative abundance of these species combined was significantly lower in the affected area than in the reference sites ($P=0.045$). The relationship between mean relative abundance of these three water-related species and points along the affected area and reference sites is graphed in Figure 6.

We examined the distribution of sensitive riparian obligate species to determine areas of higher diversity. Figure 7 shows two graphs: A) the total number of species (richness), and B) the number of sensitive riparian obligate species plotted for all count points in the study area. Total species richness is fairly evenly distributed over most points, with the exception of some points in reference site I that support a significantly greater number of species (see Table II). In contrast, sensitive riparian obligates show much more variation. Areas of high diversity of these species include Magic Mountain to upper Castaic Junction (points 7 - 11), Salt Creek down to Las Brisas (points 27 - 36), and reference sites I and II (excluding the last point at reference site II). These areas are discussed in more detail within the context of least Bell's vireo habitat use and distribution.

3.3 Habitat Relationships

The results of estimated percent cover of habitat parameters for each point is presented in Table IV. We used multiple regression analysis to examine each of the habitat parameters (and combinations) in relation to mean relative abundance and species richness. Mean relative abundance did not correlate significantly with any of the habitat parameters. However, species richness was significantly negatively related to the number of habitat parameters present at a point, and the total tree coverage (Figure 8). The combined regression equation is: Species Richness = 34.0 - 0.948 Habitat Parameters - 0.102 Total Tree, r-squared = 20.3 %, p = 0.003.

TABLE II. Comparison of mean (in bold) species richness and relative abundance of points per section within the study area (Standard Error in normal font).

	AFFECTED AREA (SECTIONS)					REFERENCE SITES			
	1	2	3	4	Total	I	II	Total	P*
Relative Abundance	34.72 10.57	35.67 15.05	31.33 5.72	33.28 25.21	33.75 15.26	49.89 17.77	34.39 9.26	42.14 15.89	0.03 *
Species Richness	22.44 4.09	23.00 3.87	24.67 3.84	21.78 4.74	22.97 4.12	29.11 4.68	26.78 4.55	27.94 4.63	0.000 *
Total Richness	54	55	56	55	76	62	66	78	

* Mann-Whitney Test of Affected versus Reference Sites: ns - not significant, * - significant at p<0.05

TABLE III. Mean relative abundance (in bold) of the three most common species and water-related species in the study area (Standard Error in normal font).

	AFFECTED AREA (SECTIONS)					REFERENCE SITES			
	1	2	3	4	Total	I	II	Total	P*
Abundant Species									
Common Yellowthroat	1.89 1.05	1.78 0.79	1.33 1.12	2.33 1.06	1.83 1.06	1.61 1.02	2.83 1.66	2.22 1.48	0.486 ns
Song Sparrow	2.78 0.75	2.44 1.01	2.00 1.35	2.00 1.09	2.31 1.08	1.67 1.06	2.39 1.50	2.03 1.31	0.369 ns
House Finch	2.50 1.35	1.22 1.20	0.44 0.53	0.61 0.55	1.19 1.24	1.61 2.52	0.78 0.80	1.19 1.86	0.595 ns
Water-related Species									
Killdeer	0.00 0.00	0.50 0.87	2.28 1.82	0.28 0.56	0.76 1.35	1.39 1.54	0.44 0.73	0.92 1.26	0.373 ns
Spotted Sandpiper	0.00 0.00	0.00 0.00	1.05 0.95	0.55 0.53	0.40 0.68	0.67 0.90	0.11 0.22	0.39 0.70	0.985 ns
Fish-eaters+	0.05 0.17	0.55 0.17	0.17 0.25	0.28 0.56	0.14 0.33	0.67 0.79	0.39 0.55	0.53 0.67	0.045 *

* Mann-Whitney Test of Affected versus Reference Sites: ns - not significant, * - significant at p<0.05

+ Fish-eaters = Great Blue Heron, Great Egret, Snowy Egret, Black-crowned Night Heron, Green Heron, and Belted Kingfisher

Figure 6. The relationship between mean relative abundance and count points along the affected area and reference sites for several water-related species (Santa Clara River, California).

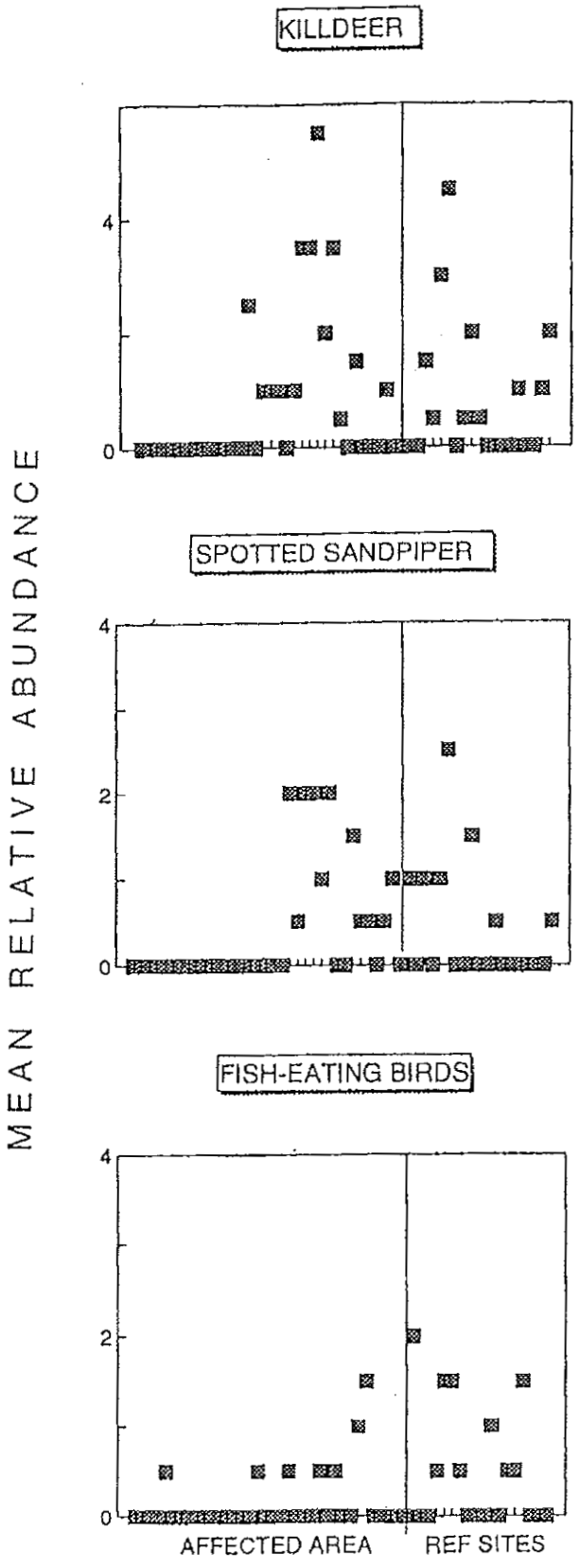


Figure 7. The relationship between points along the affected area and reference sites and: A. the total number of species detected per point; and B. the total number of sensitive riparian obligate species per point (willow flycatcher, least Bell's vireo, warbling vireo, blue grosbeak, yellow-breasted chat, and yellow warbler).

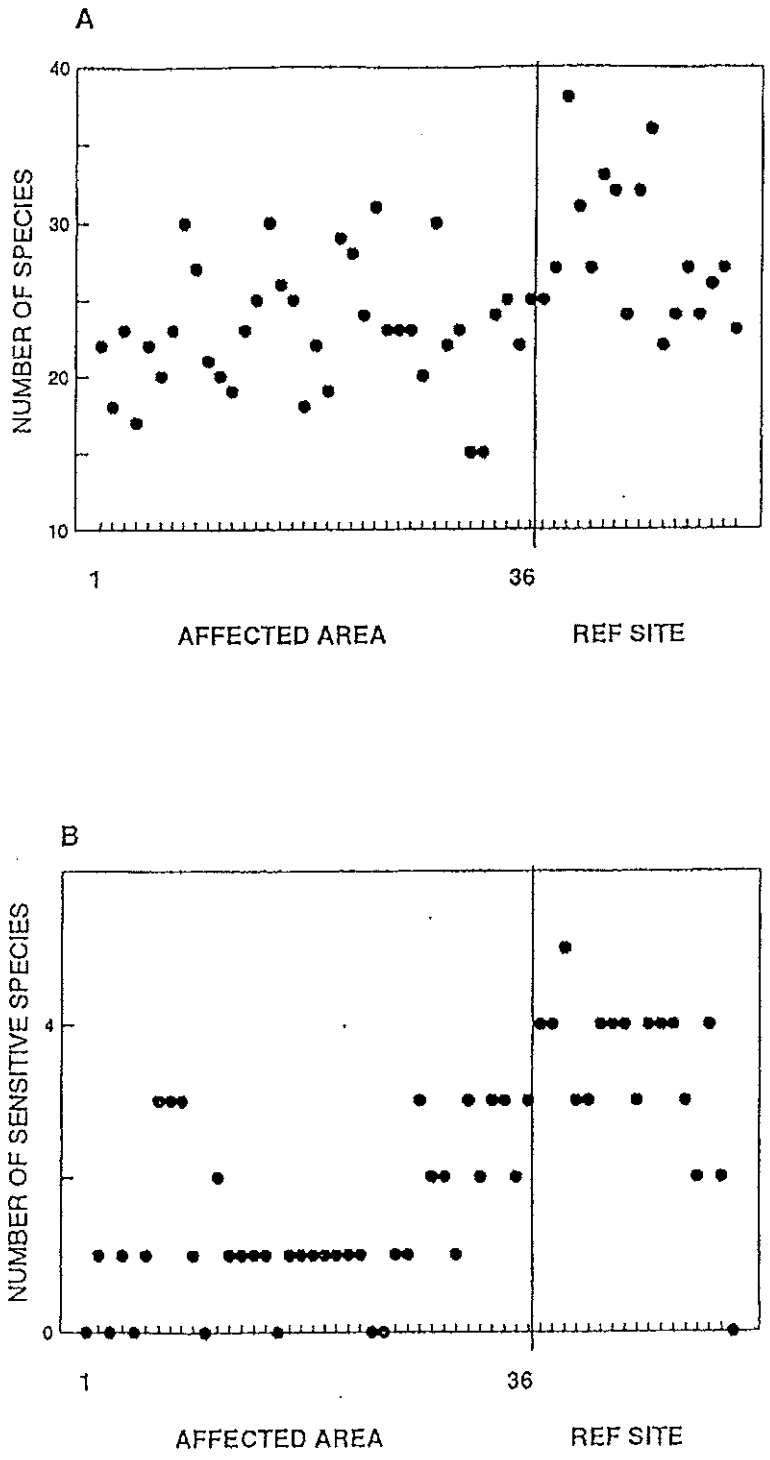
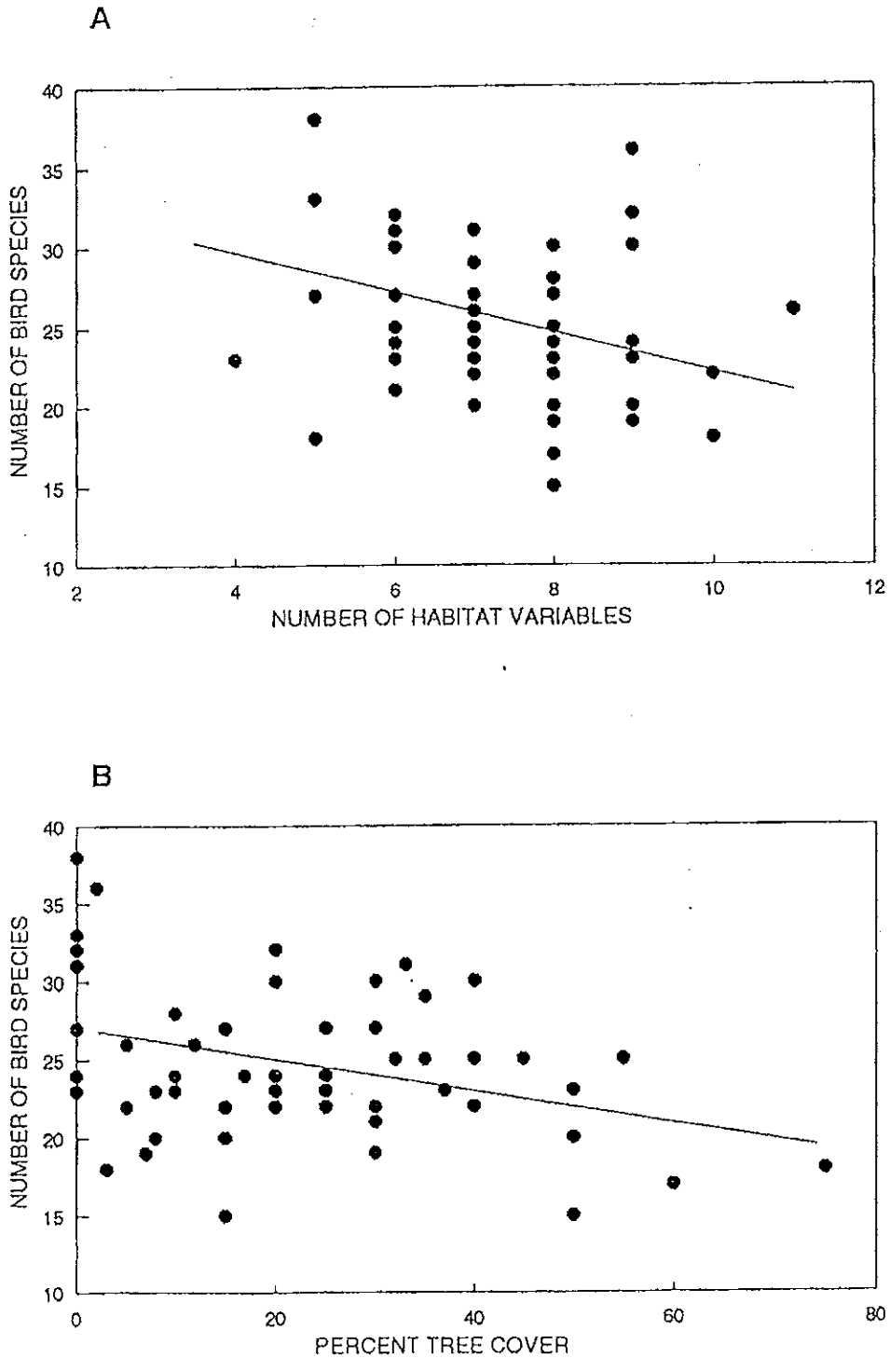


