

**Distribution, Abundance, and Breeding Activities
of the Southwestern Willow Flycatcher
at Marine Corps Base Camp Pendleton, California, in 2000**



June 2001

U.S. Geological Survey
Western Ecological Research Center
San Diego Field Station



**Distribution, Abundance, and Breeding Activities of the
Southwestern Willow Flycatcher at Marine Corps Base Camp Pendleton,
California, in 2000**

Final Report

Prepared for:

Assistant Chief of Staff, Environmental Security
U.S. Marine Corps Base Camp Pendleton
Camp Pendleton, California 92055

Prepared by:

Barbara E. Kus
U.S.G.S. Western Ecological Research Center
San Diego Field Station
5745 Kearny Villa Road, Suite M
San Diego, California 92123

June 2001

MIPR# M3320000MP0030

Recommended citation:

Kus, B.E. 2000. Distribution, abundance and breeding activities of the southwestern willow flycatcher at Marine Corps Base Camp Pendleton, California, in 2000. Final Report prepared for Assistant Chief of Staff, Environmental Security, Marine Corps Base Camp Pendleton.

TABLE OF CONTENTS

	<u>Page</u>
<i>LIST OF TABLES</i>	i
<i>LIST OF FIGURES</i>	ii
EXECUTIVE SUMMARY	iii
INTRODUCTION	1
STUDY AREAS AND METHODS	2
Field Surveys	2
Nest Monitoring	10
Banding	10
RESULTS	10
Population Size and Distribution	10
Habitat Characteristics	25
Breeding Activities	25
Nest Site Characteristics	25
Cowbird Parasitism	28
Banded Birds	28
DISCUSSION	30
CONCLUSIONS AND RECOMMENDATIONS	31
LITERATURE CITED	33

LIST OF TABLES

1. Habitat characteristics of willow flycatcher locations at Marine Corps Base Camp Pendleton in 2000	26
2. Nesting activities of southwestern willow flycatcher pairs at Marine Corps Base Camp Pendleton in 2000	27
3. Nest site characteristics of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in 2000	27
4. Band status of willow flycatchers at Marine Corps Base Camp Pendleton in 2000	29

TABLE OF CONTENTS

(continued)

LIST OF FIGURES

1. Willow flycatcher survey areas at Marine Corps Base Camp Pendleton, 2000: Santa Margarita River, De Luz Creek and Fallbrook Creek	4
2. Willow flycatcher survey areas at Marine Corps Base Camp Pendleton, 2000: Aliso Creek, French Creek and Santa Margarita River	5
3. Willow flycatcher survey areas at Marine Corps Base Camp Pendleton, 2000: Cristianitos Creek, San Mateo Creek and San Onofre Creek	6
4. Willow flycatcher survey areas at Marine Corps Base Camp Pendleton, 2000: San Mateo Creek and San Onofre Creek	7
5. Willow flycatcher survey areas at Marine Corps Base Camp Pendleton, 2000: Las Flores Creek, Horno Canyon and Piedra de Lumbre Canyon	8
6. Willow flycatcher survey areas at Marine Corps Base Camp Pendleton, 2000: Windmill Canyon and Pilgrim Creek	9
7. Locations of willow flycatchers at Marine Corps Base Camp Pendleton, 2000: De Luz Creek	11
8. Locations of willow flycatchers at Marine Corps Base Camp Pendleton, 2000: Santa Margarita River and Lake O'Neill (Fallbrook Creek)	12
9. Locations of willow flycatchers at Marine Corps Base Camp Pendleton, 2000: Santa Margarita River and Ysidora Basin	13
10. Locations of willow flycatchers at Marine Corps Base Camp Pendleton, 2000: Las Flores Creek	14
11. Locations of willow flycatchers at Marine Corps Base Camp Pendleton, 2000: Aliso Creek	16
12. Locations of willow flycatchers at Marine Corps Base Camp Pendleton, 2000: Windmill Canyon and Pilgrim Creek	17
13. Southwestern willow flycatcher territories at Marine Corps Base Camp Pendleton, 2000: Lake O'Neill, Fallbrook Creek	18
14. Southwestern willow flycatcher territories at Marine Corps Base Camp Pendleton, 2000: Rifle Range Road, Santa Margarita River	19
15. Southwestern willow flycatcher territories at Marine Corps Base Camp Pendleton, 2000: STP-3 Ponds, Santa Margarita River	20
16. Southwestern willow flycatcher territories at Marine Corps Base Camp Pendleton, 2000: Santa Margarita River	21
17. Southwestern willow flycatcher territories at Marine Corps Base Camp Pendleton, 2000: Northeast Ysidora Basin, Santa Margarita River	22
18. Southwestern willow flycatcher territories at Marine Corps Base Camp Pendleton, 2000: Ysidora Basin, Santa Margarita River	23
19. Southwestern willow flycatcher territories at Marine Corps Base Camp Pendleton, 2000: Southwest Ysidora Basin, Santa Margarita River	24

EXECUTIVE SUMMARY

Surveys for the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) were conducted at Marine Corps Base Camp Pendleton, California, between 15 May and 31 August 2000. Eleven transient flycatchers of unknown subspecies were detected during surveys, and two transients were captured in mist nets at MAPS (Monitoring Avian Productivity and Survival) stations on De Luz Creek and the Santa Margarita River. Transients occurred in a range of habitat types including mixed willow riparian, willow-sycamore dominated riparian, and sandbar and mule fat scrub. All but one transient individual were sighted within 50 m of surface water.

Eighteen southwestern willow flycatcher breeding territories were located. With the exception of a new site at Lake O'Neill on Fallbrook Creek, all territories were along the lower Santa Margarita River. The majority of territories (15/18) were located in mixed willow riparian habitat. Resident flycatchers exhibited a bimodal distribution with regard to distance to surface water, with 53 percent within 50 m, and the remainder from 150 to 575 m away from it.

The eighteen territorial males included ten confirmed pairs, five single males, and three males of undetermined status. Nesting was documented for eight of the ten pairs, with each pair attempting one nest. All nests were successful, and flycatchers fledged an average of 2.3 young per pair. No instances of cowbird parasitism were observed. Pairs placed nests in five species of plants, including black willow (*Salix goodingii*), sandbar willow (*S. exigua*), stinging nettles (*Urtica dioica*), blackberry (*Rubus ursinus*) and giant reed (*Arundo donax*).

Two resident males and one female were returning banded birds, including one male banded as an adult in 1998 and one female banded as an adult in 1999. Four resident males and one female were captured and color banded in 2000, and six nestlings in two nests were banded. In addition, both of the transients captured at MAPS stations were banded. None of the transients observed during surveys carried bands.

INTRODUCTION

The southwestern willow flycatcher (*Empidonax traillii extimus*) is one of four subspecies of willow flycatcher in the United States, with a breeding range including southern California, Arizona, New Mexico, extreme southern portions of Nevada and Utah, and western Texas (Hubbard 1987, Unitt 1987). Restricted to riparian habitat for breeding, the southwestern willow flycatcher has declined in recent decades in response to widespread habitat loss throughout its range and, possibly, cowbird parasitism (Wheelock 1912; Willett 1912, 1933; Grinnell and Miller 1944; Remson 1978; Garrett and Dunn 1981; Unitt 1984, 1987; Gaines 1988; Schlorff 1990; Whitfield and Sogge 1999). By 1993, the species was believed to number approximately 70 pairs in California (USFWS 1993) in small disjunct populations. The southwestern willow flycatcher was listed as endangered by the State of California in 1992 and by the U.S. Fish and Wildlife Service in 1995.

Willow flycatchers in southern California co-occur with the least Bell's vireo (*Vireo bellii pusillus*), another riparian obligate endangered by habitat loss and cowbird parasitism. However, unlike the vireo, which has increased six-fold since the mid-1980's in response to management alleviating these threats (USGS unpubl. data), willow flycatcher numbers have remained low. Currently, the majority of southwestern willow flycatchers in California are concentrated in three sites: the South Fork of the Kern River in Kern County (Whitfield and Lynn 2001), the Upper San Luis Rey River, including a portion of the Cleveland National Forest in San Diego County (Kus *et al.* 1999; Haas 2000), and Marine Corps Base Camp Pendleton in San Diego County (Griffith Wildlife Biology 2000a). Outside of these sites, southwestern willow flycatchers occur as small, isolated populations of one to half a dozen pairs (Kus *et al.* in review). Data on the distribution and demography of the flycatcher, as well as identification of factors limiting the species, are critical information needs during the current stage of recovery planning.

The purpose of this study was to document the status of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in San Diego County, California. Specifically, our goals were to (1) determine the size and composition of the willow flycatcher population at the Base, (2) document nesting activities of resident flycatchers, and (3) characterize habitat used by flycatchers. These data, when combined with data for other years, will inform natural resource managers about the status of this endangered species at Camp Pendleton, and guide modification of land use and management practices as appropriate to ensure the species' continued existence.

This work was funded by the Assistant Chief of Staff, Environmental Security, Resources Management Division, Marine Corps Base Camp Pendleton, California.

STUDY AREAS AND METHODS

Field Surveys

All of Camp Pendleton's major drainages, and several minor ones supporting riparian habitat, were surveyed for flycatchers between 15 May and 31 August 2000. Field work was conducted by Jason Berkley, Mike Fugagli, David Kisner, Barbara Kus, Carol Reynolds, Jennifer Turnbull, and Jeff Wells. The specific areas surveyed are as follows:

Santa Margarita River: between Interstate 5 and the eastern boundary of Camp Pendleton, including Ysidora Basin and Stagecoach Canyon (Figures 1,2).

De Luz Creek: between the confluence with the Santa Margarita River and the Base boundary (Figure 1).

Roblar Creek: between the confluence with De Luz Creek and the Foxtrot/Golf boundary (Figure 1).

Fallbrook Creek: between Lake O'Neill and the Base boundary (Figure 1).

Las Flores Creek: between the Pacific Ocean and a point approximately 75 m upstream of Basilone Road (Figure 5).

Horno Creek: between Old Highway 101 and the upstream limit of riparian habitat (Figure 5).

Piedra de Lumbre Canyon: between the confluence with Las Flores Creek and the upstream limit of riparian habitat (Figure 5).

French Creek: between the Pacific Ocean and the Edson Range Impact Area (Figure 2).

Aliso Creek: between the Pacific Ocean and the electrical transmission lines (Figure 2).

San Onofre Creek: between the Pacific Ocean and the access road to Range 219 ("south fork"), and between the north/south fork confluence and the confluence with Jardine Canyon ("north fork") (Figures 3 and 4).

San Mateo Creek: between the Pacific Ocean and the Base boundary, including habitat south of the creek, and south and east of the agricultural fields (Figures 3 and 4).

Cristianitos Creek: between the confluence with San Mateo Creek and the Base boundary (Figure 3).

Pilgrim Creek: between the Base boundary and the limit of habitat upstream of Sewage Treatment Plant 1, including two side drainages between Pilgrim Creek and the southern Base boundary (Figure 6).

Windmill Canyon: from the Base boundary to the golf course (Figure 6).

Drainages were surveyed at least once during each of four consecutive 15-day periods between 15 May and 15 July, except for French Creek, Aliso Creek, Cristianitos Creek, Windmill Canyon, Horno Creek, Piedra de Lumbre Canyon, Roblar Creek, and Stagecoach Canyon, which were surveyed during the first three periods.

Investigators followed standard survey protocol (Sogge *et al.* 1997), moving slowly through the riparian habitat while searching and listening for willow flycatchers. Observers walked along the edge(s) of the riparian corridor on the upland and/or river side where habitat was narrow enough to detect a bird on the opposite edge. In wider stands, observers traversed the habitat in a way that permitted detection of all birds throughout its extent. Surveys were conducted between dawn and early afternoon, depending on wind and weather conditions.

