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

2003 Annual Report

Prepared for:

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

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
WESTERN ECOLOGICAL RESEARCH CENTER

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

By Barbara E. Kus and Kerry E. Kenwood

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2005

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Cover photographs by Mary Whitfield (top left), Mark Sogge (bottom left), and Suzanne Langridge (right).

Recommended citation:

Kus, B. E. and K. Kenwood. 2005. Distribution, abundance and breeding activities of the southwestern willow flycatcher at Marine Corps Base Camp Pendleton, California. 2003 Annual Report. Prepared for Assistant Chief of Staff, Environmental Security, Marine Corps Base Camp Pendleton.

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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 July 2003. Thirty-nine transient flycatchers of unknown subspecies were detected during surveys. Transients occurred in a range of habitat types including mixed willow riparian, willow-sycamore dominated riparian, riparian scrub, upland scrub and predominantly non-native vegetation. The distance from transient locations to the nearest surface water averaged 200 ± 399 m (N = 39).

Twenty southwestern willow flycatcher territories were located. With the exception of two territories at Lake O'Neill on Fallbrook Creek and one territory upstream of Basilone Road on Las Flores Creek, all territories were along the Santa Margarita River. All territories were located in mixed willow riparian habitat. Exotic vegetation, particularly poison hemlock (*Conium maculatum*), giant reed (*Arundo donax*), and tamarisk (*Tamarix ramosissima*) was present in all territories, and was dominant (% cover > 50) in 10% (2/20) of territories. Eighty-one percent of resident flycatchers were within 75 m of surface water, and the remainder 95-340 m away from it.

The resident flycatcher population included six non-territorial "floater" birds, four unpaired males, and 16 pairs. Nesting was documented for all 16 pairs, which produced 1-3 nests each. Sixty-eight percent (17/25) of nests were successful, and flycatchers fledged an average of 3.0 young per pair. No instances of cowbird parasitism were observed. Pairs placed nests in ten species of plants, including black willow *(Salix gooddingii*), arroyo willow (*S. lasiolepis*), sandbar willow (*S. exigua*), mule fat (*Baccharis salicifolia*), stinging nettle (*Urtica californa*), tamarisk, poison hemlock, wild rose (*Rosa californica*), coast live oak (*Quercus agrifolia*), and wild grape (*Vitis girdiana*).

Ten territorial males, 11 territorial females, and three floaters were banded previously at Camp Pendleton between 2000 and 2002. Fifty-five percent of the adults banded in 2002 returned in 2003, while 27% of nestlings and hatching year birds banded in 2002 returned to Camp Pendleton in 2003. Thirty-three percent of returning adults changed breeding locations within Camp Pendleton between 2002 and 2003. Six resident males and two females were captured and color banded in 2003, and 34 nestlings in 12 nests were banded. None of the transients observed during surveys were seen to carry 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 Western Ecological Research Center, San Diego Field Station 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 Cohen 2003), the Upper San Luis Rey River, including a portion of the Cleveland National Forest in San Diego County (Varanus Biological Services 2001), and Marine Corps Base Camp Pendleton in San Diego County (Kus and Kenwood 2003). Outside of these sites, southwestern willow flycatchers occur as small, isolated populations of one to half a dozen pairs (Kus *et al.* 2003). 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 from 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 July 2003. Field work was conducted by Anne Condon, Dana Kamada, Kerry Kenwood, Barbara Kus, Brynne Langan, Brennan Mulrooney, Jay Rourke, and Mike Wellik. The specific areas surveyed are as follows:

Santa Margarita River: between Stuart Mesa Road and the Base boundary, 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).

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

Las Flores Creek: between the Pacific Ocean and a point approximately 0.8 km upstream of Basilone Road (Figure 5).

Cockleburr Canyon: between the Pacific Ocean and Interstate 5 (Figure 2).

Horno Canyon: 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 0.5 km upstream of the electrical transmission lines (Figure 2).

Newton Canyon: between the confluence with the Santa Margarita River and the upstream limit of riparian habitat (Figure 2).

San Onofre Creek: between the Pacific Ocean and the access road to Range 219 (Figures 3, 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, 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 entrance (Figure 6).