Table IV. Habitat parameters at each of the 54 points used to count birds. Numbers are estimates of percent cover in a 100 meter radius around each point.

						SHRUB COVER						TREE COVER		
POINT NUMBER	Water	Open Ground	Ruderal	Forbe	Emergent Wetland	Mulefat	Salix sp.	Tamarisk	Arundo	Cottonwood sp.	Miscellaneous sp.	Salix sp.	Fremont Cottonwood	Black Co
Affected Area														
1	0	7	0	3	2	20	20	1	2	5	0	40	0	0
2	0	0	0	0	15	3	0	0	7	0	0	65	10	0
3	5	0	0	20	2	2	10	0	1	10	0	40	10	0
4	5	15	0	10	3	0	5	0	2	0	0	50	10	0
5	5	25	0	20	3	5	10	2	5	0	0	5	20	0
6	5	0	20	25	0	0	20	5	10	0	0	10	5	0
7	5	15	0	30	10	0	15	0	0	2	3	20	0	0
8	3	25	0	20	2	5	15	0	5	5	0	20	0	0
9	0	0	21	15	0	5	10	0	2	22	0	22	3	0
10	20	0	0	25	20	0	5	0	0	0	0	25	5	0
11	0	32	0	18	5	5	17	0	5	10	0	5	3	0
12	5	30	0	15	0	10	5	0	5	0	0	27	3	0
13	0	30	0	10	0	15	0	0	10	0	25	3	7	0
14	0	25	0	10	0	10	5	0	2	0	3	10	35	0
15	10	10	0	30	3	0	0	5	10	0	2	0	30	0
16	5	15	0	45	2	2	15	2	3	3	3	0	5	0
17	20	15	0	25	2	0	0	0	3	0	0	15	20	0
18	5	5	0	30	0	15	20	2	5	0	15	2	1	0
19	10	5	0	8	2	40	15	0	0	0	0	15	5	0
20	5	20	0	50	0	10	3	4	1	0	0	2	5	0
21	5	10	0	0	0	35	10	5	0	0	0	30	5	0
22	10	30	0	15	0	15	15	5	0	0	0	5	5	0
23	5	25	0	5	0	35	5	5	0	0	0	5	15	0
24	15	43	0	5	0	30	2	5	0	0	0	0	0	0
25	20	5	0	10	0	15	35	5	0	0	0	5	5	0
26	15	37	0	10	0	25	0	5	0	0	0	3	5	0
27	0	35	0	0	0	20	5	0	0	0	0	37	0	0
28	5	0	0	25	0	10	5	0	5	0	0	35	15	0
29	0	5	0	15	0	20	20	0	0	0	0	15	25	0
30	3	5	5	20	2	5	40	0	5	0	0	10	5	0

						SHRUB COVER						TREE COVER		
POINT NUMBER	Water	Open Ground	Ruderal	Forbe	Emergent Wetland	Mulefat	Salix sp.	Tamarisk	Arundo	Cottonwood sp.	Miscellaneous sp.	Salix sp.	Fremont Cottonwood	Black Cot
31	25	5	10	0	15	0	10	0	10	0	0	25	0	0
32	10	10	0	20	5	5	20	0	15	0	0	15	0	0
33	10	5	0	10	10	0	10	0	5	0	0	45	5	0
34	10	10	0	15	10	0	5	5	20	0	0	10	15	0
35	20	0	0	8	5	0	10	0	2	0	0	55	0	0
36	10	15	0	15	5	0	25	0	0	0	0	10	20	0
Reference Sites														
R1	0	19	0	20	0	10	1	0	10	0	0	40	0	0
R2	0	23	3	20	5	0	15	0	2	0	0	32	0	0
R3	0	5	0	45	5	0	15	0	0	0	0	30	0	0
R4	0	5	0	10	0	5	70	0	10	0	0	0	0	0
R5	22	10	0	15	3	2	15	0	0	0	0	33	0	0
R6	10	35	20	10	10	0	15	0	0	0	0	0	0	0
R7	0	40	0	25	0	5	0	0	10	0	20	0	0	0
R8	2	40	0	5	3	20	30	0	0	0	0	0	0	0
R9	0	35	0	10	0	15	10	0	20	0	0	10	0	0
R10	5	28	0	10	5	5	5	0	20	0	2	20	0	0
R11	10	15	0	25	5	20	15	0	5	3	0	2	0	0
R12	0	25	0	5	0	5	10	0	44	5	1	5	0	0
R13	5	18	0	10	5	0	30	0	15	0	0	15	0	2
R14	10	25	0	10	0	15	20	0	5	0	0	15	0	0
R15	10	10	0	30	5	10	30	0	5	0	0	0	0	0
R16	0	3	0	25	0	25	25	0	10	0	0	10	0	2
R17	15	15	5	20	5	15	25	0	0	0	0	0	0	0
R18	0	65	0	8	0	15	5	0	5	0	2	0	0	0

Figure 8. The relationship between the total number of species (richness) per point and: A. the total number of habitat variables recorded; and B. the total percent tree cover.



3.4 Endangered Species Surveys

This is the first year that all three endangered species were detected within the study area. The locations of all individuals of the three endangered species are presented in Figures 9 - 23. Observations and monitoring Accounts are as follows.

3.4.1 Yellow-billed Cuckoo

One yellow-billed cuckoo was heard at the Magic Mountain area between points 7 and 8 on July 10th (Figure 9). The bird repeated its congeneric (both sexes) vocalization several times seemingly in response to a taped playback. This individual was not found on subsequent searches of this area and was presumed to have migrated through the area.

3.4.2 Southwestern Willow Flycatcher

Figure 18 shows two locations of southwestern willow flycatchers within reference site I. This probably represents one individual since the locations are in close proximity and the dates do not overlap. The bird at the second location sang frequently and occupied the site long enough to be considered territorial.

3.4.3 Least Bell's Vireo

Least Bell's vireos were found at three locations within the affected area (Magic Mountain, Salt Creek, and Las Brisas; Figures 9 - 13), at the two reference sites (Figures 16 - 22), and at three locations outside the study area: Fillmore Fish Hatchery (Figure 14), Sespe Creek confluence (Figure 15), and downstream of Highway 101 (Figure 23). General population and productivity parameters for all vireo sites are presented in Table V. Vegetation used for nest support is presented in Table VI. Productivity per successful pair was relatively high at the affected area and reference sites; where as, productivity was significantly lower at the three additional areas.

Affected Area. In 1997, we found evidence of only one pair of least Bell's vireos at the Salt Creek location, the lowest found during this study. One pair of successful vireos was found at Las Brisas where a pair had been present in 1994 and 1996. In addition, two more pairs were found along the narrow stretch of river adjacent to highway 126 approximately 1 km upstream of the Las Brisas pair. Two pairs also bred successfully just north of Magic Mountain in a 3 year old riparian woodland. Four of the 14 adults found in the affected area were banded as nestlings in 1994 (1), 1995 (2), and an uncertain year.

One of 3 nests at the Salt Creek site may have failed due to cows, where paths were located through nest sites. Another nest was found after it had been abandoned, before nestling stage, as no evidence of feather sheathing powder was found in the nest cup; the other nest was not

completed and the adults moved to a site nearby for the remainder of the breeding season. No vireo nests were parasitized in the affected area during 1997 study (although at least 2 pairs of song sparrows were observed feeding fledgling cowbirds, and 2 pairs of common yellowthroats were observed feeding nestling cowbirds).

Reference Sites. A total of 54 males were found at the two reference sites: 40 at reference site I and 14 at reference site II. Of 43 females at the reference sites, at least 33 were at reference site I and 10 at reference site II. Productivity at reference site I was higher than at either reference site I and the affected area, due to greater nest failure in those two areas. In 1997, one vireo nest was parasitized in the reference site I, in addition to 2 pairs each of wrentits and common yellowthroats that were observed feeding juvenile cowbirds. As in previous years, relative abundance data from the point counts indicate that considerably fewer cowbirds were present in the reference sites than in the affected area (Figure 24).

Banding Results Sixteen nestlings from the affected area and 122 nestlings from the reference sites were banded with a US Fish and Wildlife numbered aluminum band and a drainage colored band. One male vireo, banded as a nestling on the San Luis Rey River, San Diego County, in 1993 (Kus, 1993) was again present at reference site I in the same territory used in 1995 and 1996. This territory is in the vicinity of another territory held by two vireos (from 1991-94) that were banded as nestlings in San Diego County (SEB 1993). A female, banded as a nestling on the San Luis Rey River in 1995, was in a new location in reference site II (Kus, pers. comm.).

Four previously banded females (a female in the affected area downstream of the Los Angeles-Ventura County line, a female in reference site II, and 2 females in reference site I) were caught to obtain their band numbers in order to determine their origins. These females came from nests in reference site II in 1995, reference site II in 1993, reference site I in 1992, and reference site II in 1993, respectively. One unbanded female was caught and banded near the Fillmore Fish Hatchery.

Figure 9. Threatened and Endangered species detected in section 1 of the affected area (points 7 - 9), Santa Clara River, Los Angeles County, California.