For each bird encountered, investigators recorded age (adult or juvenile), sex, breeding status (paired, unpaired or transient), and whether the bird was banded. Flycatcher locations were mapped on 1":12,000" aerial photographs as well as 1":24,000" USGS topographic maps, using a Garmin 12 Global Positioning System (GPS) unit with 1-15 m positioning accuracy to determine geographic coordinates. Distance to the nearest surface water was recorded for each location, and habitat type specified according to the following categories based on dominant vegetation:

Mixed willow riparian: Habitat dominated by one or more willow species including *Salix gooddingii*, *S. lasiolepis*, and *S. laevigata*, with *Baccharis glutinosa* as a frequent co-dominant.

Willow-cottonwood: Willow riparian habitat in which *Populus fremontii* is a co-dominant.

Willow-sycamore: Willow riparian habitat in which *Platanus racemosa* is a co-dominant.

Sandbar scrub: Dry and/or sandy habitat dominated by *Salix hindsiana*, with few other species.

Mule fat scrub: Habitat dominated by *Baccharis glutinosa*, with few other species.

Mule fat-sycamore: Mule fat scrub in which *Platanus racemosa* is a co-dominant.

Sycamore-oak: Woodlands in which *Platanus racemosa* and *Quercus agrifolia* occur as co-dominants.

Non-native: Sites vegetated exclusively with non-native species such as *Arundo donax* and *Tamarix* sp.

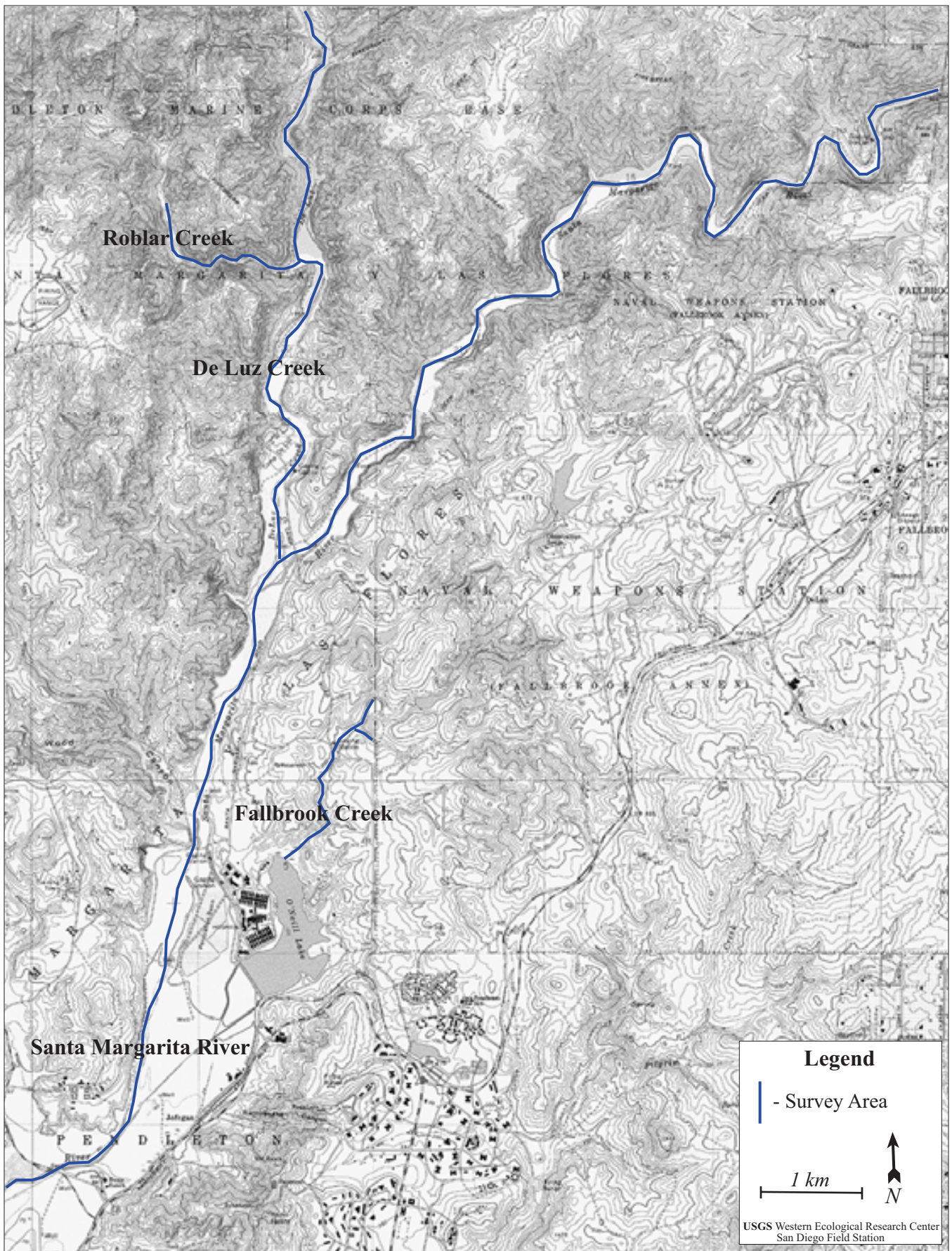


Figure 1. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2000:
 Santa Margarita River, De Luz Creek and Fallbrook Creek

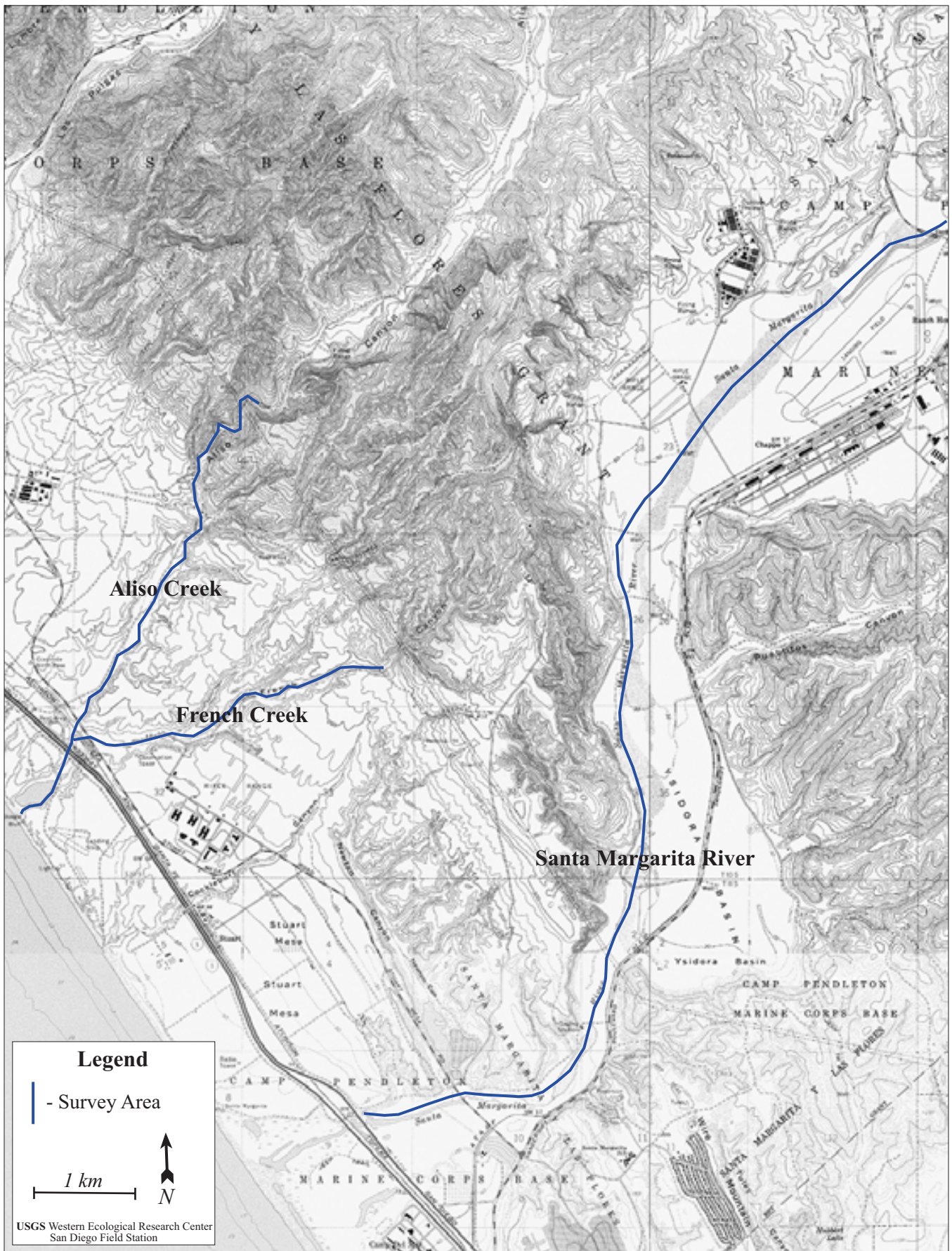


Figure 2. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2000: Aliso Creek, French Creek, and Santa Margarita River

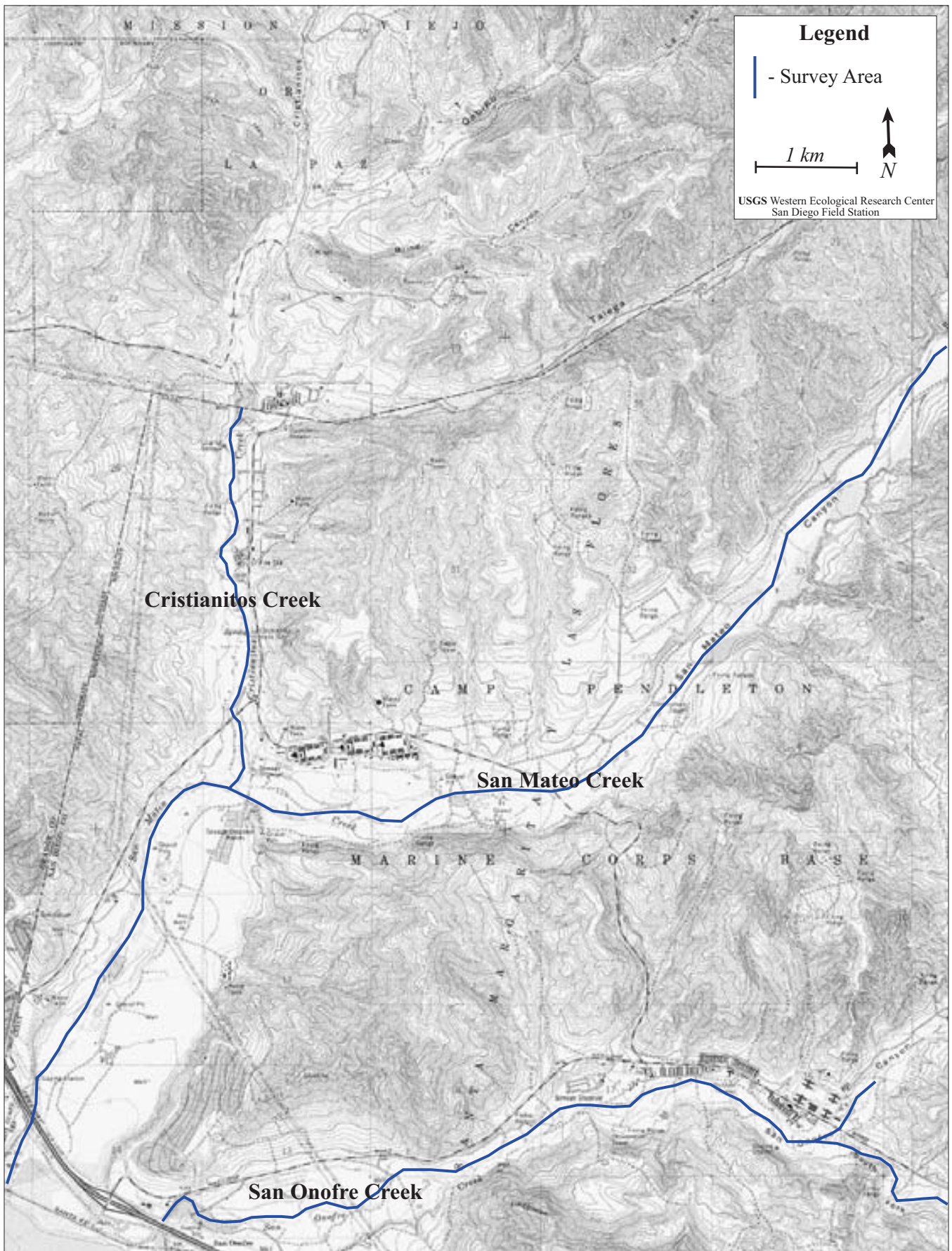


Figure 3. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2000:
Cristianitos Creek, San Mateo Creek and San Onofre Creek