Drainages were surveyed at least once during each of four consecutive survey periods between 15 May and 31 July. The first period extended from 15 May through 31 May, the second period from 1 June through 21 June, the third from 22 June through 14 July, and the fourth from 15 July through 31 July.

Investigators followed standard survey protocol (Sogge *et al.* 1997), moving slowly (approximately 2 km per hour) 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 choosing routes 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 (WSG84). Territories were delineated by connecting the outmost perches used by flycatchers. 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 salicifolia* 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.

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

Riparian scrub: Dry and/or sandy habitat dominated by *S. exigua* or *B. salicifolia,* with few other species.

Upland scrub: Disturbed coastal sage scrub adjacent to riparian habitat.

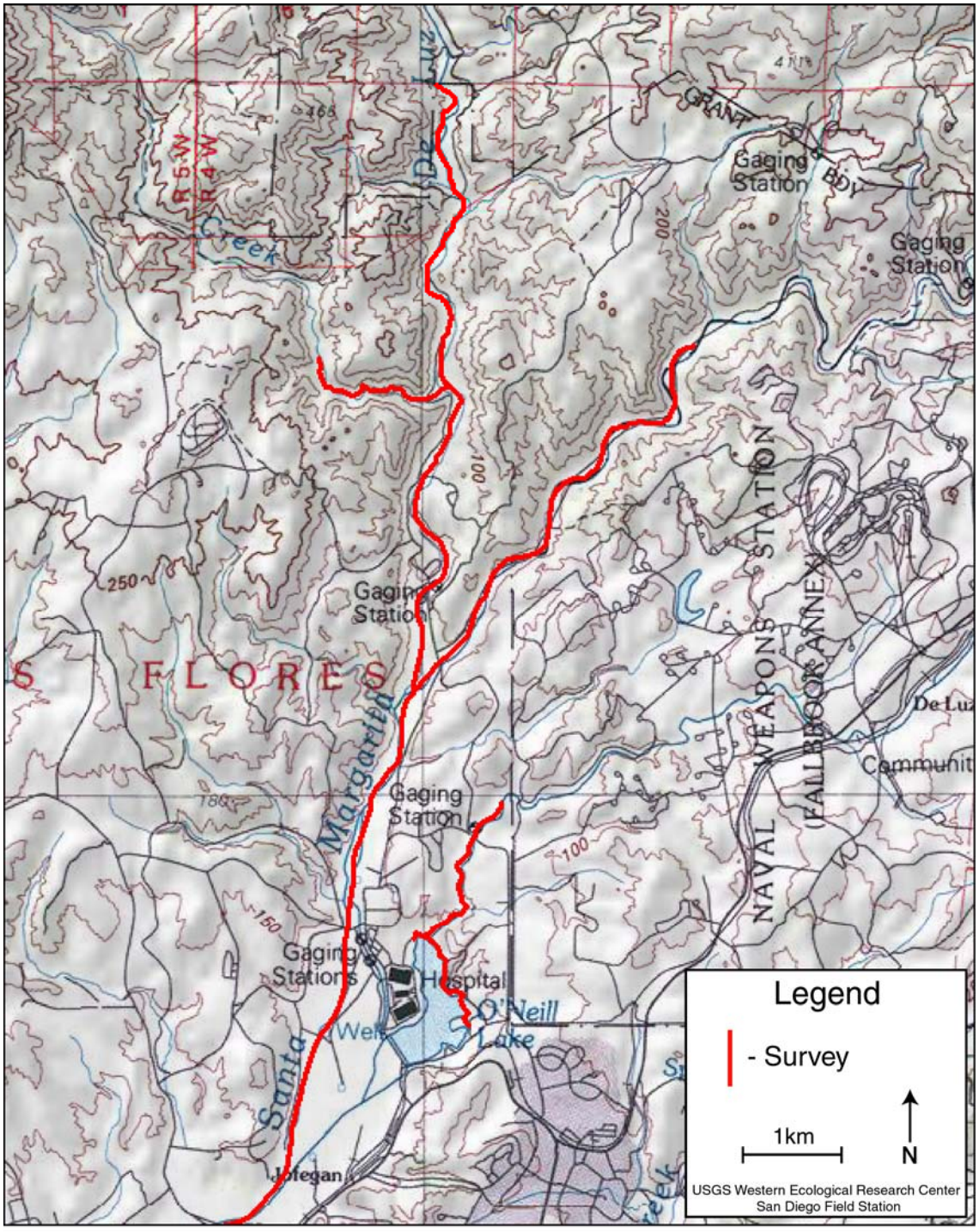

Figure 1. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2003: Santa Margarita River, Fallbrook Creek, De Luz Creek and Roblar Creek