0 Count Points

Least Bell's Vireo Pair

Yellow-billed Cuckoo

Low-flow Channel

Source: Pacific Western Aerial Surveys: 11 April 1994. 1 inch:550 feet

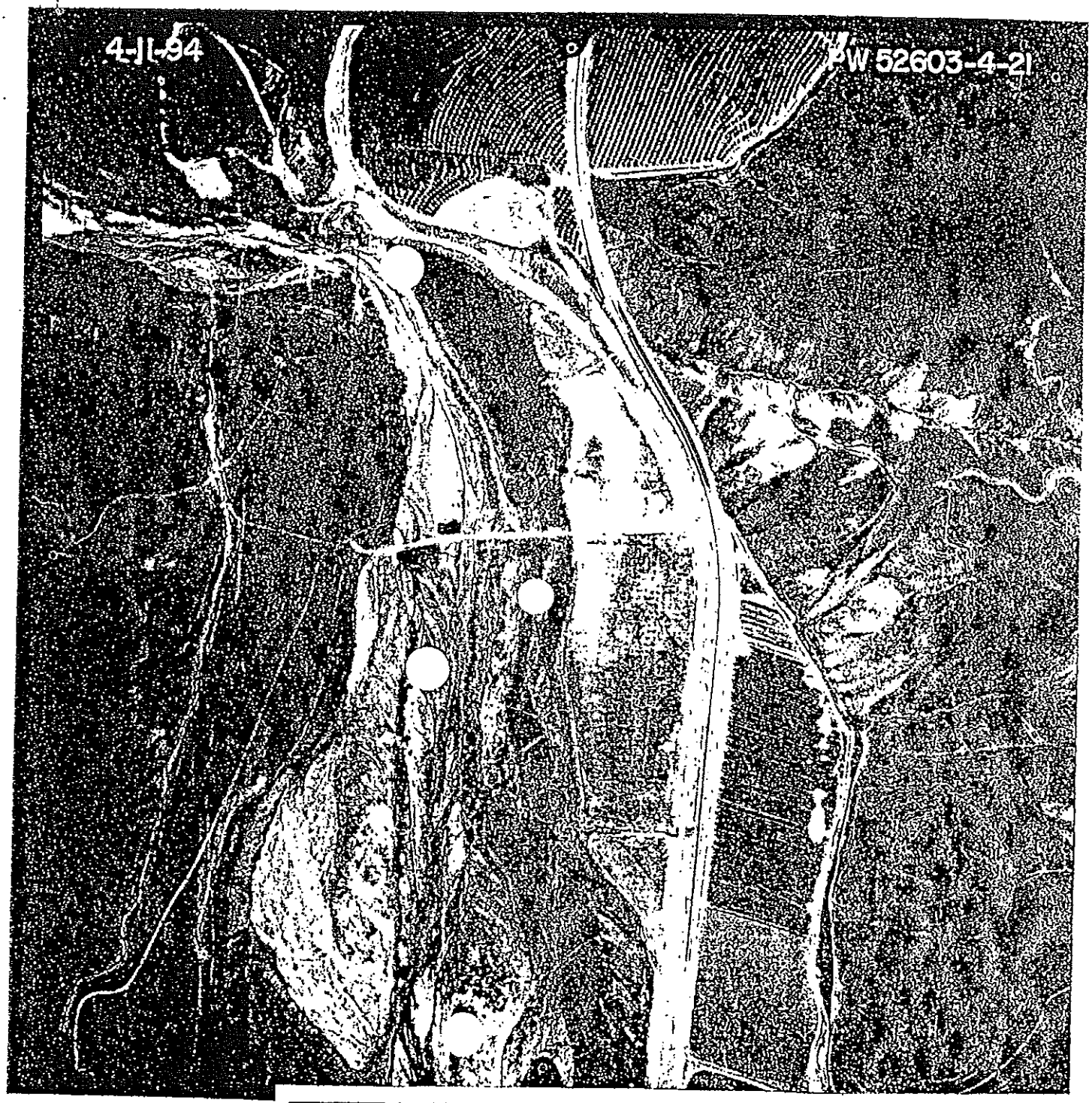


Figure 10. Threatened and Endangered species detected in section 3 of the affected area (points 25 - 27), Santa Clara River, Ventura County, California.

0 Count Points

Least Bell's Vireo Pair

Least Bell's Vireo Male

Source: Pacific Western Aerial Surveys: 11 April 1994. 1 inch:550 feet

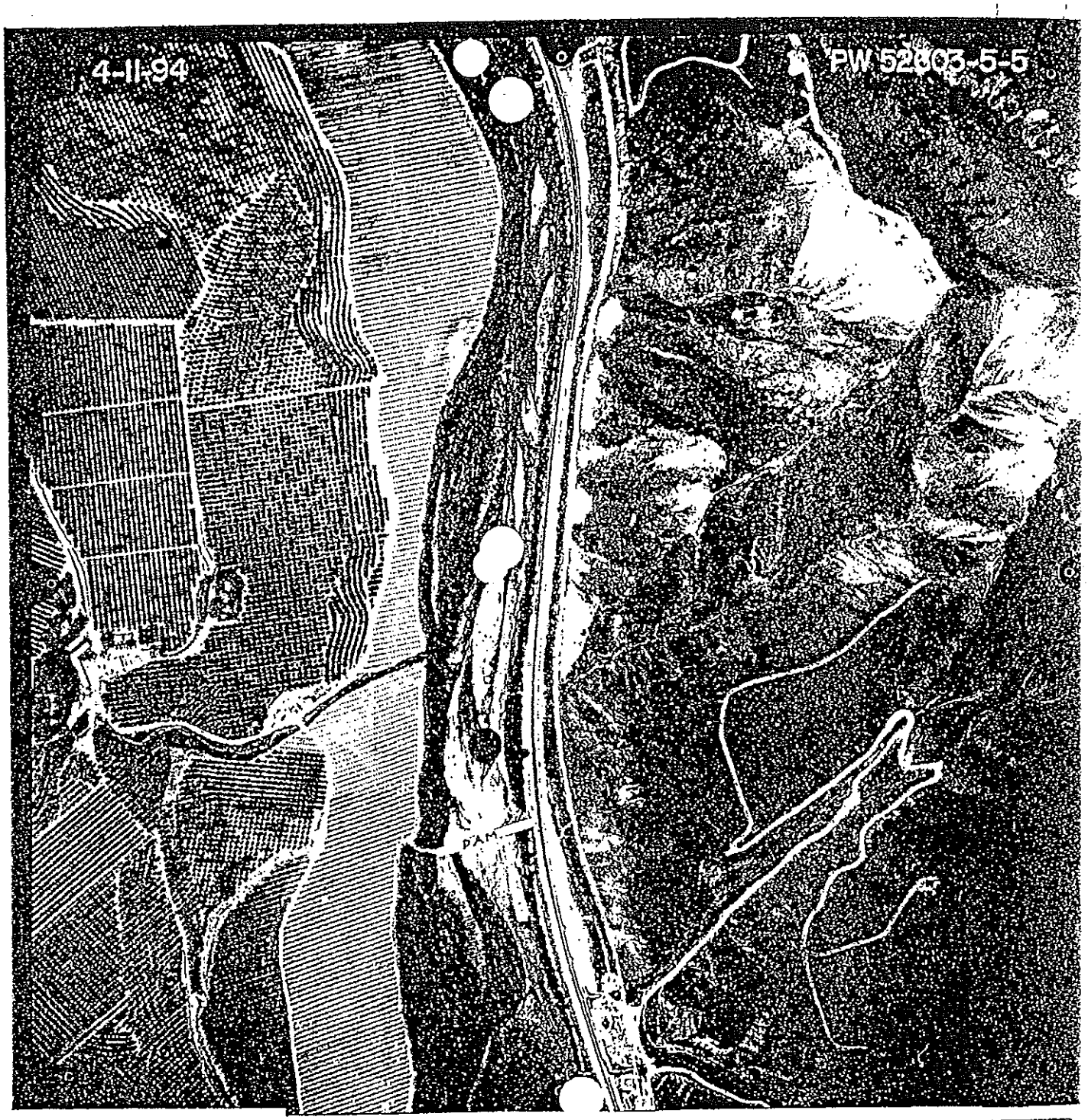


Figure 11. Threatened and Endangered species detected in section 4 of the affected area (points 31 - 33), Santa Clara River, Ventura County, California.

0 Count Points

Least Bell's Vireo Pair

Least Bell's Vireo Male

Source: Pacific Western Aerial Surveys: 11 April 1994. 1 inch:550 feet

Labinger Bio Consulting

Figure 12. Threatened and Endangered species detected in section 4 of the affected area (points 33 - 34), Santa Clara River, Ventura County, California.

0 Count Points

Least Bell's Vireo Pair

Least Bell's Vireo Male

Source: Pacific Western Aerial Surveys: 11 April 1994. 1 inch:550 feet

Labinger Bio Consulting

Figure 13. Threatened and Endangered species detected in section 4 of the affected area (points 34 - 36), Santa Clara River, Ventura County, California.

0 Count Points

Least Bell's Vireo Pair

Source: Pacific Western Aerial Surveys: 11 April 1994. 1 inch:550 feet

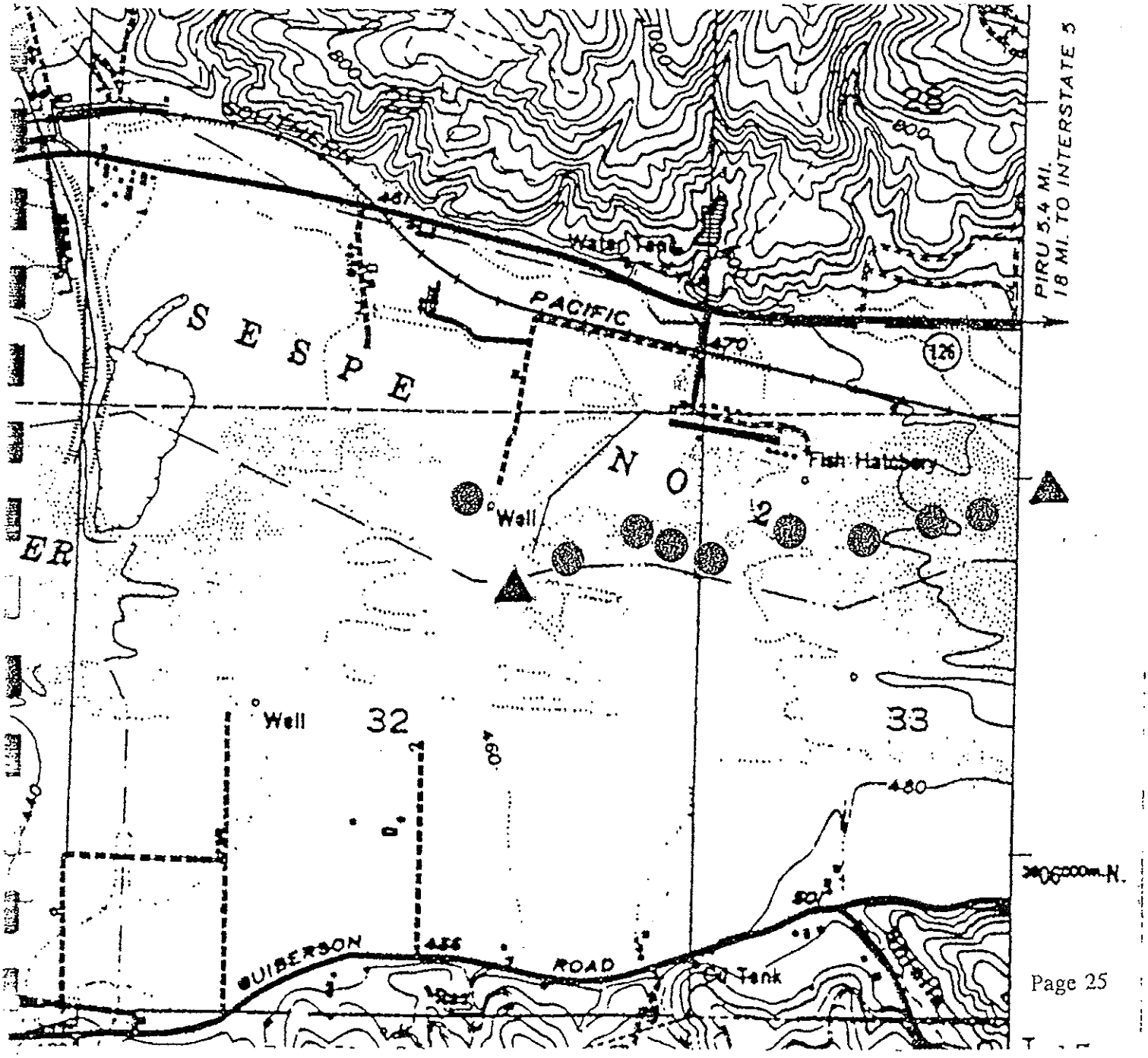
Figure 14. Threatened and Endangered species detected in Fillmore Fish Hatchery (CDFG) area, Santa Clara River, Ventura County, California.