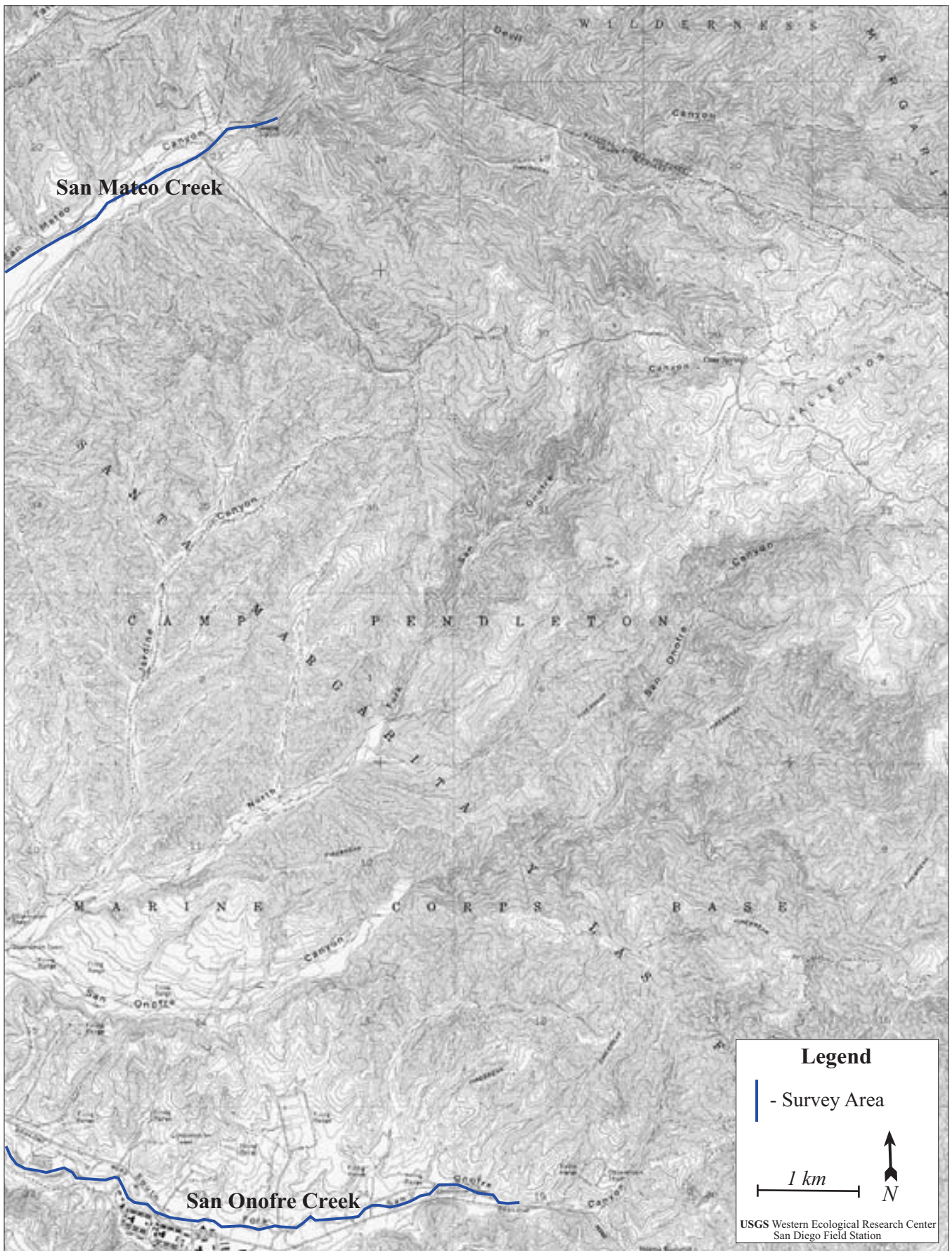


Figure 4. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2000:
San Mateo Creek and San Onofre Creek

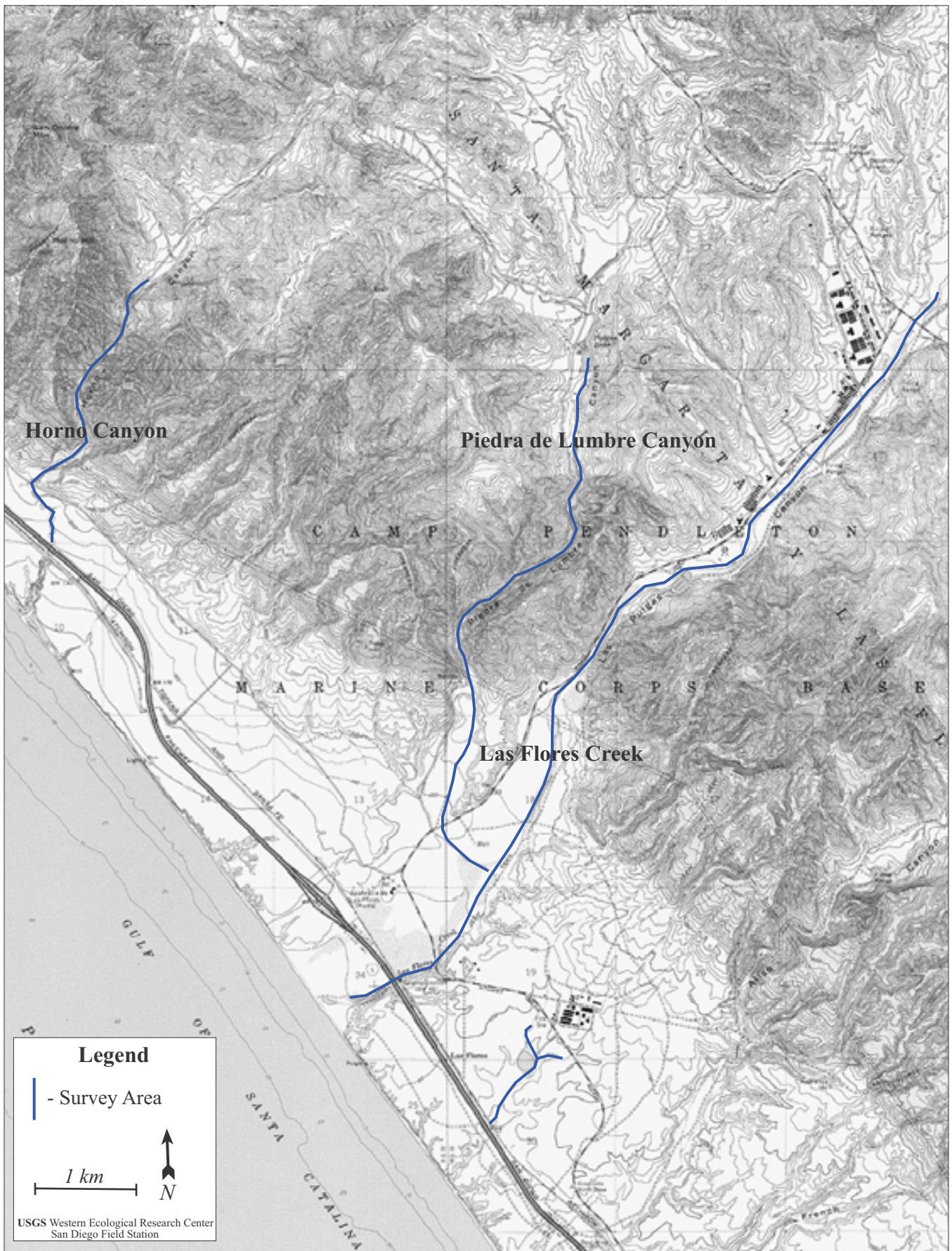


Figure 5. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2000:
Las Flores Creek, Horno Canyon and Piedra de Lumbre Canyon

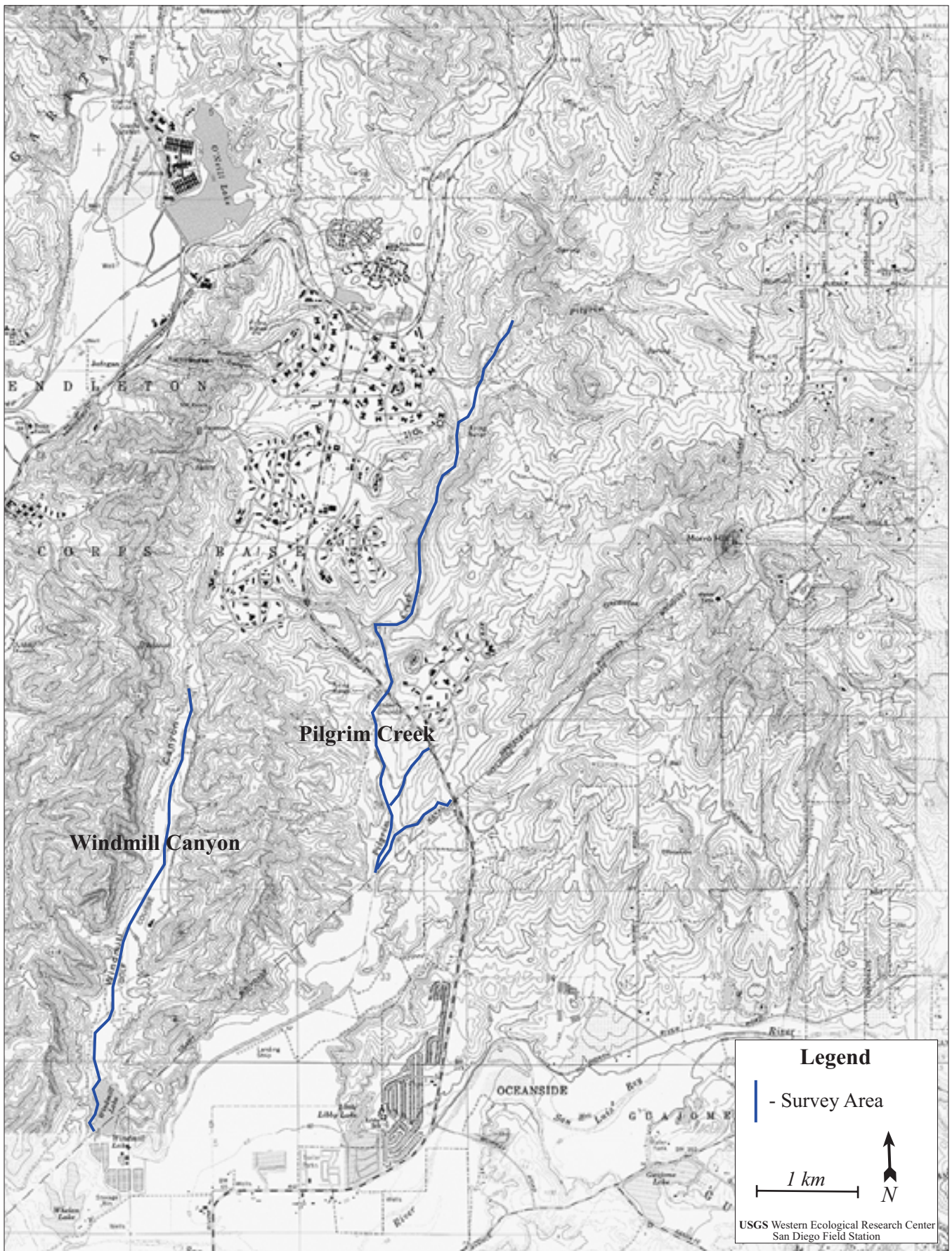


Figure 6. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2000: Windmill Canyon and Pilgrim Creek

Nest Monitoring

Pairs were observed for evidence of nesting, and nests located and monitored following standard protocol (Rourke *et al.* 1999). Nests were visited as infrequently as possible to minimize the chances of leading predators or brown-headed cowbirds (*Molothrus ater*) to nest sites; typically, the first visit was timed to determine the number of eggs laid, the second to determine hatching, and the third to band nestlings. Characteristics of nests, including height, host species, and host height were recorded following abandonment or fledging of nests.