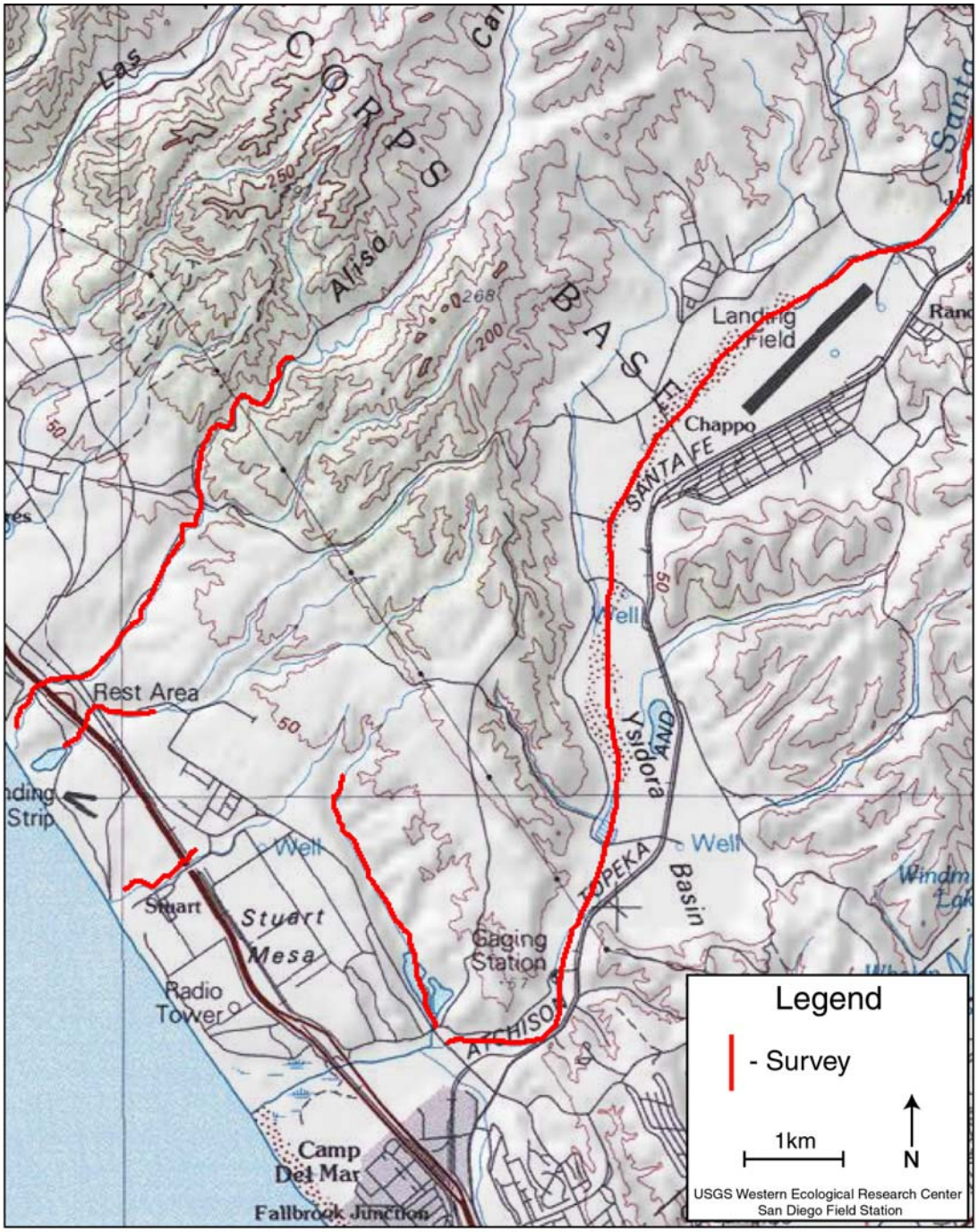

Figure 2. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2003: Santa Margarita River, Newton Canyon, Cockleburr Canyon, French Creek, and Aliso Creek