● Least Bell's Vireo Pair

▲ Least Bell's Vireo Male

Source: Adapted from U.S.G.S. topographic map, Fillmore Quadrat. 1 inch:1000 feet

Labinger Bio Consulting



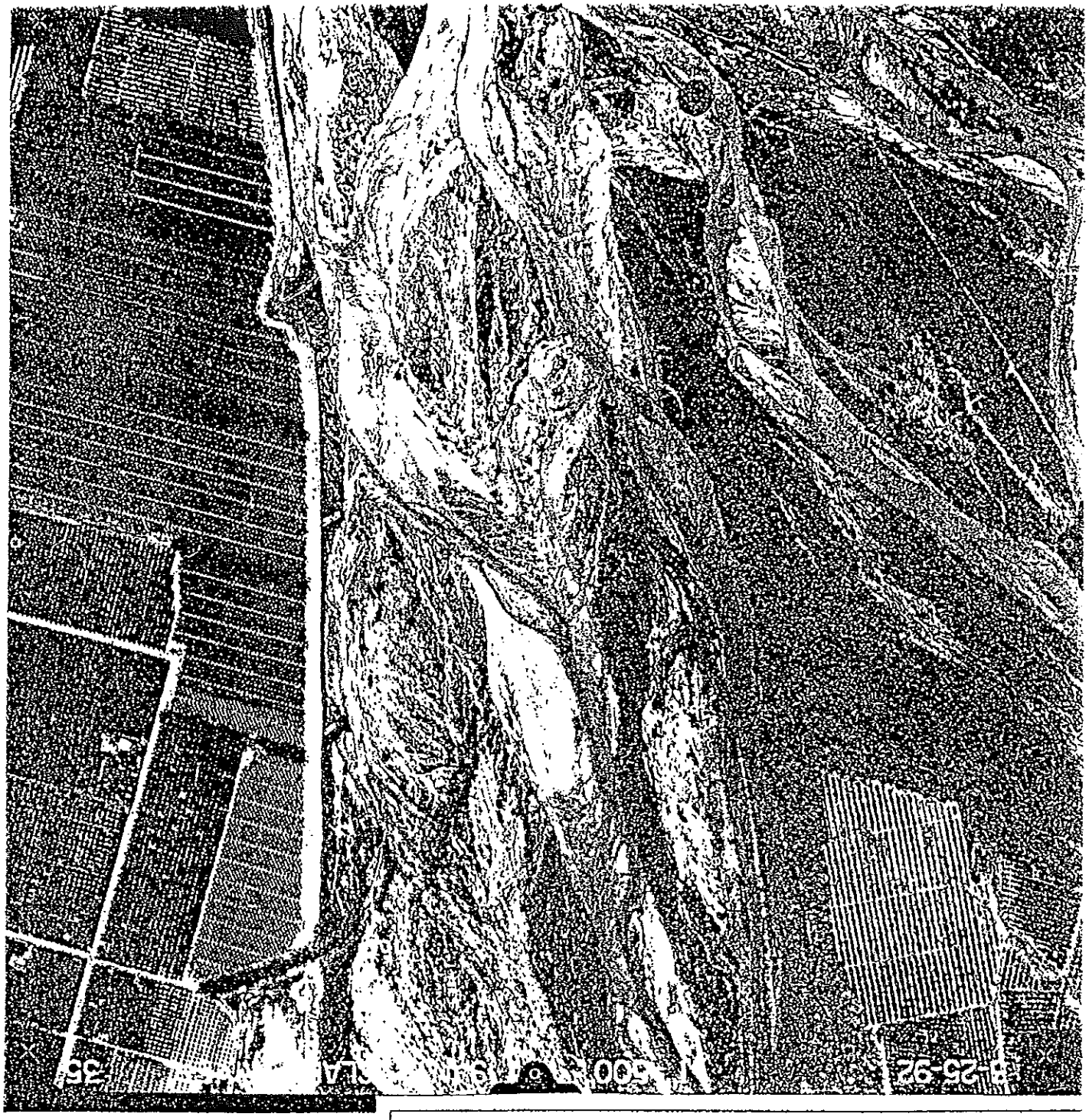


Figure 15. Threatened and Endangered species detected at the Sespe Creek confluence at Santa Clara River, Ventura County, California.

Least Bell's Vireo Male

Source: Pacific Western Aerial Surveys: 25 March 1992. 1 inch:550 feet

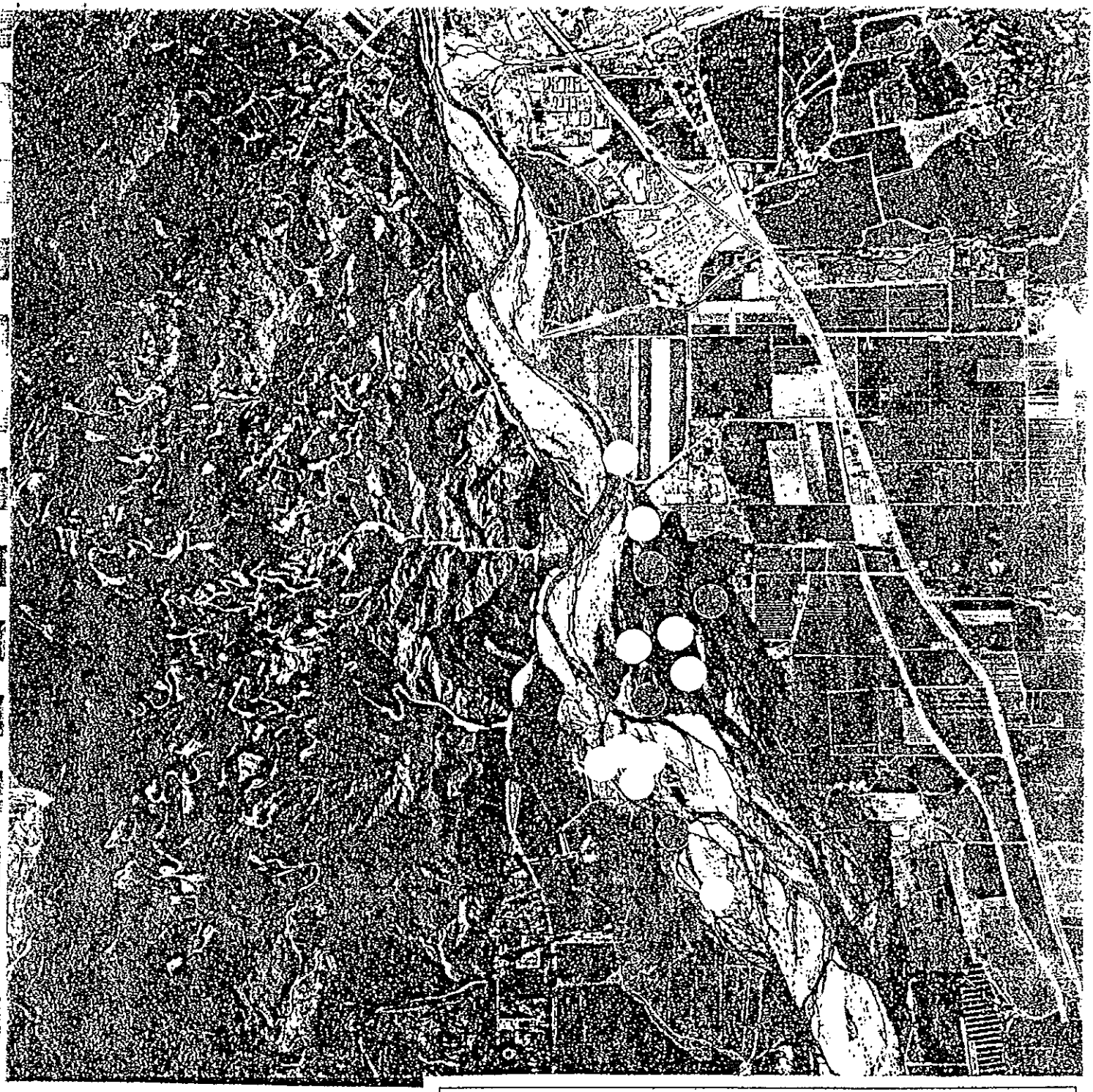


Figure 16. Threatened and Endangered species detected in reference site II, Santa Clara River, Ventura County, California.

Least Bell's Vireo Pair

Least Bell's Vireo Male

Source. Pacific Western Aerial Surveys: 2 February 1993. 1 inch:1500 feet

Figure 17. Threatened and Endangered species detected in reference site I (Points R1-R3), Santa Clara River, Ventura County, California.

0 Count Point

Least Bell's Vireo Pair

Source: Pacific Western Aerial Surveys: 18 March 1992. 1 inch:550 feet

Figure 18. Threatened and Endangered species detected in reference site I (R3 - R5), Santa Clara River, Ventura County, California.