Banding

Nestlings were banded at 7-10 days of age. Each bird received a single aluminum USGS numbered band on the left leg. Unbanded adults were captured in mist nets within their territories, and were banded with a unique combination of a numbered USGS band on one leg and a single celluloid color band on the other.

RESULTS

Population Size and Distribution

Transients

Eleven transient willow flycatchers of unknown sub-species were observed during Base-wide surveys, and an additional two were captured in mistnets at MAPS (Monitoring Avian Productivity and Survival) stations operated at De Luz Creek and the lower Santa Margarita River (Kus and Beck 2001; Figures 7-12). All transients were detected between mid-May and mid-June with the exception of the De Luz Creek bird, which was captured during netting on 2 August 2000. Transients occurred on drainages throughout the Base, including the upper and lower Santa Margarita River, Aliso, Las Flores, Pilgrim, and De Luz Creeks, Windmill Canyon, and Fallbrook Creek at Lake O'Neill.

Territorial Birds

Eighteen males established territories and remained throughout the breeding season (Figures 8-9, 13-19). Of these males, ten were confirmed as paired, five appeared single, and three were of undetermined status. One of the males (South 2, Figure 19) appeared to be polygynous, interacting with two adult females in his territory. Territories were limited to the Santa Margarita River downstream of Basilone Road, and to the mouth of Fallbrook Creek where it enters Lake O'Neill.

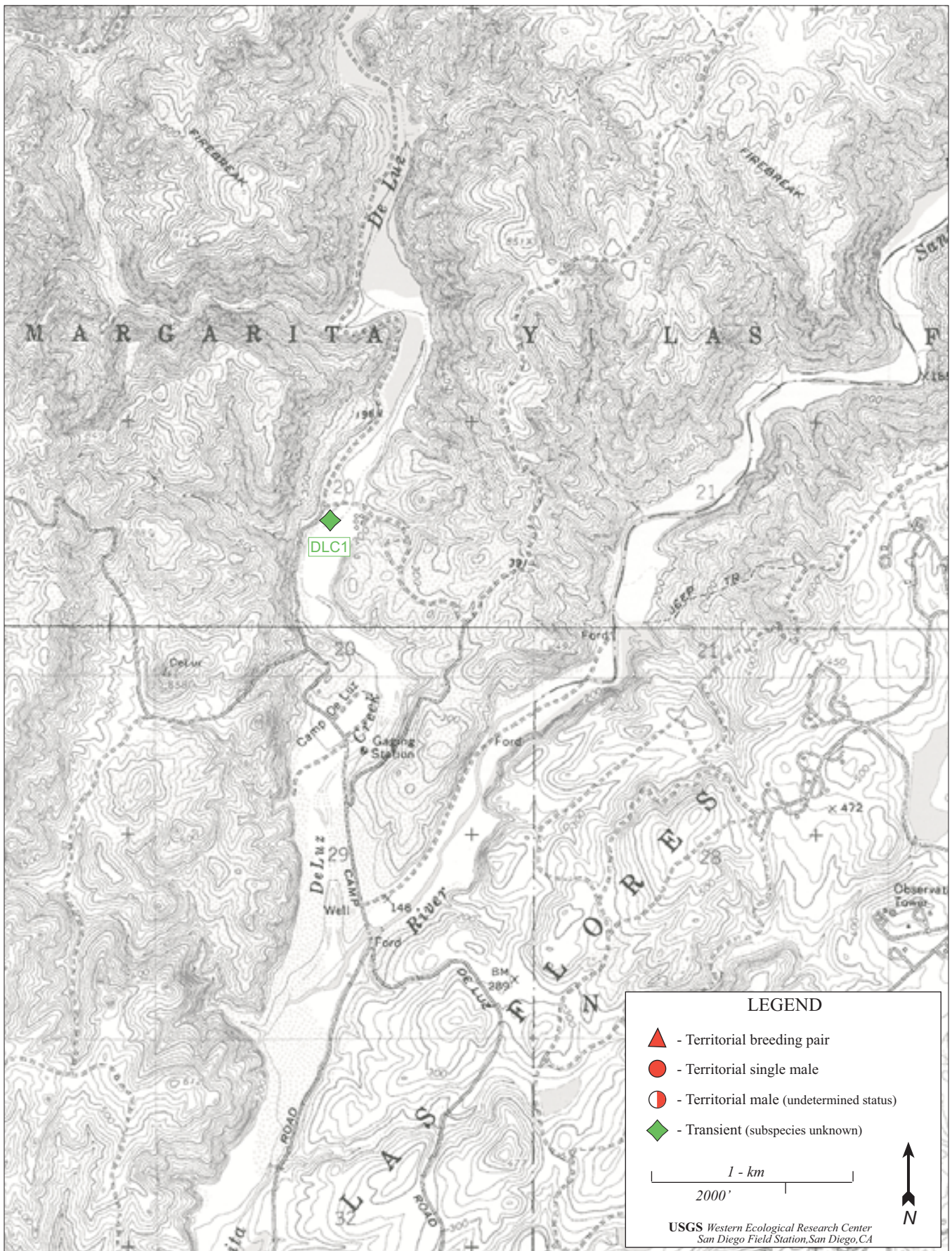


Figure 7. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2000: De Luz Creek

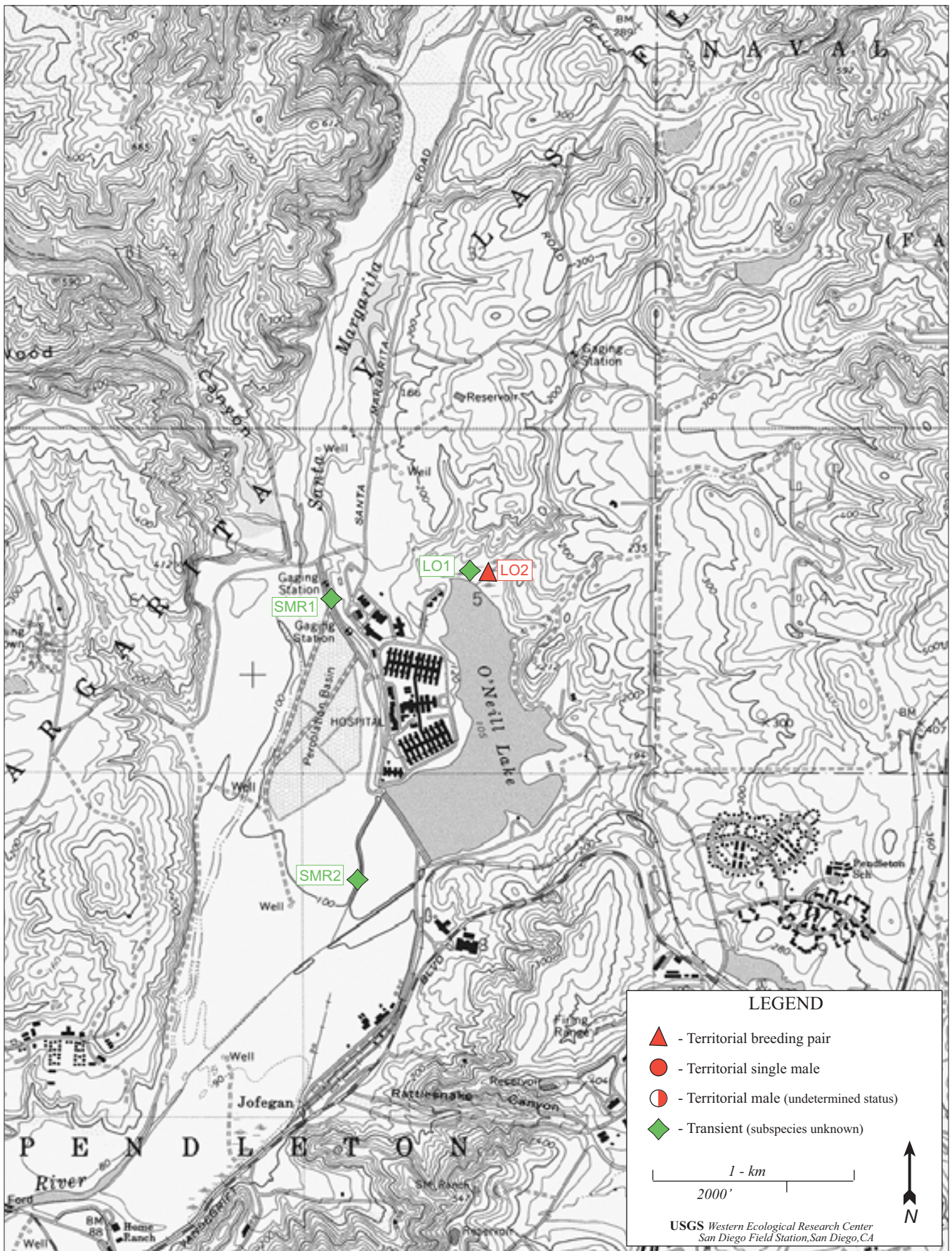


Figure 8. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2000: Santa Margarita and Lake O'Neill (Fallbrook Creek)

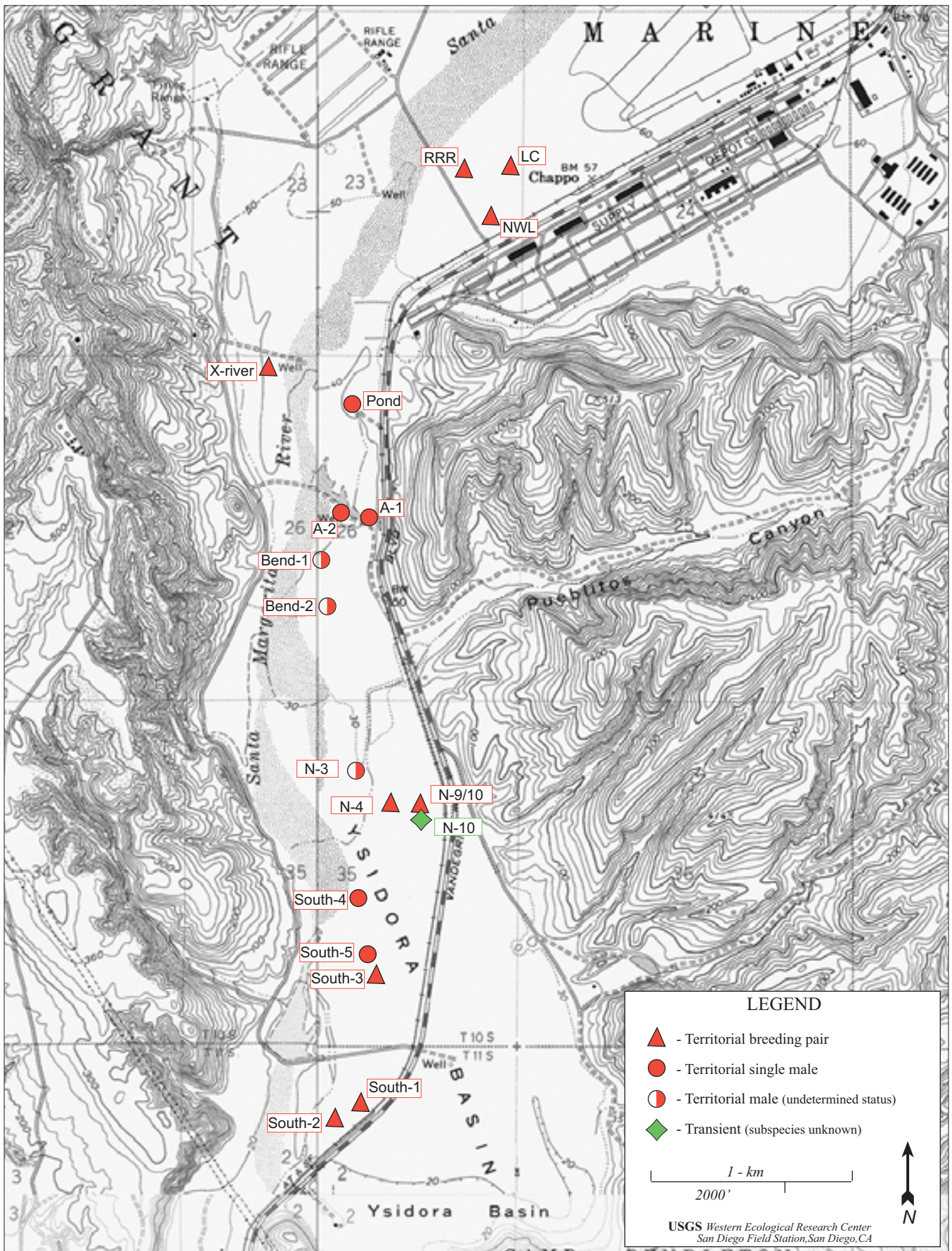


Figure 9. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2000: Santa Margarita River and Ysidora Basin