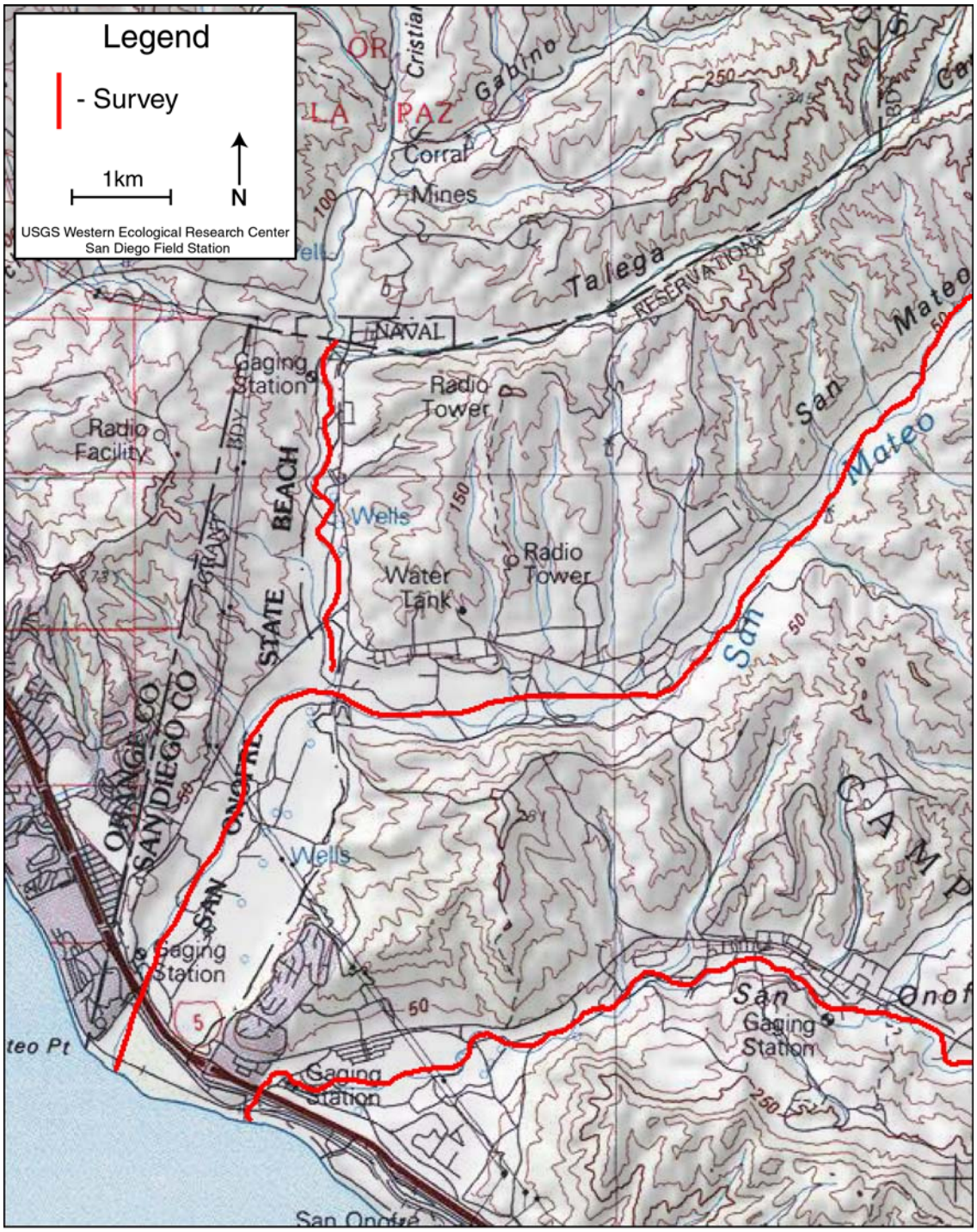

Figure 3. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2003: Cristianitos Creek, San Mateo Creek and San Onofre Creek