0 Count Points

Least Bell's Vireo Pair

Least Bell's Vireo Male

Southwestern Willow Flycatcher

Source: Pacific Western Aerial Surveys: 18 March 1992. 1 inch:550 feet

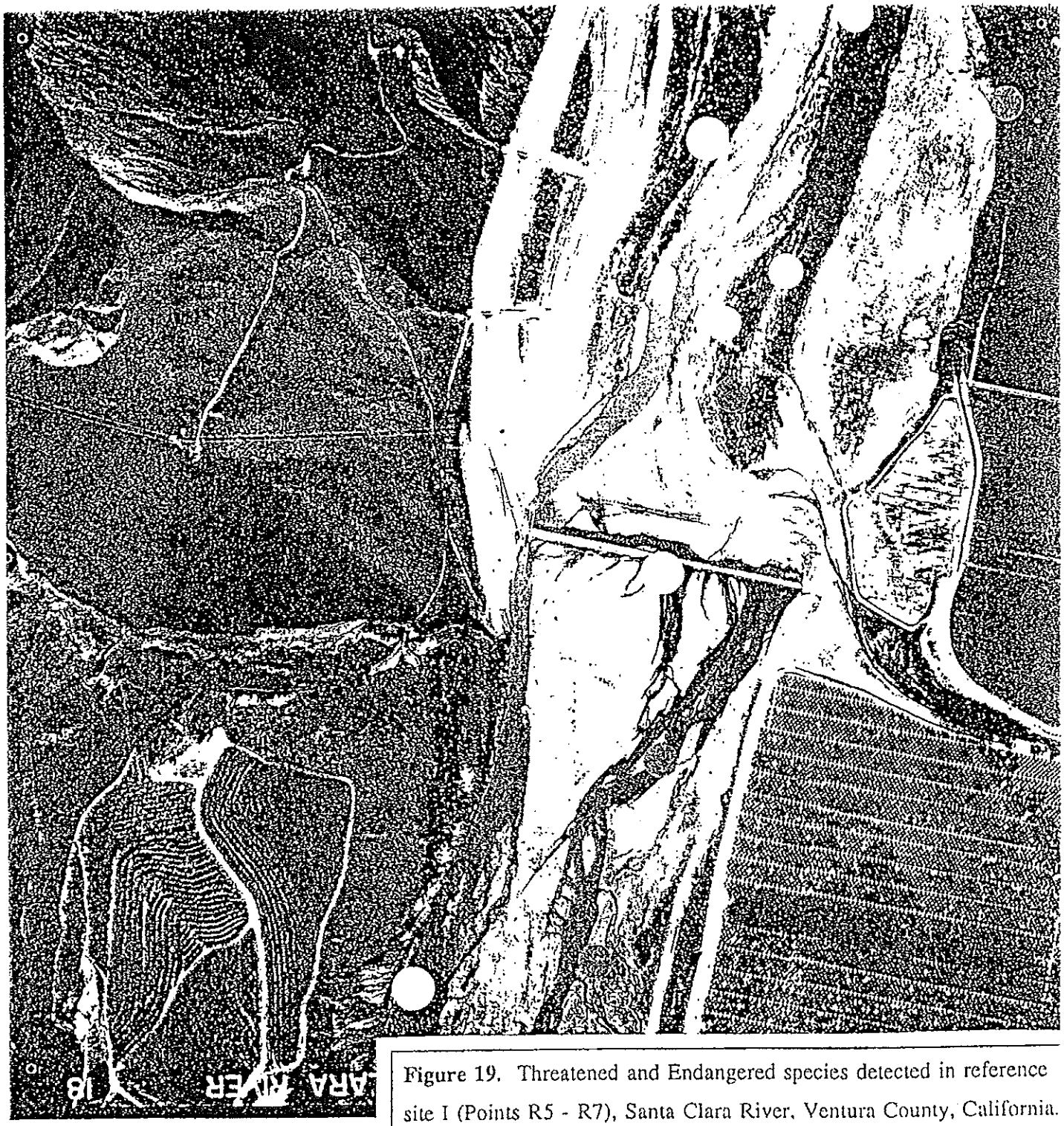


Figure 19. Threatened and Endangered species detected in reference site I (Points R5 - R7), Santa Clara River, Ventura County, California.

0 Count Point

Least Bell's Vireo Pair

Least Bell's Vireo Male

Southwestern Willow Flycatcher

Source: Pacific Western Aerial Surveys: 18 March 1992. 1 inch:550 feet

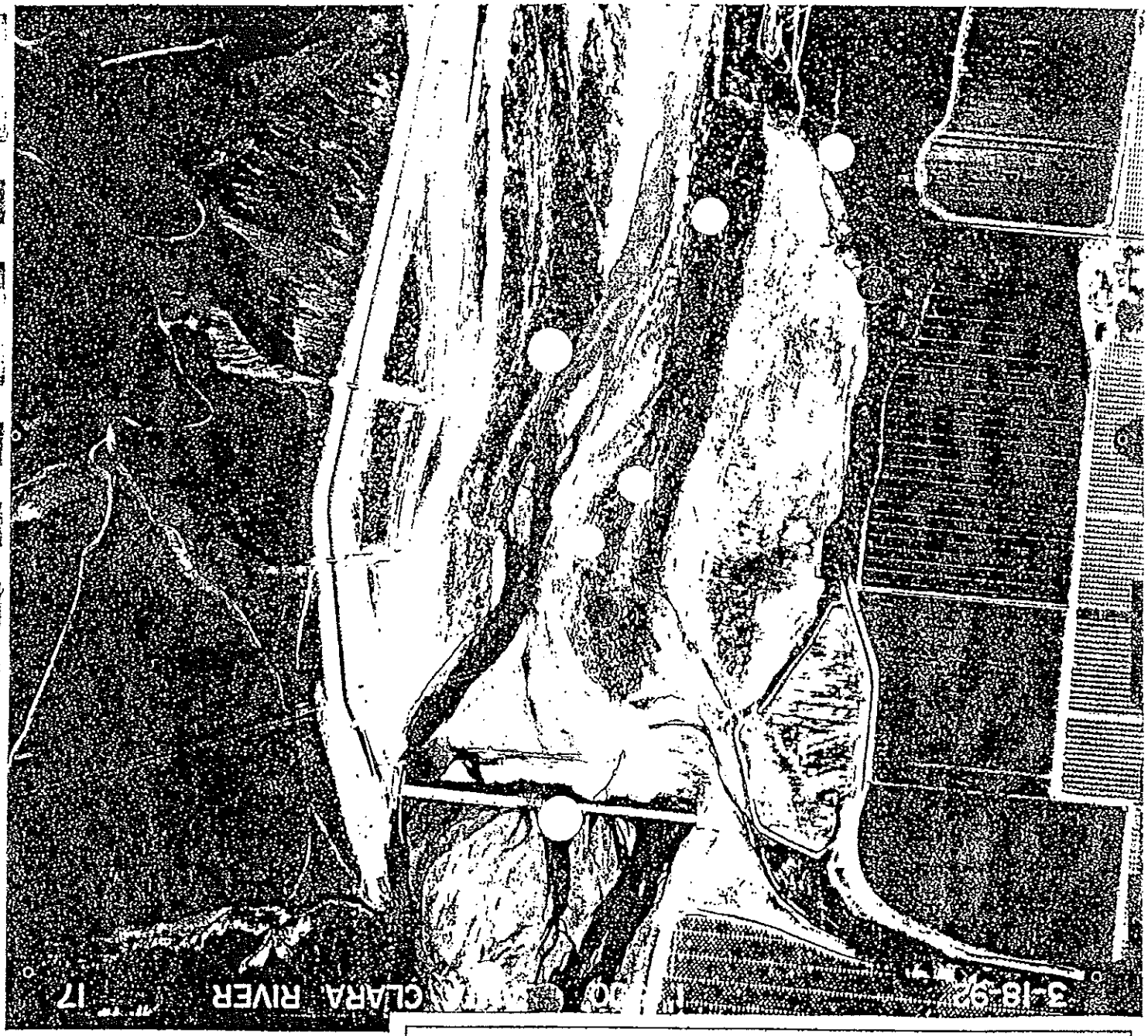


Figure 20. Threatened and Endangered species detected in reference site I (Points R6 - R8), Santa Clara River, Ventura County, California.

0 Count Point

Least Bell's Vireo Pair

Least Bell's Vireo Male

Southwestern Willow Flycatcher

Source: Pacific Western Aerial Surveys: 18 March 1992. 1 inch:1500 feet

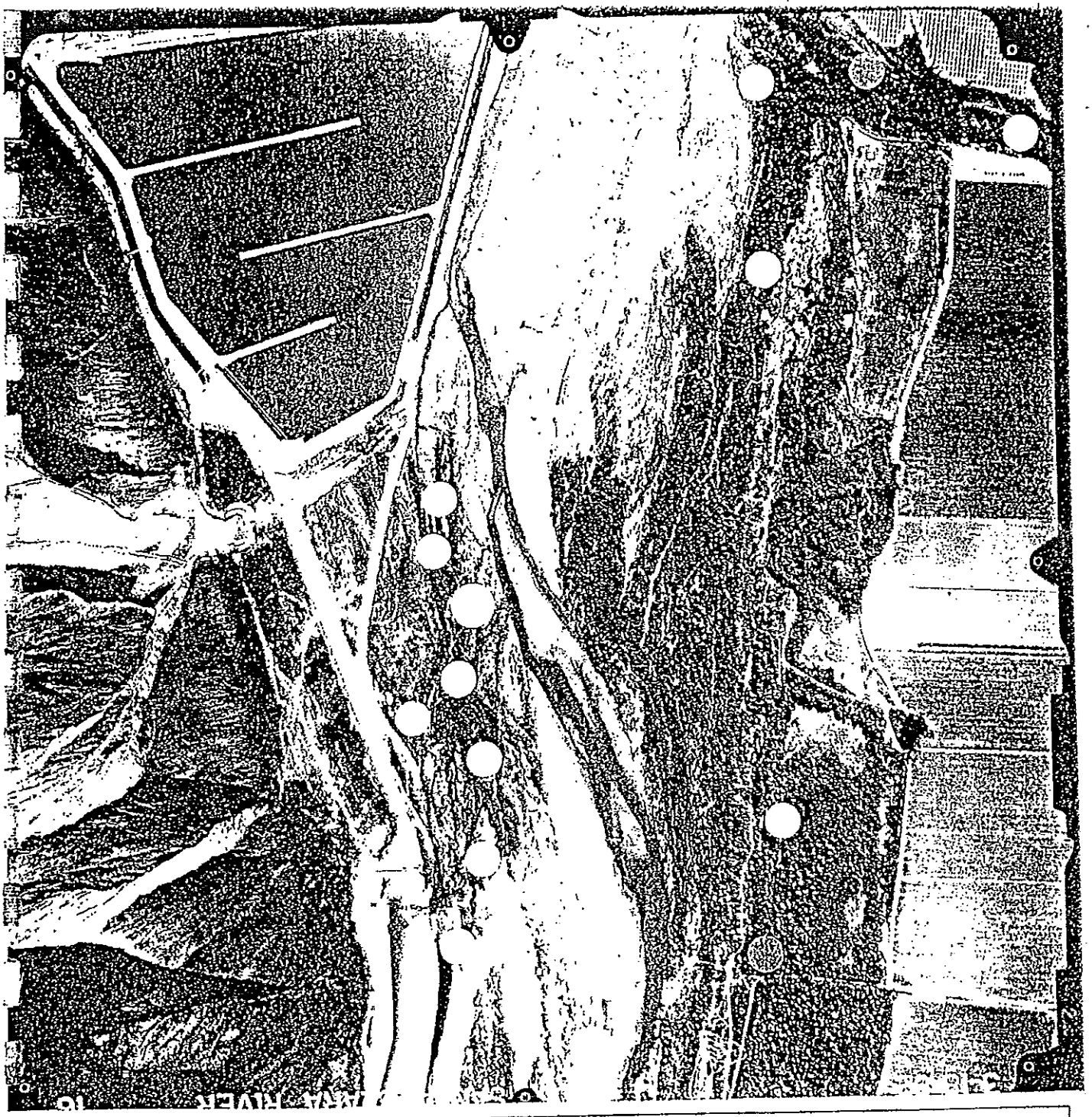


Figure 21. Threatened and Endangered species detected in reference site I (Points R8 - R9), Santa Clara River, Ventura County, California.

0 Count Points

Least Bell's Vireo Pair

Least Bell's Vireo Male

Source: Pacific Western Aerial Surveys: 18 March 1992. 1 inch:550 feet

Figure 22. Threatened and Endangered species detected in reference site 1, Santa Clara River, Ventura County, California.

Least Bell's Vireo Pair

Least Bell's Vireo Male

Source: Pacific Western Aerial Surveys: 18 March 1992. 1 inch:550 feet

Figure 23. Threatened and Endangered species detected downstream of U.S. Highway 101, Santa Clara River, Ventura County, California.

Least Bell's Vireo Pair

Least Bell's Vireo Male

Source: Pacific Western Aerial Surveys: 18 March 1992. 1 inch:550 feet

Table V. Least Bell's vireo territories, adults, nests and young produced in affected area and reference sites, Santa Clara River, Los Angeles and Ventura counties, California, during 1997.

Attribute[2]	Affected Areas			Reference Sites		Other[1]	
	Magic Mtn.	Salt Creek	Las Brisas	I	II		Total
Territories	2	3	5	40	14	14+	78
Males	2	3	5	40	14	14+	78
Females	2	1	3	33	10	10+	59
Known pairs	2	1	3	34	10	10+	60
Successful pairs	2	0	3	28	9	5+	47
Vireo young seen	7	0	12+	123+	32+	12+	186+
Nesting attempts	3+	3	6+	48+	14+	15+	89+
Nests successful	2	0	4	36+	9	5+	56+
Unknown outcome	0	1	0	0	0	3	0
Nests parasitized	0	0	0	1	0	0	1
Cowbirds raised	0	0	0	0	0	0	0
Young/fledged nest	3.5	0	3.0+	3.5	3.6	2.4	3.3
Productivity							
Young/pair	3.5	0	4.0+	3.6	3.2	1.2	3.1
Young/successful pair	3.5	0	4.0+	4.4	3.6	2.4	4.0

[1] Other areas: Fillmore Fish Hatchery; Sespe Creek confluence; down stream of US-101.