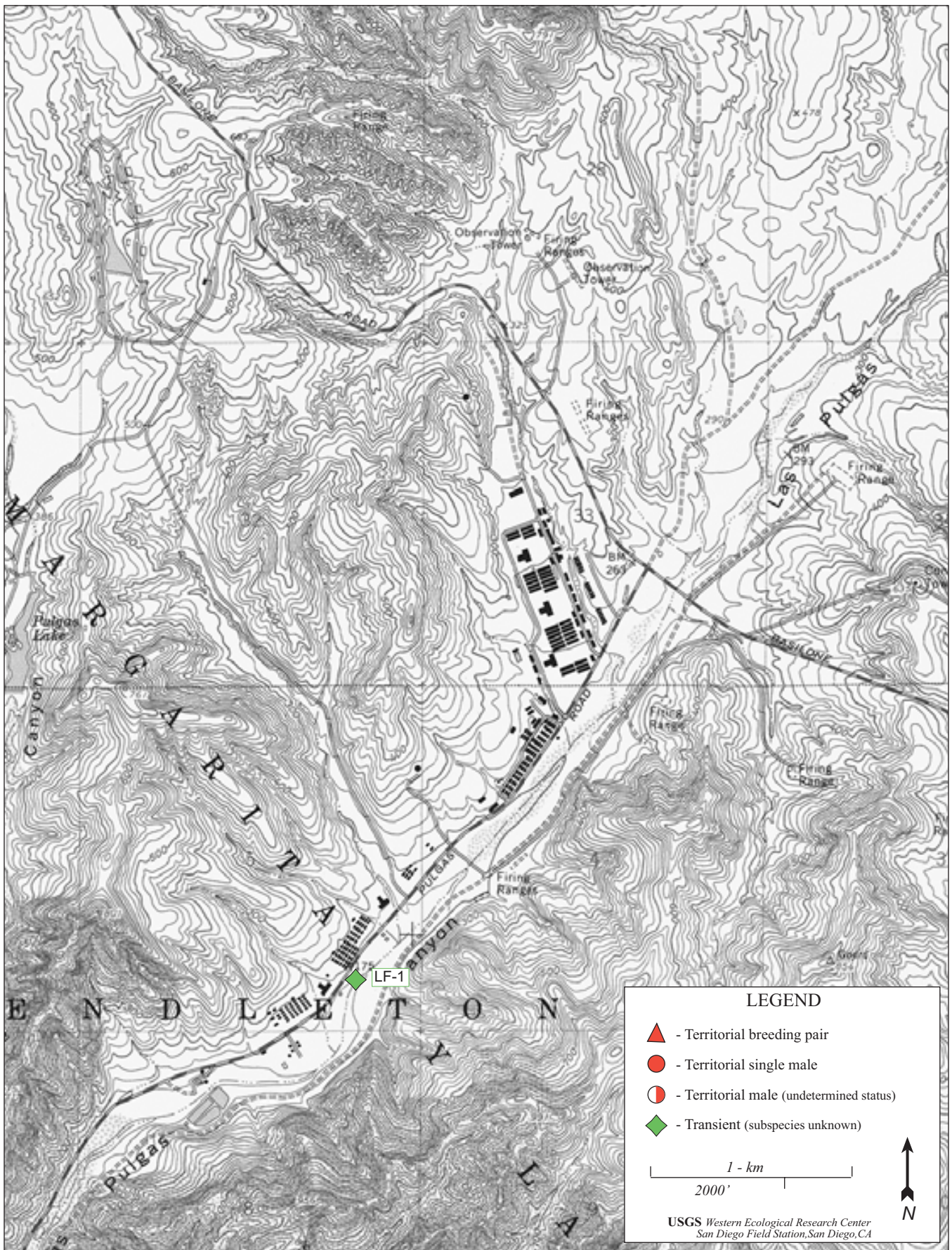


Figure 10. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2000:
Las Flores Creek

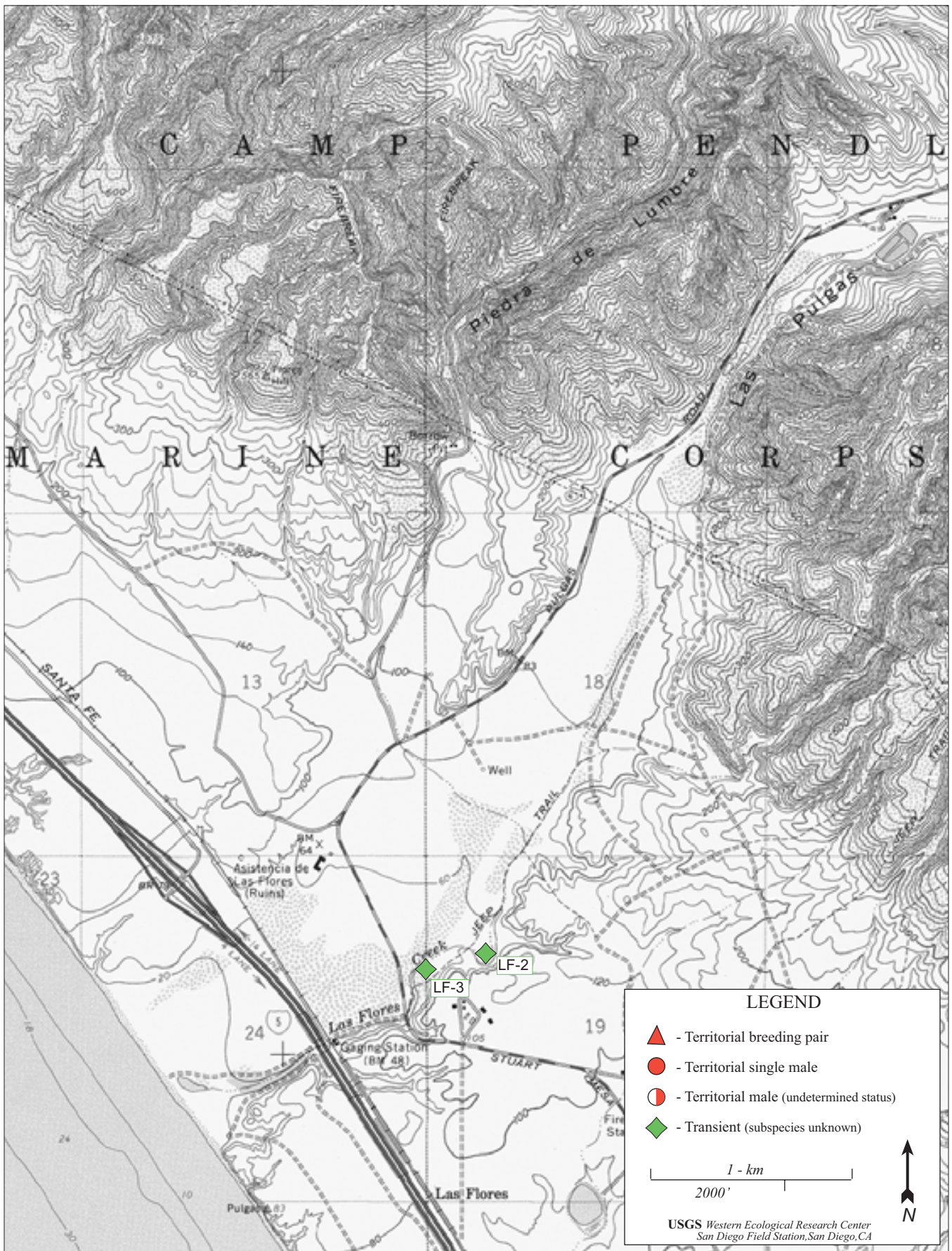


Figure 10 (cont.). Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2000:
Las Flores Creek