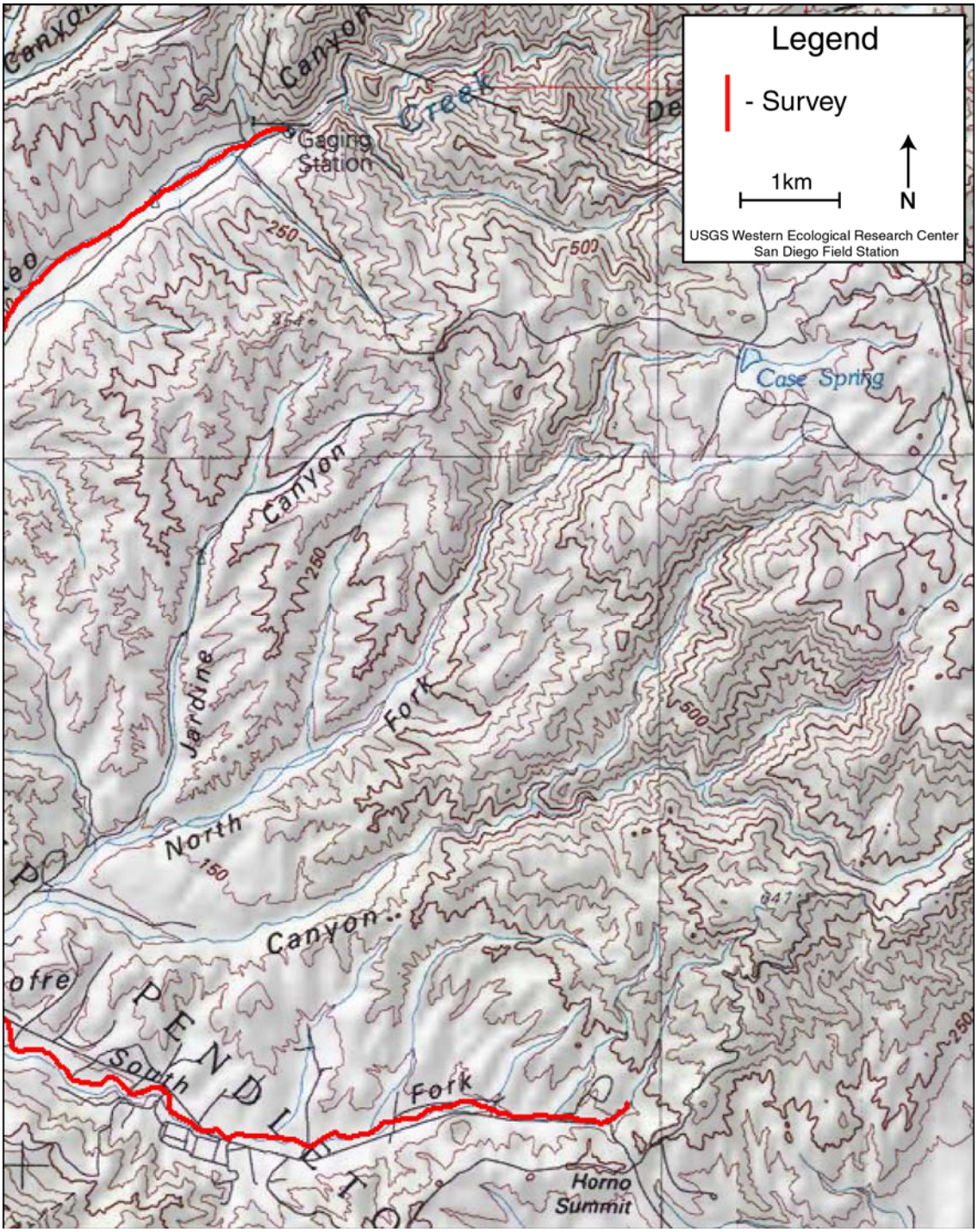

Figure 4. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2003: San Mateo Creek and San Onofre Creek