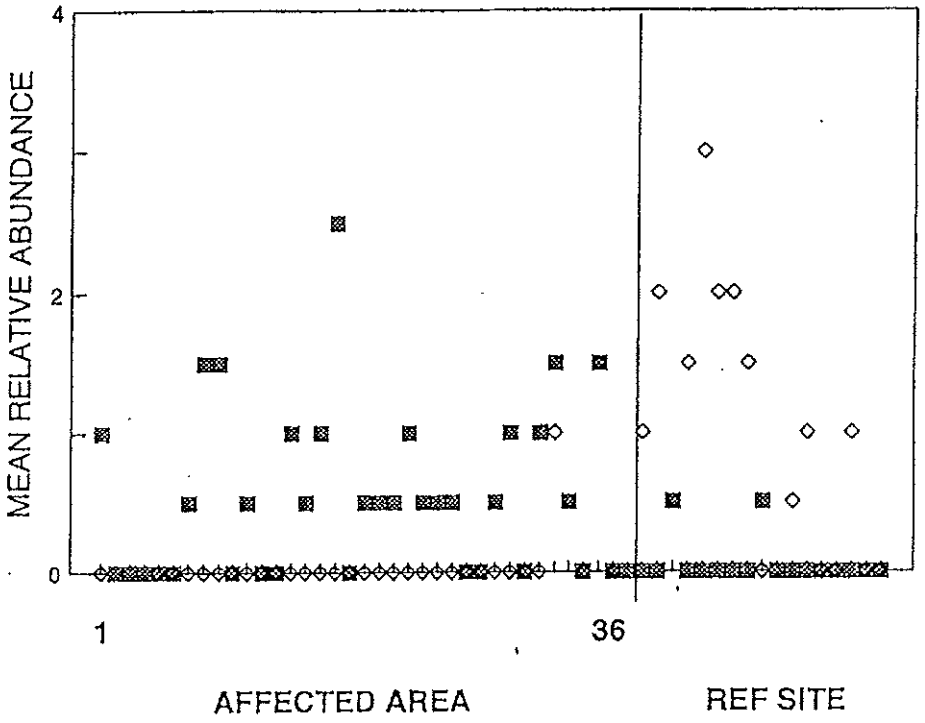
[2] Includes where nests were presumed because recent fledglings were observed with active pairs (some re-nesting) whose previous nests were not found.

Table VI. Plant species used for nest host during 1994-97 study of least Bell's vireos on Santa Clara River in Ventura and Los Angeles Counties, California.

Nest hosts	1994	1995	1996	1997	Total
Artemisia californica	0	0	0	2	2
Artemisia douglasiana	1	0	2	0	3
Artemisia tridentata	0	0	0	1	1
Atriplex lentiformis	1	1	1	0	3
Arundo donax	2	1	0	3	6
Baccharis salicifolia	10	4	13	28	55
Brassica geniculata	0	1	0	0	1
Conyza canadensis	1	0	0	0	1
Populus fremontii	0	0	0	2	2
Populus trichocarpa	0	1	0	0	1
Prunus sp.	0	1	0	0	1
Rhus integrifolia	0	0	1	0	1
Toxicodendron diversilobum	0	1	1	0	2
Salix spp. (4 willow species)[1]	21	14	25	40	100
Total number of nests	36	24	43	76	179

[1] Includes arroyo, narrowleaf, red, and yellow willows (*Salix lasiolepis, S. exigua, S. laevigata, and S. lasiandra,* respectively).

Figure 24. The relative abundance of brown-headed cowbirds (black squares) and least Bell's vireos (diamonds) detected per point along the affected area and reference sites, Santa Clara River, California.



3.5 Sensitive Species Accounts

Great Blue Heron (*Ardea herodias*)

Great blue herons are listed on the California Natural Diversity Data Base as a species that warrants monitoring. Along the central and south coast, breeding sites of this species are increasingly uncommon (Garrett and Dunn 1981, Lehman 1994). They require marsh, riparian and grassland for foraging and mature, tall trees for nesting.

Great blue herons were found in low numbers throughout the study area. This species is most common on the lower Santa Clara River within the reference sites. One active nest was observed at the Sespe Creek confluence. Four juveniles were also observed: three in reference site I and one in reference site II.

Great Egret (*Casmerodius albus*)

Great egrets are listed on the California Natural Diversity Data Base as a species that warrants monitoring. Breeding sites are increasingly uncommon throughout much of southern California (Garrett and Dunn 1981). Great egrets require marsh, riparian, grassland or agricultural fields for foraging and mature, tall trees for nesting.

Only 2-3 individuals were found within the study area, and limited to the reference sites. No nesting or juveniles were observed.

White-tailed Kite (*Elanus leucurus*)

White-tailed kites are a California Species of Special Concern. Although breeding populations fluctuate greatly, declines continue to be recorded throughout California (Lehman 1994). Kites forage over open habitats such as marsh, grassland and savannah, and nest in trees in riparian and oak woodland. Their diet is composed primarily of small mammals.

At least four pairs of white-tailed kites were found within the study area in 1997. Each reference site had a pair, and within the affected area, one pair was observed within sections 1 and 2, and a second pair was observed in Section 4. At least 4 kites fledged from a nest north of Magic Mountain (affected area), and at least 2 juveniles were observed at both reference sites.

Cooper's Hawk (*Accipiter cooperi*)

The Cooper's hawk is a California Species of Special Concern. In southern California birds are mostly resident, however populations are augmented in winter with northern birds. Cooper's Hawks are uncommon breeders in Southern California but fairly evenly distributed

where appropriate habitat exists (Garrett and Dunn 1981, Lehman 1994). Nests throughout most of California from March through July. During the breeding season they require woodlands (preferably live oak and riparian) adjacent to semi-open habitat where they feed primarily on small birds.

Cooper's hawks were observed at all sections of the affected area and reference sites. No nests were found this year, although one juvenile bird was observed at reference site I. This is the first year that an active nest was not found at the upper portion of section 1. During the first two years of this study, Cooper's hawks were also documented breeding within sections 2 and 3.

Horned Lark (*Eremophila alpestris)*

Horned Larks are a California Species of Special Concern. They are resident throughout California in areas of large open grassland and agricultural fields. Although large flocks can be seen during the winter, breeding appears to be more uncommon (Garrett and Dunn 1981).

At least 2-3 horned larks were observed near point 9 in the agricultural fields adjacent to the river bottom. In past years of this study, horned larks have been observed also along Section 2 of the affected area.

Loggerhead Shrike (*Lanius ludovicianus*)

The Loggerhead Shrike is a California Species of Special Concern. They are resident along the central and south coast, where numbers increase in the winter. Further inland, shrikes are locally common in open areas of grassland and scrub and are uncommon breeders along the mountains and coastal plain (Garrett and Dunn 1981, Lehman 1994).

This species was conspicuously absent from the river bottom in 1997, in contrast to known populations along the adjacent mountain ranges (Labinger, unpublished data), and past breeding in reference site I. One individual was observed at the upper end of reference site I.

Yellow Warbler (*Dendroica petechia*)

The yellow warbler is a California Species of Special Concern. This neotropical migrant is fairly common locally where mature riparian woodland exists. Numbers have been decreasing steadily throughout California, especially in southern California (Garrett and Dunn 1981). Nests in the upper canopy of riparian trees, commonly willow species.

Yellow warblers are found throughout the study area, but were significantly more common at

reference site I where relative abundance was 4 to 6 times greater than in other sections (Table I). Very low populations exist along the upper portions of the study area (Sections 2 and 3) where only 4-5 pairs were present. This is unexpected given the extent of seemingly suitable habitat along these portions of the affected area. Yellow warblers appear to be highly susceptible to cowbird parasitism which may partly explain their low numbers within the affected area. In past years, yellow warblers were observed feeding cowbird fledglings.

Yellow-breasted Chat (*Icteria virens*)

The yellow-breasted chat is a California Species of Special Concern. This neotropical migrant is locally common to rare in riparian woodland of southern California. Numbers have been decreasing steadily throughout California, especially in southern California (Garrett and Dunn 1981). Nests in low, thick riparian vegetation.

Yellow-breasted chats are patchily distributed over available habitat within the study area. They are much more common at the reference sites where relative abundances were 5 to 10 times greater than in the affected area (Table I). Only 1-2 pairs were present along sections 1 and 2 within the affected area, despite the presence of seemingly suitable habitat along those areas. They too may be adversely affected by cowbirds; a pair was observed feeding a fledgling cowbird at reference site I in 1996.

4.0 Discussion

4.1 General Bird Community

We found significant differences in several bird population parameters both between the affected area and reference sites, and within the affected area. Species richness (i.e. number of species) and mean relative abundance were significantly greater in the reference sites, especially reference site I, but showed little difference between sections within the affected area. However, limiting the analysis to sensitive species of riparian obligates, we found that diversity was higher in portions of sections 1 and 2 (in addition to reference sites). Although many factors can affect overall bird distribution, these results probably reflect significant differences in habitat quantity and quality which are specific to riparian obligate species.

This is the second year in a row that no trends were found between points within the affected area in relative abundance or species richness. In 1994, species richness and the relative abundance of several species, including waterbirds, were positively correlated with distance from oil spill origin. This may indicate that significant oil related impacts are now minimal. In addition, this is the first year that no significant differences were found between the affected area and reference sites in the relative abundance of the two most common water-related species, killdeer and spotted sandpiper. Interestingly, overall numbers for both of these species were lower this year compared to 1994 - 1996. This may be partially a result of

loss of bare ground due to increased vegetative growth since the last scouring floods in 1995.

The results of the habitat parameters' analysis are difficult to interpret. The only factors significantly correlated with bird species richness were: 1) the total number of habitat parameters found at a point (habitat diversity); and 2) total tree cover. However, both of these correlations were negative. In other words, the number of bird species decreased with increased habitat diversity and tree cover. This result is contrary to expected. One problem with this analysis is that habitat parameters were estimated within 100 meter circles; whereas, birds were detected up to 350 meters from count points. One way to correct for this would be to limit the analysis to birds detected within 100 meters, but sample sizes might be too small for statistical analysis. A better solution would be to increase the amount of habitat sampling around points.

4.2 Endangered Species

Western yellow-billed cuckoo

The yellow-billed cuckoo is an insectivorous neotropical migrant. It occurs throughout North America and is divided into eastern (*C. a. americanus*) and western subspecies. Western yellow-billed cuckoos arrive late in the season at the end of June through the beginning of July and stay until late August and September (Laymon & Halterman 1987). In general, this species requires broad woodlands of even-aged growth, preferring older growth cottonwood or other canopied riparian woods for breeding sites (Gaines and Laymon 1984). Highly specific foods occurring in cyclic infestations (such as hairy caterpillars and tree frogs) are also important determinants in cuckoo distribution and productivity (Laymon & Halterman 1987). The Magic Mountain location of the cuckoo found this year is within one of the broadest stretches of riparian woodland along the river, including many older growth Fremont cottonwoods.

The western yellow-billed cuckoo is listed state endangered and has no federal endangered status. Historically cuckoos were widespread in the state, but have declined to only three small populations (Gaines & Laymon 1984). Although detailed historical data are lacking from the South Coast region, cuckoo breeding has been documented along the Santa Clara River (Willet 1933). More recently, a cuckoo was observed between 23 June and 4 July 1979, on the Santa Clara River within the area affected by the oil spill (Webster in Garret & Dunn 1981). A dead cuckoo was found in the parking lot at Magic Mountain (adjacent to this years individual) on 3-5 July 1981 (specimen at CSU Northridge, California; Laymon pers. comm.). Finally, in July 1992, a cuckoo was heard within the affected area in section 3 (Holmgren M. pers. comm.). The 1997 cuckoo was the first to be observed during the four-year study.