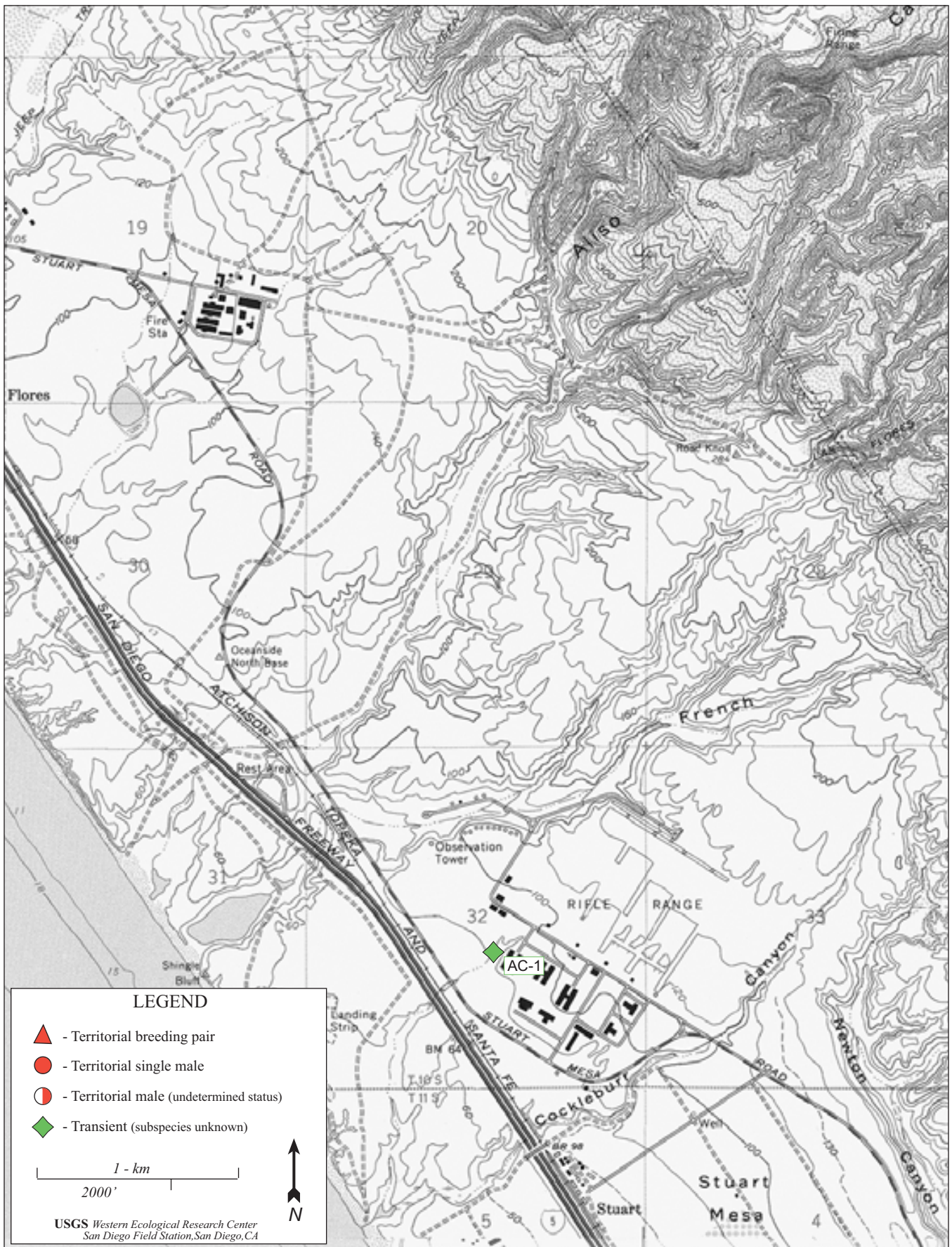


Figure 11. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2000: Aliso Creek

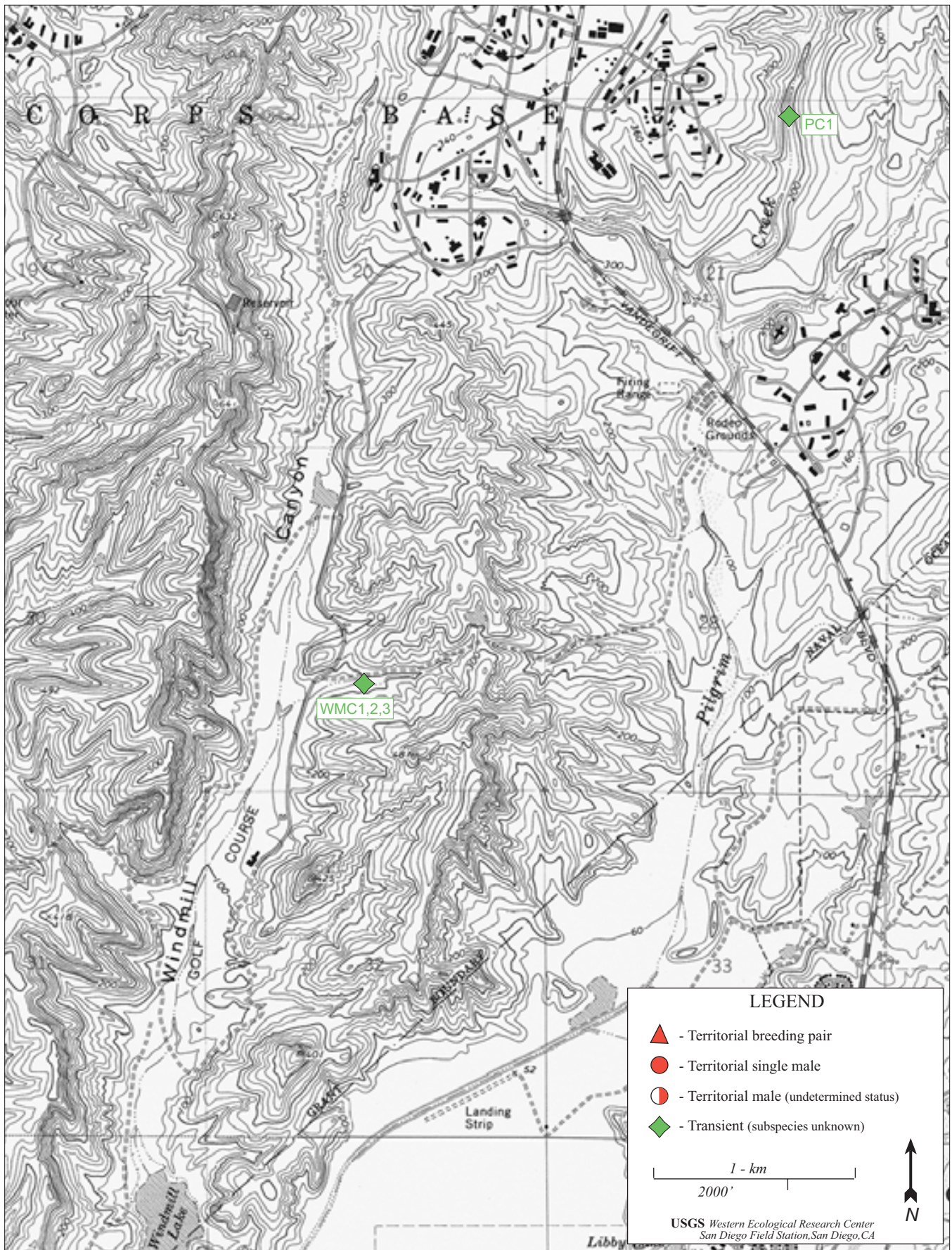


Figure 12. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2000: Windmill Canyon and Pilgrim Creek



Figure 13. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2000:
Lake O'Neill, Fallbrook Creek

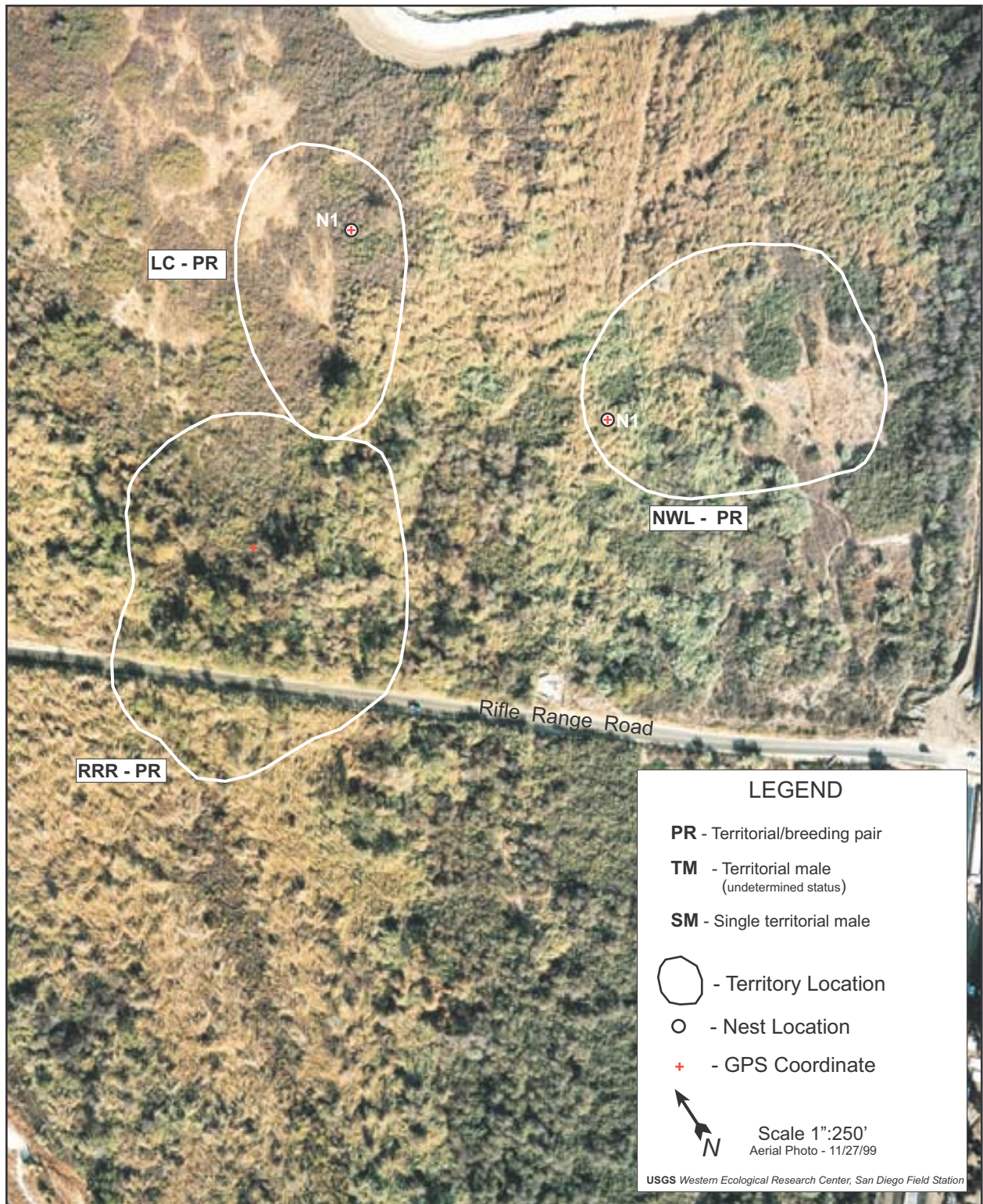


Figure 14. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2000: Rifle Range Road, Santa Margarita River

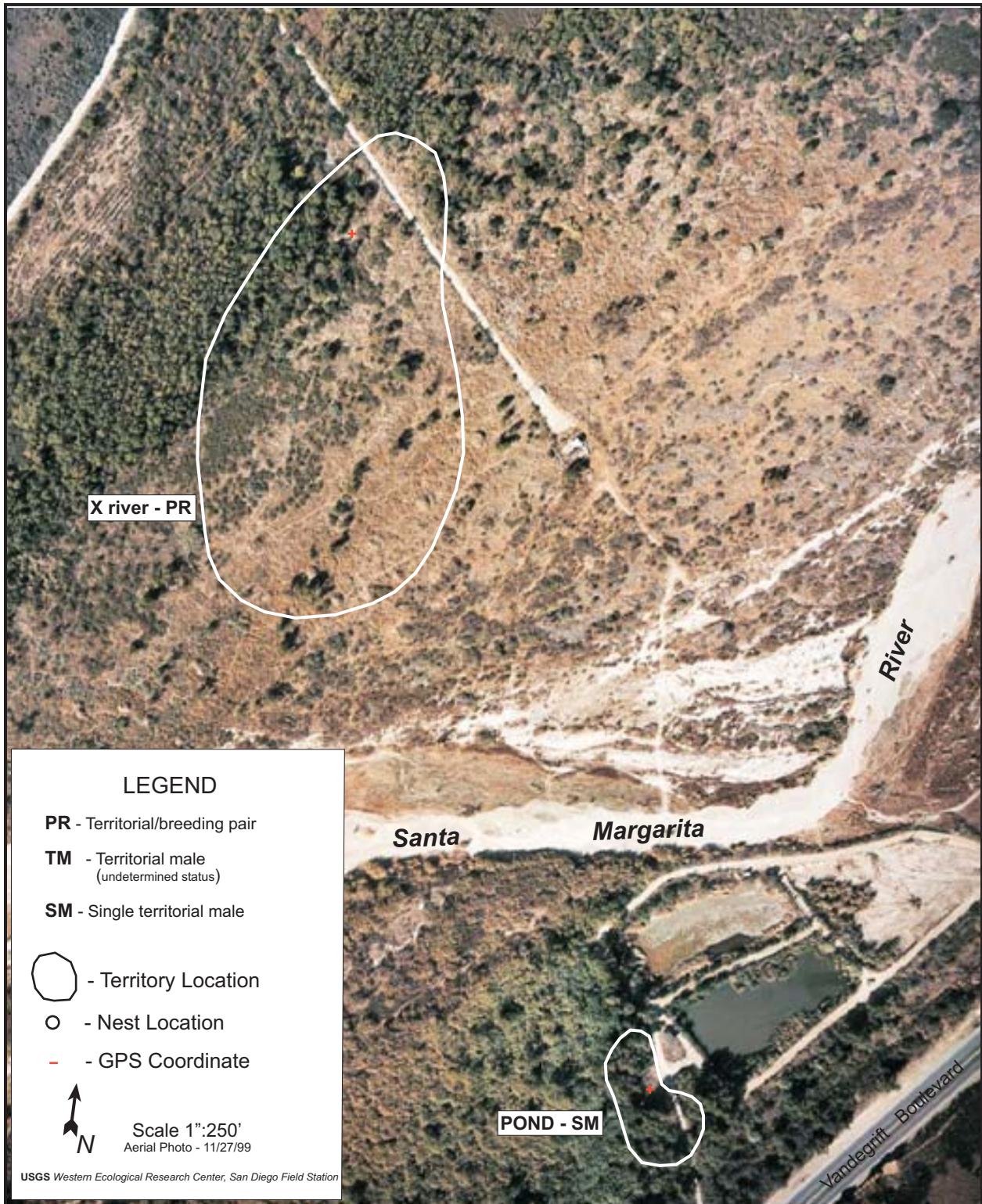


Figure 15. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2000: STP-3 Ponds, Santa Margarita River