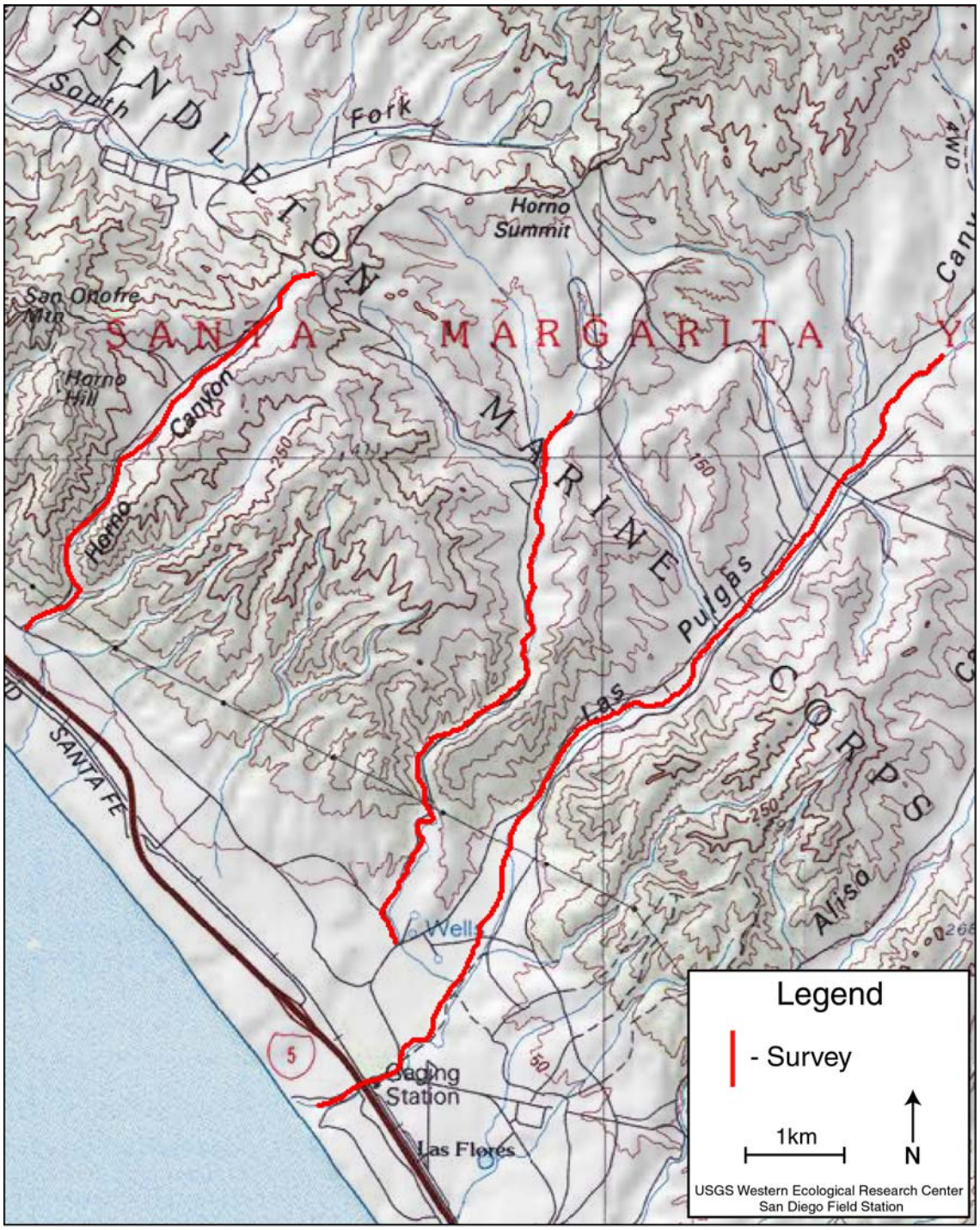

Figure 5. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2003: Las Flores Creek, Piedra de Lumbre Canyon, and Horno Canyon