Southwestern willow flycatcher

The willow flycatcher is a small, insectivorous neotropical migratory species ranging broadly from the east coast through most of the lower 48 states and parts of Canada. Willow flycatchers breed in a variety of wet habitats, particularly swamps and riparian thickets, especially willow (Garrett & Dunn 1981). Formerly widespread in the southwest and sporadically distributed in California, the species has declined in recent decades.

There are three recognized subspecies of willow flycatcher in California (all are State Endangered), of which the southwestern race (recently listed as Federally Endangered) is the most likely to occur in coastal southern California (Schlorff 1990). A few small populations persist in coastal southern California, including one on the Santa Ynez River, Santa Barbara County (Unitt et al. in prep), and one on the Santa Margarita River in San Diego County (Buck, pers. comm.). On the Santa Clara River, no breeding birds have been documented in recent years within the area affected by the spill. However, Webster (in Garrett & Dunn 1981) encountered several singing males, between June and July 1979, assumed to be breeding, within the study area.

We have observed several, apparently non-breeding individuals during this study: 1994 - a singing, territorial bird at reference site II (Labinger et al. 1994); and 1995 - two non-singing individuals along section 3 of the affected area (Labinger et al. 1995). The Habitat in which the territorial bird was found in 1997 appears to support excellent conditions for breeding: willow woodland, interspersed with ponds of standing water, and open and shaded areas of emergent wetland.

Least Bell's vireo

The Bell's vireo is a small insectivorous neotropical migrant which nests in the low vegetation associated with thickets of willow and mulefat in riparian woodlands. The least Bell's vireo is one of the four subspecies recognized in North America (Brown 1993). Formerly widespread in California, the species underwent a dramatic decline in abundance and range during the first half of the 20th century (Grinnell and Miller 1944; Gaines 1977). It was designated an endangered species by the California Fish and Game Commission in 1980 (CDFG 1986) and was listed as endangered by the Federal government in 1986 (USFWS 1986).

The species arrives in late March through April and departs from late August through September. Nesting usually begins several days after pair formation. Nests are typically placed in the fork of a shrub, small tree or in weeds, suspended within a meter of the ground in dense scrub vegetation found in or adjacent to the river bottom (Gray and Greaves 1984).

Although the historic breeding range of least Bell's vireos extended throughout the lowland valleys of California, USA, and northern Baja, Mexico (Wilbur 1979 and 1980), the present breeding range is limited to about 50 locations from Santa Barbara County south to San Diego County, where the majority of the U.S. population is found (Franzreb 1989). They have been observed within the affected area over the past decade (Independent Environmental Consultants 1993; Labinger et al. 1994) and breeding was documented by Holmgren (1992). Several other small sub-populations exist on the lower stretch of the Santa Clara River outside the spill area (Labinger et al. 1994). Annual surveys were conducted from 1991 through 1994 as part of a cowbird trapping program for the lower river in Ventura County (SEB 1991, 1992, 1993). Data on least Bell's vireo nesting and productivity on the Santa Clara River has been compiled annually since 1991.

Annual changes in least Bell's vireo populations within our study area vary between locations (Table VII). In general, total pairs within the affected area and reference site II have remained relatively stable, but with increasing distribution from central locations (e.g. spreading down river from Salt Creek, and down river and south river from Timber Canyon, respectively). In contrast, at reference site I, vireos increased steadily by 20 - 30 percent each year since 1991, with an almost 40 percent increase from 1996 to 1997. Least Bell's vireo populations elsewhere appear to be increasing at comparable rates, from approximately 300 pairs (1974-1985, Franzreb 1989) to over 1,400 pairs in 1996 (USFWS, unpubl. data). This increase apparently is due in part to removal of cowbirds from habitats near major breeding populations and improved protection of riparian woodlands along major rivers of southern California (USFWS, unpubl. data).

Several adults that were banded as nestlings on the San Luis Rey River, San Diego County returned again this year. Over the past four years we have documented the dispersal of vireos within the Santa Clara River watershed including individuals moving between the reference sites and the affected area, and between watersheds to the north and the south. Data obtained from these recaptured birds provide important information about site tenacity and dispersal. Combining the data from several different banding studies, we have suggested that enough gene flow occurs between populations to consider least Bell's vireos a panmictic species.

It is difficult to account for the sub-population size and density differences between locations within the study area. Differences in productivity between locations may have more to do with habitat quality than habitat availability. For example, vireos were successful at the Salt Creek sight only in 1995 when cattle had been removed. The habitat was not trampled and few cowbirds were observed (Labinger et al. 1996). Possible factors affecting the distribution and productivity of birds in general are discussed below. In addition, location specific factors are described under the Restoration Recommendation Section.

Table VII. Least Bell's vireo productivity on the Santa Clara River, Ventura and Los Angeles counties, California, during 1994-1997.

	1994[1]	1995	1996	1997
Affected Area				
Males	9	2	7	10
Pairs	5	2	6	6
Young produced	3	9	12	19
Young per pair	0.6	4.5	2.0	3.2
Cows present	yes	yes[2]	yes	yes
Cowbird control	no	no	yes	yes
Reference Site I				
Males	14	15	25	40
Pairs	13	14	26	34
Young produced	33	60	77	123
Young per pair	2.5	4.3	2.9	3.6
Cows present	no	no	no	no
Cowbird control	yes	yes	yes	yes
Reference Site II				
Males	9	8	8	14
Pairs	7	8	8	10
Young produced	17	19	9	32
Young per pair	2.4	2.4	1.1	3.2
Cows present	yes	yes	yes	yes
Cowbird control	yes	yes	yes	yes
Other Areas[3]				
Males	---	---	--	14
Pairs	---	---	--	10
Young produced	---	---	--	12
Young per pair	---	---	--	1.2
Cows present	no	no	no	no
Cowbird control	yes	yes	yes	yes
Grand total pairs	25	24	40	60
Grand total young[4]	53	88	98	186
Grand total young per pair	2.1	3.7	2.5	3.1

[1] Third year cowbird trapping in 2 Reference sites and Fillmore.
[2] Cattle were removed from Salt Creek area, and they raised young successfully in 3 or 3 nests.
[3] Other areas are Fillmore Fish Hatchery, Sespe Creek confluence, down stream of US-101.
[4] Total young is minimum number, because survey effort varied from year to year.

4.3 Factors Affecting Bird Populations

The decline of many riparian obligate species in the western United States is believed to be the result of habitat loss and degradation from agriculture, pesticides and herbicides, livestock grazing, water diversion projects and continued urbanization of riparian corridors. In addition, brood parasitism by brown-headed cowbirds (a bird which lays its eggs in other species' nests to be raised by the hosts) appears to be suppressing productivity of host species such as least Bell's vireos and southwestern willow flycatchers, and may hinder the re-colonization of former breeding areas (Greaves and Labinger, in press; Whitfield 1990). This is evident for least Bell's vireos during this study where cowbirds have hindered vireo nest success by laying eggs in and destroying early nests.

An annual cowbird control program along the lower reaches of Santa Clara River, initiated by California Department of Fish and Game in 1991 (SEB 1993), appears to have positively affected least Bell's vireo productivity from Fillmore downstream to Saticoy. A limited Caltrans trapping program (2 traps in the Castaic Junction area in 1996 and 1997) may have positively affected vireos in the Magic Mountain area near I-5 (Haglund and Baskin 1996, pers. comm.).

All of the adverse factors mentioned above exist along portions of the study area and much of the Santa Clara River. Under the following section, impacts are described for specific locations along the river.

5.0 Restoration Recommendations

The processes required for restoring natural habitats are poorly understood, despite much research and experimentation. Kruczynski (1990) suggests that mitigation restoration should be designed to replace "all the ecological functions provided by the destroyed wetlands such as wildlife habitat, water quality, flood storage, and water quantity functions". However, most restoration projects are measured in terms of acreage planted which is seemingly simple and cost-effective. We feel that this is problematic and that functionality should play a key role in developing a restoration project (Holmgren et al. 1993).

Habitat "function" refers to those processes that are necessary for the natural maintenance of an ecosystem. Complete documentation of all types of functions is difficult and seldom attempted. For this project, we suggest relying on indicators such as species diversity and abundance to characterize habitat function and potential. As a group, birds can be excellent indicators because of their wide distribution, easy detectability, and occupy a wide range of ecological niches. Although we have little quantifiable pre-oil spill (base-line) data, the reference sites could serve as models to assist in determining restoration goals, and measuring progress and success.

Restoration can be divided into several types: 1) Restoration - restoration of historic riparian land which is currently not functioning as riparian habitat; 2) Enhancement - enhancement of riparian habitat currently functioning below optimum; Creation - creation of riparian habitat on land that was not historically riparian in nature; and 4) Preservation - preservation of riparian habitat (preferably of existing high functionality).

For this project, we rank these from highest priority: enhancement, restoration, preservation, and creation. Creation of riparian habitat is extremely difficult and costly, and should not be considered here. Enhancement and restoration are on almost equal standing and could both provide viable and interesting possibilities, and may depend more on land availability and funding. We consider enhancement the highest priority based on the assumption that high habitat quality is best obtained by removing obstacles to functionality in areas adjacent to functional habitat. For this discussion, functional habitat is based on the relative abundance and number of bird species found in the course of our study.

5.1 Specific Location Accounts

Habitat descriptions, impacts and restoration possibilities are presented below for specific locations within and outside the spill area. Restoration possibilities are meant to provide a general list of possibilities for incorporating into a more detailed restoration plan. In addition to the information provided here, restoration planning should work in tandem with other on going plans for the Santa Clara River such as the Santa Clara River Management Plan, and mitigation projects by CalTrans and private landowners (e.g. Newhall Land and Farming Corporation).

Affected Area

Section 1

Description - This area supports a wide variety of riparian habitats such as mature cottonwood/willow forest, early successional willow scrub, and emergent wetland marsh. The area between points 7 and 9 has a high diversity of sensitive bird species and is designated as least Bell's vireo Critical Habitat by the federal government. During the entire year, vegetation in this area is watered primarily by effluent from various water treatment plants, the nearest being the Valencia Water Treatment Plant (VWTP) about 350-400 m up stream of the vireo nesting location and a smaller, unidentified source of apparently untreated water approximately 300 m down stream of the VWTP confluence with Santa Clara River. As a result of the proximity of this highly enriched water supply, a lush riparian vegetation consisting of native willow and cottonwoods, and introduced stands of giant reed, the biennial white sweetclover (*Melilotus albus*), water speedwell (*Veronica serpyllifolia*). Ponded water forms marsh consisting of cattails and bulrushes. This area remains relatively humid, even on

hotter, windier days which may account for a seemingly high density of insects.

Sensitive and locally rare species - green heron, white-tailed kite, Cooper's hawk, golden eagle, yellow-billed cuckoo, least bell's vireo, blue grosbeak, yellow-breasted chat, yellow warbler.

Impacts - urbanization, agriculture, pesticide/herbicide, water treatment outflow.

Restoration Possibilities -

Enhancement -Limit pesticide and herbicide use along buffer some distance from the river and its tributaries.
-Arundo removal and native vegetation planting outside of low-flow channel.
-Remove brown-headed cowbirds.

Restoration -Restore lowland agricultural fields adjacent to high functioning areas.

Preservation -Preserve high functioning area between points 7 and 9.