Figure 16. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2000: Santa Margarita River

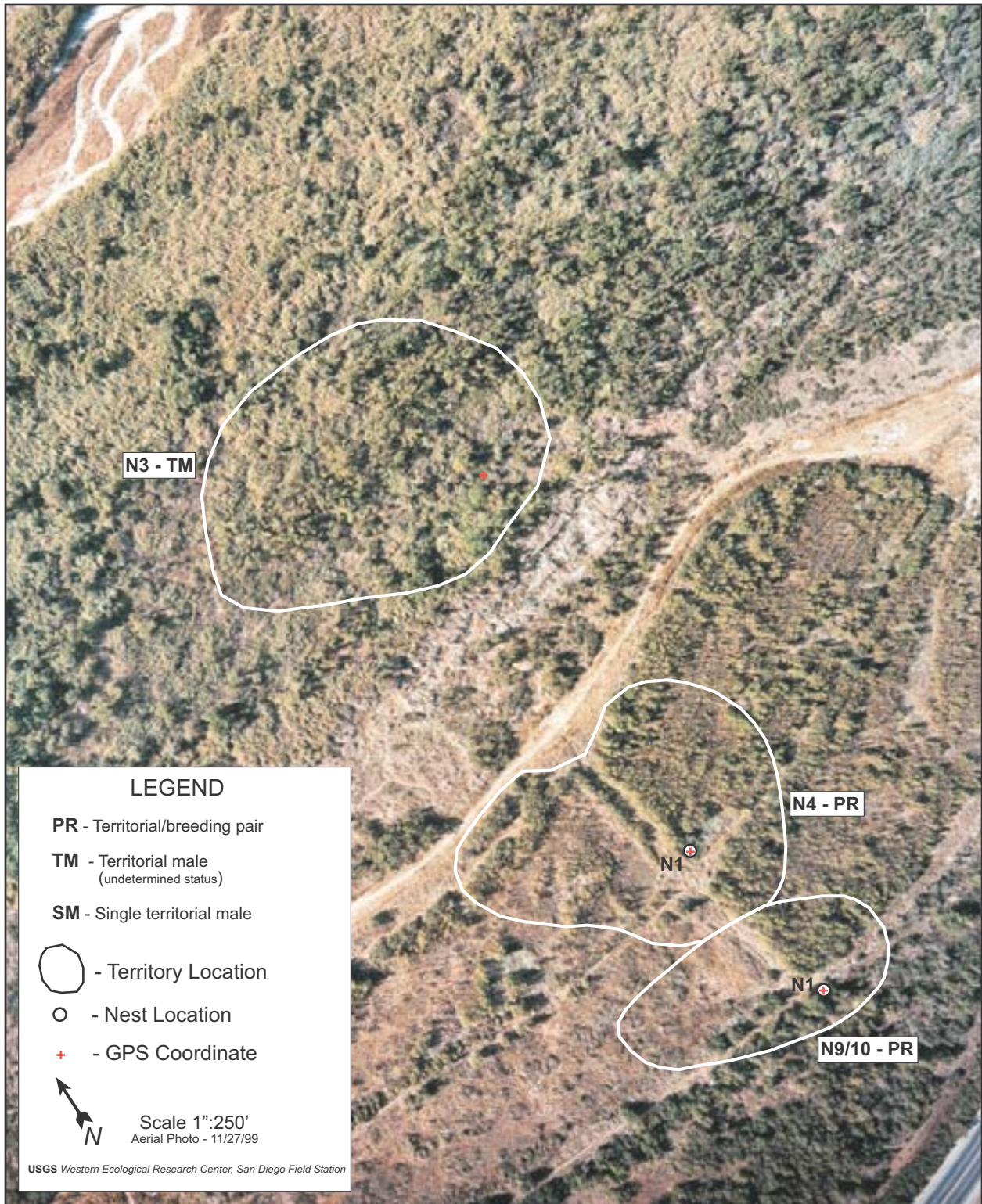


Figure 17. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2000: Northeast Ysidora Basin, Santa Margarita River



Figure18. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2000: Ysidora Basin, Santa Margarita River



Figure 19. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2000: Southwest Ysidora Basin, Santa Margarita River

Habitat Characteristics

Two-thirds (20/31) of all the flycatcher sightings occurred in habitat classified as mature mixed willow riparian (Table 1), with a dense understory of blackberry (*Rubus ursinus*), stinging nettles (*Urtica dioica*), or poison hemlock (*Conium maculatum*) often present. Sixteen percent (5/31) of the locations were in willow-sycamore dominated habitat, primarily in Windmill Canyon. Thirteen percent (4/31) occurred in scrub habitat dominated by sandbar willow (*Salix exigua*) and/or mule fat, and one location was in a pure stand of salt cedar (*Tamarix* sp.). Breeding flycatchers were less equitably distributed across these four habitat types than were transients, with 83 percent (15/18) of breeding territories located in mixed willow riparian.

Flycatcher locations differed widely in their proximity to surface water (Table 1). All but one of the 13 transients were within 50 m of water (range: 0-50 m; exception = 575 m (N10)). In contrast, breeders exhibited a bimodal distribution with regard to distance to nearest surface water, with roughly half (9/17) within 50 m ($\bar{X} = 28.3 \pm 18.4$ m), and the rest greater than 150 m away ($\bar{X} = 295.0 \pm 155.4$ m).

Breeding Activities

Nesting was observed for eight of the ten pairs (Table 2). Each pair attempted one nest, for a total of eight nests. With the exception of one nesting attempt in early July, all nests were initiated during the first half of June. All nests were successful, fledging a total of 23 young. Seasonal productivity for the Camp Pendleton flycatcher population in 2000 was estimated at 2.3 young per pair (23 young/10 pairs). Clutch size, based on nests observed with full clutches, averaged 3.0 ± 0.7 (N=5).

Nest Site Characteristics

Flycatchers placed nests in five species of plants (Table 3), including black willow (*Salix goodingii*), sandbar willow (*S. exigua*), stinging nettles, blackberry, and giant reed (*Arundo donax*). Nest height averaged 1.8 ± 1.0 m (N=6), while host height averaged 4.3 ± 3.1 m (N=6).

Table 1. Habitat Characteristics of Willow Flycatcher Locations at Marine Corps Base Camp Pendleton in 2000.

ID	Drainage	Status^a	Habitat Type	Distance to Surface Water (m)
LO1	Fallbrook Creek	T	Mixed willow riparian	10
LO2	Fallbrook Creek	P	Mixed willow riparian	10
WMC1	Windmill Canyon	T	Willow-sycamore	17
WMC2	Windmill Canyon	T	Willow-sycamore	3
WCM3	Windmill Canyon	T	Willow-sycamore	7
PC1	Pilgrim Creek	T	Willow-sycamore	3
AC1	Aliso Creek	T	Mixed willow riparian	0
LF1	Las Flores Creek	T	Sandbar scrub	0
LF2	Las Flores Creek	T	Mule fat scrub	20
LF3	Las Flores Creek	T	Mule fat scrub	20
DLC1	De Luz Creek	T	Mixed willow riparian	5
USMR1	Santa Margarita River	T	Mixed willow riparian	20
USMR2	Santa Margarita River	T	Mule fat scrub	50
LC	Santa Margarita River	P	Sandbar scrub	200
NWL	Santa Margarita River	P	Mixed willow riparian	375
RRR	Santa Margarita River	P	Willow-sycamore	210
N4	Santa Margarita River	P	Mixed willow riparian	450
N9/10	Santa Margarita River	P	Mixed willow riparian	575
N10	Santa Margarita River	T	Mixed willow riparian	575
N3	Santa Margarita River	U	Mixed willow riparian	250
A01	Santa Margarita River	S	Mixed willow riparian	20
A02	Santa Margarita River	S	Mixed willow riparian	150
BEND01	Santa Margarita River	U	Mixed willow riparian	150
BEND02	Santa Margarita River	U	Mixed willow riparian	0
POND	Santa Margarita River	S	Mixed willow riparian	20
XRIV	Santa Margarita River	P	Mixed willow riparian	NA
SOUTH1	Santa Margarita River	P	Mixed willow riparian	50
SOUTH2	Santa Margarita River	P	Mixed willow riparian	50
SOUTH3	Santa Margarita River	P	Mixed willow riparian	50
SOUTH4	Santa Margarita River	S	Non-native (tamarisk)	30
SOUTH5	Santa Margarita River	S	Mixed willow riparian	25

^aT = transient, P = breeding pair, S = single male, U = status undetermined.

ID	Lay Date	# Eggs	# Fledglings	Comments
LO2	3 Jun	3	3	
LC	1 Jun	4	4	Banded young, all m:- ^d
NWL	11 Jun	3	3	
RRR	8 Jun ^a	3+ ^c	3	
N4	12 Jun	2	2	
N9/10	16 Jun	3+ ^c	3	Banded young, all M _{br} :- ^e
XRIV	7 Jun ^a	3+ ^c	3	
SOUTH1	9 Jul	2	2	
SOUTH2	B ^b	--	--	
SOUTH3	B ^b	--	--	

^aDate estimated; nest not seen.
^bNo nesting observed.
^cMinimum number, based on number of fledglings observed.
^dBanding scheme: m:- = aluminum metal USGS band on left leg, nothing on right leg.
^eBanding scheme: M_{br}:- = anodized bronze metal USGS band on left, nothing on right leg.

ID	Host Species	Host Height (m)	Nest Height (m)
LO2	<i>Salix gooddingii</i>	10.0	1.8
LC	<i>Salix hindsiana</i>	3.5	1.7
NWL	<i>Arundo donax</i>	5.5	3.8
N4	<i>Urtica dioica</i>	2.6	1.2
N9/10	<i>Urtica dioica</i>	2.2	0.9
SOUTH 1	<i>Rubus ursinus</i>	1.8	1.4

Cowbird Parasitism

No instances of cowbird parasitism of southwestern willow flycatcher nests were observed in this study.

Banded Birds

Thirteen of the 18 resident males, and nine of the eleven females, were observed closely enough to determine with confidence whether they were banded (Table 4). Of these, two males and one female were returning banded birds banded in previous years, including one male banded in 1998 as part of a range-wide genetics study (J. Owens, pers. comm.), and one female banded in 1999 at the Santa Margarita MAPS station. None of the transients observed during surveys were banded.

Four resident males and one female were netted during the study and color banded. In addition, both of the transients captured during operation of MAPS stations were banded.

Six nestlings in two nests were banded; all of these young fledged (Table 2).

Table 4. Band status of willow flycatchers at Marine Corps Base Camp Pendleton in 2000.

ID	Status ^a	Banded?	Comments ^b
I.O1	T	No	
LO2	P	Male: no, Female: no	
WMC1	T	No	
WMC2	T	No	
WCM3	T	No	
PC1	T	No	
AC1	T	No	
LF1	T	No	
LF2	T	No	
LF3	T	No	
DLC1	T	Yes	Female = m: PUR, banded at De Luz MAPS in
USMR1	T	Unk.	
USMR2	T	No	
LC	P	Male: no, Female: no	
NWL	P	Male: no, Female: no	
RRR	P	Male: yes, Female: no	Male = - : m, banded in 1998. Present in LC in
N4	P	Male: no, Female: yes	Female = M _{dg} : O, banded in 1999 in same
N9/10	P	Male: yes, Female: yes	Male = M _{dg} : LGWH, banded in 2000. Female = M _{dg} : WHI, banded in 2000.
N10	T	Yes	Banded with metal band at SMR MAPS in 2000.
N3	U	Unk.	
A01	S	No	
A02	S	No	
BEND01	U	Unk.	
BEND02	U	Unk.	
POND	S	Yes	Male = O : M _{dg} , banded in 2000.
XRIV	P	Male: no, Female: unk.	
SOUTH1	P	Male: yes, Female: no	Male = M _{dg} : BKYE, banded in 2000.
SOUTH2	P	Male: yes, Females: no	Male = M _{dg} : LTBL, banded in 2000.
SOUTH3	P	Male: yes, Female: unk.	Band combo not determined.
SOUTH4	S	Unk.	
SOUTH5	S	Unk.	

^aT = transient, P = breeding pair, S = single male, U = status undetermined.

^bBand combinations: left leg : right leg; A-A = no band, m = USGS metal (silver), M_{dg} = anodized green USGS metal, PUR = purple, O = orange, WHI = white, LGWH = light green-white split, BKYE = black-yellow split, LTBL = light blue.

DISCUSSION

Riparian habitat throughout Camp Pendleton continues to support migrating and breeding willow flycatchers. Although fewer transient flycatchers were documented in 2000 than in 1999, a year of exceptional field effort (Griffith Wildlife Biology 2000a), the abundance and distribution of transients is consistent with findings of previous years and suggests that Camp Pendleton is an important stopover site where migrating birds can rest and re-fuel. Transients were observed passing through the Base through mid-June, and used a wide range of riparian habitat types.

The population of resident southwestern willow flycatchers at Camp Pendleton changed little between 1999 and 2000 with regard to distribution and abundance. As in 1999 (Griffith Wildlife Biology 2000a), 18 territories were located, and all but one of the 1999 locations (FMM3, downstream of the airfield) were occupied in 2000. A new breeding site on Fallbrook Creek at Lake O'Neill was documented, expanding slightly the distribution of breeding flycatchers at the Base beyond the confines of the lower Santa Margarita River.

As in 1999, nesting success of flycatchers was high. Average clutch size was virtually identical in both years (2000: 3.0 ± 0.7 eggs per clutch; 1999: 3.0 ± 0.5 eggs per clutch; standard deviation calculated from data in Griffith Wildlife Biology 2000a), and all located nests successfully fledged young. Griffith Wildlife Biology (2000a) estimates that nest success in 1999 was actually lower, at about 72 percent, based on suspected unsuccessful nests that were never located, and it is likely that this is case for 2000 as well. Flycatchers in 2000 averaged 2.3 young per pair, slightly more than the 2.0 per pair produced in 1999 (34 young from 17 pairs, Griffith Wildlife Biology 2000a).

Not surprisingly given the overlap in distribution between the two years, flycatcher nest sites were similar with regard to nest height (2000: ($\bar{X} = 1.8 \pm 1.0$ m; 1999: $\bar{X} = 1.8 \pm 0.6$ m, standard deviation calculated from data in Griffith Wildlife Biology 2000a) and host species, although poison hemlock, supporting two of ten nests in 1999, was not used in 2000 and *Arundo donax* was used for the first time in 2000. As in 1999, territories were predominantly in mixed willow riparian habitat. Fifty-three percent of the territories in 2000 were within 50 m of surface water, comparable to the 67 percent reported for 1999. However, data for 2000 show that a large fraction of flycatchers select territories quite distant from surface water, up to several hundred m away.

At least one, and probably two, of the three banded birds reported in 1999 were present in 2000. The female of pair N4, banded as an adult in 1999, nested successfully in the same territory both years. A bird with a single metal band, reported in territory FMM2 in 1999 (Griffith Wildlife Biology 2000a), is probably the male present in an adjacent territory (RRR) in 2000. This male, erroneously reported by Griffith Wildlife Biology (2000a) as banded by USGS in August 1999, was actually banded as an adult in the RRR area in 1998, and thus has been breeding at Camp Pendleton for at least three years. A male with a single metal band reported in

territory FJS47 (2000 territory N9/10) was replaced in 2000 by an unbanded male who was subsequently captured and color banded. A male with an undetermined band combination occupying territory South 3 in 2000 could be the former FJS47 male, but this is unknown.

CONCLUSIONS AND RECOMMENDATIONS

The breeding population of southwestern willow flycatchers at Camp Pendleton has been stable for the last decade and a half, changing little from the average of 15 territories reported by Salata (in Unitt 1987) in the mid-1980's. While survey effort, scope, and timing have varied across years, complicating analyses of trends, it is clear that the Camp Pendleton flycatcher population has not exhibited sustained growth despite an abundance of apparently suitable habitat and annual trapping of cowbirds. In contrast, least Bell's vireos at the Base, under the same management, have increased from 15 in 1980 to over 800 territories in 2000 (Salata 1980; Griffith Wildlife Biology 2000b). This is evidence that the factors currently limiting willow flycatcher population growth are not the same as those limiting vireos. While flycatchers, like vireos, respond to cowbird control with increased productivity, none of the flycatcher populations managed for cowbirds during the last one to two decades have exhibited sustained growth beyond an initial increase following implementation of trapping (Whitfield *et al.* 1999; Kus *et al.* in review). This suggests that while cowbird parasitism may at one time have depressed flycatcher populations at Camp Pendleton and elsewhere, currently other factors are limiting them. These factors are unknown, and identifying them is one of the highest priority recovery needs at this time.

Most investigations of factors limiting populations, particularly populations of endangered species, focus on demographic factors and habitat availability. Data on the reproductive success of southwestern willow flycatchers at Camp Pendleton collected during the past two years indicate a high rate of nest success and production of young, suggesting that the population is not being limited by low productivity. It therefore seems appropriate to move beyond studies of nest success to address other aspects of flycatcher demography, in particular survival and dispersal. In addition, an improved understanding of the habitat requirements and preferences of flycatchers at Camp Pendleton will be necessary to ascertain just how much suitable habitat exists at the Base and develop realistic expectations with regard to future population growth. Camp Pendleton, with the second largest flycatcher population in California, is well-positioned to be an important contributor to the base of scientific information necessary for formulating effective management strategies to recover the flycatcher. With that perspective, the following are recommendations for future flycatcher-related studies at the Base:

1. Broaden the context of flycatcher monitoring to address testable hypotheses regarding factors limiting flycatcher population growth.
2. Pursue studies of survival, recruitment, and population turnover through monitoring of color banded individuals.

3. Pursue studies of dispersal and settlement patterns of juveniles, as well as movement patterns of adults within and between years, through monitoring of color banded birds combined with comprehensive surveys on and off Base.
4. Characterize flycatcher habitat requirements through quantitative assessment of biotic and abiotic factors influencing suitability, including vegetation structure and composition, and hydrogeomorphic variables.
5. Test and refine habitat suitability model(s) by comparing flycatcher settlement patterns to GIS-based predictions of habitat suitability.
6. Apply results of validated habitat suitability model to augment existing flycatcher habitat through restoration and alleviation of stressors.

LITERATURE CITED

- Gaines, D. 1988. Birds of Yosemite and the east slope. Artemesia Press, Lee Vining, California.
- Garrett, K. and J. Dunn. 1981. Birds of southern California: status and distribution. The Artesian Press, Los Angeles.
- Griffith Wildlife Biology. 2000a. The status of the southwestern willow flycatcher at Marine Corps Base Camp Pendleton in 1999. Final report. Prepared for AC/S, ES, Camp Pendleton by J.C. Griffith and J.T. Griffith, Griffith Wildlife Biology, Calumet, Michigan.
- Griffith Wildlife Biology. 2000b. The status of the least Bell's vireo at Marine Corps Base Camp Pendleton in 2000. Prepared for the U.S. Marine Corps, Camp Pendleton, California, by Griffith Wildlife Biology, Calumet, Michigan.
- Grinnell, J. and A. Miller. 1944. The distribution of the birds of California. Pac. Coast Avif. 27.
- Haas, W.E. 2000. Southwestern willow flycatcher data summary, upper San Luis Rey River, 1995-1999. Prepared for the Bureau of Reclamation, Phoenix, Arizona.
- Kus, B.E., P.P. Beck and J.M. Wells. (In review). Southwestern willow flycatcher populations in California: distribution, abundance, and potential for conservation. Studies in Avian Biology.
- Kus, B.E. and P.P. Beck. 2001. Neotropical migratory bird monitoring study at Marine Corps Base Camp Pendleton, California. Sixth annual progress report, 2000. Prepared for the U.S. Marine Corps, Environmental and Natural Resources Office, Camp Pendleton, California.
- Kus, B.E., P.P. Beck, and J.M. Wells. 1999. Status and breeding activities of the southwestern willow flycatcher at the Cleveland National Forest in 1999. Prepared for the USDA Forest Service, Cleveland National Forest.
- Hubbard, J.P. 1987. The status of the willow flycatcher in New Mexico. Endangered Species Program, New Mexico Dept. of Game and Fish, Santa Fe, NM.
- Remson, J.V., Jr. 1978. Bird species of special concern in California. California Department of Fish and Game, Wildlife Management Division, Administrative Report 78-1.
- Rourke, J.W., T.D. McCarthy, R.F. Davidson, and A.M. Santaniello. 1999. Southwestern willow flycatcher nest monitoring protocol. Nongame and Endangered Wildlife Program Technical Report 144. Arizona Game and Fish Department, Phoenix, Arizona.

- Salata, L. 1980. Status and distribution of the least Bell=s vireo, Camp Pendleton Marine Corps Base, 1980. Unpublished report, U.S. Fish and Wildlife Service, Endangered Species Office, Sacramento, CA.
- Schlorff, R.W. 1990. Status review of the willow flycatcher (*Empidonax traillii*) in California. Report to the Fish and Game Commission, State of California Resources Agency.
- Sogge, M.K., R.M. Marshall, S.J. Sferra, and T.J. Tibbitts. 1997. A southwestern willow flycatcher natural history summary and survey protocol. National Park Service/USGS Colorado Plateau Research Station, Northern Arizona University. NRTR-97/12.
- Unitt, P. 1984. The birds of San Diego County. San Diego Society of Natural History.
- Unitt, P. 1987. *Empidonax traillii extimus*: an endangered subspecies. *Western Birds* 18:137-162.
- U.S. Fish and Wildlife Service. 1993. Proposal to list the southwestern willow flycatcher as an endangered species and to designate critical habitat. *Federal Register* 58:39495-39522.
- Wheelock, I.G. 1912. Birds of California: an introduction to more than three hundred common birds of the state and adjacent islands. A.C. McClurg and Company, Chicago, Illinois.
- Whitfield, M.J. and J.C. Lynn. 2001. Southwestern willow flycatcher (*Empidonax traillii extimus*) surveys, nest monitoring, and removal of Brown-headed Cowbirds on the South Fork Kern River, California in 2000. Final report prepared for the U.S. Army Corps of Engineers, Sacramento District, Environmental Resources Division (DACW05-00-P-0220), and the California Department of Fish and Game.
- Whitfield, M.J. and M.K. Sogge. 1999. Range-wide impact of brown-headed cowbird parasitism on the southwestern willow flycatcher (*Empidonax traillii extimus*). *Studies in Avian Biology* 18:182-190.
- Whitfield, M.J., K.M. Enos, and S.P. Rowe. 1999. Is brown-headed cowbird trapping effective for managing populations of the endangered southwestern willow flycatcher? *Studies in Avian Biology* 18: 260-266.
- Willett, G. 1912. Birds of the Pacific slope of southern California. *Pacific Coast Avifauna* 7.
- Willett, G. 1933. A revised list of the birds of southwestern California. *Pacific Coast Avifauna* 21.