Section 2

Description - This area supports a wide variety of riparian habitats such as mature cottonwood/willow forest, early successional willow scrub, and emergent wetland marsh. The area between points 11 - 13, and 14 - 15 has a moderate diversity of sensitive bird species. Vegetation in this area is watered by additional upwellings and inflow from Castaic Creek. As a result, a lush riparian vegetation consisting of native willow and cottonwoods, and introduced stands of giant reed. Marsh habitat exists on the south side of the channel between points 11 and 13, consisting of cattails and bulrushes. The upland area to the north forms a large, dry mature cottonwood forest.

Sensitive and locally rare species - green heron, white-tailed kite, Cooper's hawk, least Bell's vireo (at mouth of Castaic Creek, fledglings being fed in 1996; Dan Guthrie, pers. comm.), blue grosbeak, yellow-breasted chat, yellow warbler.

Impacts - agriculture, pesticide/herbicide, livestock grazing.

Restoration Possibilities -

Enhancement -Remove or limit livestock grazing
-Limit pesticide and herbicide use along buffer some distance from the river and its tributaries.
-Arundo removal and native vegetation planting outside of low-flow channel.
-Remove brown-headed cowbirds.

Restoration -Restore lowland agricultural fields adjacent to high functioning areas.

Preservation -Preserve high functioning areas; some enhancement measures would be required.

Section 3

Description - The low flow channel in this area is relatively wide. Much of the forested area is to the north of the channel and consists of mature cottonwood/willow forest, and mid-aged successional willow scrub. Water is enhanced through Chiquito and San Martinez Grande tributaries, and agricultural runoff. Several areas of emergent wetland are present (points 20 - 21, 23 - 24). From 1994 through 1997, the only consistent least Bell's vireo breeding sites were in a relatively small area west of the Los Angeles-Ventura county line along the north side of the main channel (between Points. 25 and 27). This area is designated Critical Habitat by the Federal government. Vegetation in this north side site is watered first by overflow from the main channel, and then in the late spring and throughout the summer by agricultural run-off which filters through thickets of relatively young tamarisk, mulefat, willows, atriplex, and Great Basin sagebrush.

Sensitive and locally rare species - white-tailed kite, Cooper's hawk, least Bell's vireo, blue grosbeak, yellow-breasted chat, yellow warbler.

Impacts - agriculture, pesticide/herbicide, livestock grazing.

Restoration Possibilities -

Enhancement -Remove or limit livestock grazing
-Limit pesticide and herbicide use along buffer some distance from the river and its tributaries.
-Arundo and Tamarisk removal and native vegetation planting outside of low flow channel.
-Remove brown-headed cowbirds.

Restoration -Restore lowland agricultural fields adjacent to high functioning areas. This is particularly critical in areas where agricultural fields reach down to the low flow channel as along portions of each section in the affected area.

Preservation -Preserve high functioning areas; some enhancement measures would be required.

Section 4

Description - A large oxbow exists between points 27 and 30 that supports a mature woodland of Fremont's cottonwood, willow, live oak and sycamore (a very rare tree on the river). Downstream vegetation consists of strips of older willows and cottonwoods on the north side of the channel, with scattered older cottonwoods and willows lining artificial berms on the south side. There are dense understories of giant reed and various chaparral and riparian habitat species on the berms and along the edge of Highway 126, including atriplex, coyote bush, mulefat, willows, and mugwort. The main channel is lined with narrow strip thickets of younger willows and mulefat, with various forbs in the understory. A small marsh of emergent wetland exists between points 35 and 36 on the south side. It is unclear whether the source of this water is from natural upwellings or agricultural run-off.

Sensitive and locally rare species - green heron, white-tailed kite, Cooper's hawk, least Bell's vireo, warbling vireo, Swainson's thrush, blue grosbeak, yellow-breasted chat, yellow warbler.

Impacts - agriculture, flood control berms, pesticide/herbicide, livestock grazing (points 28 - 30), Highway 126.

Restoration Possibilities -

Enhancement -Remove or limit livestock grazing
-Limit pesticide and herbicide use along buffer some distance from the river and its tributaries.
-Arundo removal and native vegetation planting outside of low-flow channel.
-Remove brown-headed cowbirds.
-Remove artificial berm and place outside of the existing riparian habitat.

Restoration -Restore lowland agricultural fields adjacent to high functioning areas. This is particularly critical in areas where agricultural fields reach down to the low flow channel as along portions of each section in the affected area.

Preservation -Preserve high functioning areas; some enhancement measures would be required.

Reference Site I

Description - This area has supported the highest number of bird species within the study area over the past four years. Most of this area supports a rich willow woodland, with emergent wetland lining the low-flow channel. Over the past 4 years

the bare area above the Vern Freeman Diversion has become re-vegetated with willow woodland, interspersed with open water marsh and emergent wetland. A territorial southwestern willow flycatcher was found in this area in 1997, along with two pairs of least Bell's vireos. The north side of the river below Vern Freeman Diversion (points 7 - 9) supports a drier upland, with mature Fremont's and black cottonwoods and willows. The densest population of least Bell's vireos on the river is present here, averaging a 30 percent growth rate over the past 4 years to 33 pairs in 1997. Vireo territories in this section consist of two general types: an older, drier woodland out of and several meters above the low-flow channel; and a moister woodland slightly above the main river gradient (the most common). The drier upland areas are former duck pond sites with large poison oak and giant reed thickets, intermingled beneath older willows. One of the most productive patches exists on the south side of the river, along the United Water Conservation District (UWCD) canal from the Vern Freeman Diversion. These willow thickets appear to depend on the weekly releases from the canal. In 1997, only a small amount of water was released here (most water was used by UWCD), resulting in the early senescence of willow leaves in June, a known response to drought conditions.

Sensitive and locally rare species - green heron, great egret, white-tailed kite, Cooper's hawk, southwestern willow flycatcher, least Bell's vireo, Swainson's thrush, blue grosbeak, yellow-breasted chat, yellow warbler.

Impacts - agriculture, pesticide/herbicide, water diversions, gravel mining, off-road vehicles.

Restoration Possibilities -

Enhancement	-Limit pesticide and herbicide use along buffer some distance from the river and its tributaries. -Arundo removal and native vegetation planting outside of low flow channel. -Maintain minimum flows below Freeman Diversion.
Restoration	-Restore lowland agricultural fields and abandoned gravel mining areas. This is particularly critical in areas where riparian woodland has been lost down to the low flow channel.
Preservation	-Preserve high functioning areas; some enhancement measures would be required.

Reference Site II

Description - This section supports the widest intact riparian corridor (approximately one mile) within the study area (probably for the entire river). The highest diversity of birds including least Bell's vireos are limited to a relatively pristine portion of the

mile-wide section that extends from Balcom Canyon on the south side, down river about 2.0 km to Willard Road on the north side (Points R-12 to R-16). Vireos have been found here consistently since studies of the river started in 1991 (Figure 24, SEB 1993); however, in 1997, more Least Bell's vireos were on the south side of the main channel than on the north, a reversal from the previous several years. Scouring and movement of the low flow channel southward from Willard Road area has had both positive and negative impacts. Newly forming thickets supporting high bird diversity exist along a mile stretch on the south side (an area that had formerly been above river grade and held dry-land agriculture) and on the north side below Willard road. Land currently in pasture above river gradient on the south side is covered with yerba mansa (Anemopsis californica) and native rush species, and there are several perched wetlands that had been converted to duck ponds. After the 1994 floods, the low flow channel moved south. The north side supports a large mature cottonwood and willow forest, interspersed with willow thickets, coastal sage scrub, and open gravel bars. In remnants of the former main channel there are several ponded sections that are fed by up-welling as well as southward flowing agricultural run-off. In some sections in these woods, are found horse tails (Equisetum sp.) and giant stream orchid (Epipactis gigantea). Giant reed thickets are found throughout much of this area.

Sensitive and locally rare species - American bittern, green heron, great egret, white-tailed kite, Cooper's hawk, southwestern willow flycatcher, least Bell's vireo, warbling vireo, Swainson's thrush, blue grosbeak, yellow-breasted chat, yellow warbler.

Impacts - agriculture, pesticide/herbicide, livestock grazing (points R-12 to R-15).

Restoration Possibilities -

Enhancement -Remove or limit livestock grazing
-Limit pesticide and herbicide use along buffer some distance from the river and its tributaries.
-Arundo removal and native vegetation planting outside of low-flow channel.
-Remove brown-headed cowbirds.

Restoration -Restore pasture land on south side adjacent to high functioning areas.
-Restore orchard adjacent to low-flow channel on the north side south of Willard road.

Preservation -Preserve high functioning areas; some enhancement measures would be required. One landowner (Mr. Hedricks) on the south side of the river is negotiating to put some of his land in a conservation easement with the Coastal Conservancy. A sizable part of this land has been used by least Bell's vireos in recent years.

Additional Areas

A. Fillmore Fish Hatchery

Description - High quality riparian habitat exists along a two-mile stretch on the north side. Areas include moist to dry woods adjacent to watercress ponds, and wet woods fed by narrow overflow channels from the ponds. These areas extend nearly 200 m towards the main river channel; all sections have dense giant reed thickets of various age classes, which completely dominate artificial berms of the watercress ponds. Least Bell's vireos have been found consistently around Fillmore Fish Hatchery since 1991 (SEB 1993; Greaves, unpubl. data), with at least 9 pairs and 2 males present during surveys in 1997. On the upstream (east) end of this area, a riparian restoration effort has cut several hectares of giant reed and planted willows and cottonwoods. In 1997, vireos were found breeding in this area.

Sensitive and locally rare species - green heron, great egret, white-tailed kite, Cooper's hawk, least Bell's vireo, Swainson's thrush, blue grosbeak, yellow-breasted chat, yellow warbler.

Impacts - agriculture, pesticide/herbicide, artificial berms.

Restoration Possibilities -

Enhancement -Limit pesticide and herbicide use along buffer some distance from the river and its tributaries.
-Arundo removal and native vegetation planting outside of low-flow channel.
-Move artificial berms farther away from low-flow channel.
-Remove brown-headed cowbirds.

Restoration -Restore watercress fields on north side adjacent to high functioning areas.

Preservation -Preserve high functioning area; understanding water flow in this area is crucial.

A. Sespe Creek Confluence

Description - High quality riparian habitat is restricted mostly to the Sespe Creek flow section. Habitat is varied and includes old growth, mature cottonwood and willow forest, mid-successional willow thickets, gravel bars, and ponded marsh. At least two male least Bell's vireos were found here, but no breeding was documented.

Sensitive and locally rare species - green heron, great egret, white-faced ibis, white-tailed kite, Cooper's hawk, least Bell's vireo, Swainson's thrush, blue grosbeak, yellow-breasted chat, yellow warbler.

Impacts - agriculture, pesticide/herbicide.

Restoration Possibilities -

Enhancement -Limit pesticide and herbicide use along buffer some distance from the river and its tributaries.
-Arundo removal and native vegetation planting outside of low-flow channel.
-Remove brown-headed cowbirds.

Restoration -Restore orchards on east side adjacent to high functioning areas.
-Restore gravel mining area.

Preservation -Preserve high functioning area; understanding water flow in this area is crucial.

A. Highway 101 to Victoria Avenue

Description - Riparian habitat is present along both sides of the river and includes some mature cottonwood and willow forest, mid-successional willow thickets, and open sage scrub (north side). Additional water flow from water-treatment plant, golf course and urban run-off. In 1997, two pairs of least Bell's vireos attempted to breed in this area; the first occurrence in recent years (Labinger, unpubl. data).

Sensitive and locally rare species - green heron, great egret, white-tailed kite, Cooper's hawk, least Bell's vireo, Swainson's thrush, blue grosbeak, yellow-breasted chat, yellow warbler.

Impacts - urbanization, golf course, water-treatment plant, resident "homeless" people.

Restoration Possibilities -

Enhancement -Limit pesticide and herbicide at the golf course.
-Arundo removal and native vegetation planting outside of low-flow channel.
-Restrict human access.
-Remove brown-headed cowbirds.

Restoration -Limited opportunities here.

Preservation -Preserve high functioning areas; enhancement measures would be required.

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