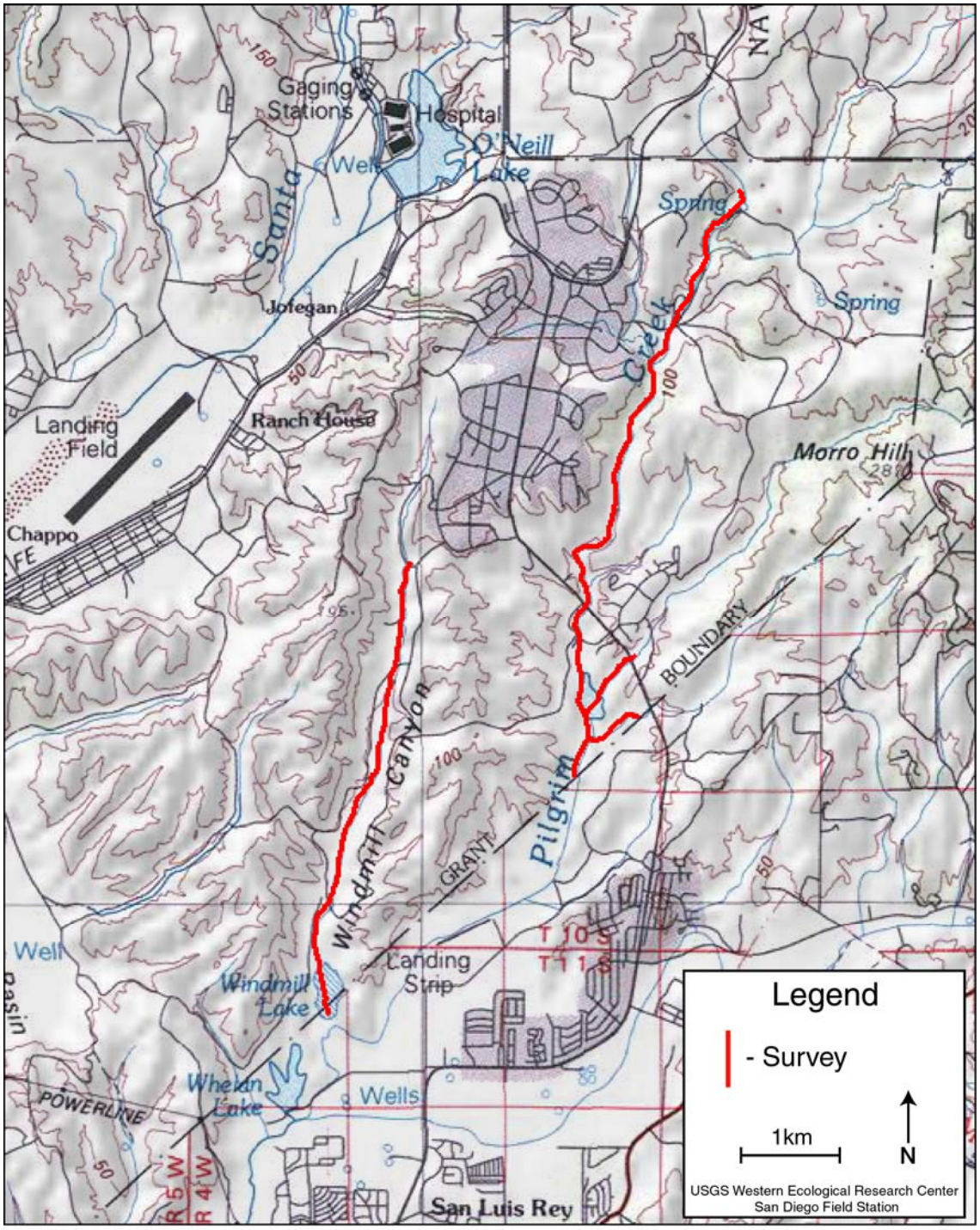

Figure 6. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2003: Windmill Canyon and Pilgrim Creek

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

Percent cover of exotic vegetation at each location was estimated using cover categories of <5%, 5-50%, and > 50%, and the dominant exotic species recorded.

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, there were four to six visits per nest. The first visit was timed to determine the number of eggs laid, the next few visits to determine hatching and age of young, the next to band nestlings, and the last to confirm fledging. 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 unique color combination including an anodized red-colored aluminum federal numbered band on one leg and a single bi-colored metal band on the other. Unbanded adults were captured in mist nets within their territories, and were banded with a unique combination of a numbered federal band (anodized dark green) on one leg and a bi-colored metal band on the other.

RESULTS

Population Size and Distribution

Transients

Thirty-nine willow flycatchers of unknown sub-species were observed during Base-wide surveys (Figures 7-14). All transients were detected between 15 May and 17 June. Transients occurred on two-thirds of the drainages surveyed including the Santa Margarita River, Fallbrook, Las Flores, French, Aliso, and San Onofre Creeks, and Cockleburr, Horno, Newton, and Windmill Canyons. No flycatchers were detected at Cristianitos, San Mateo, De Luz, Roblar or Pilgrim Creeks, nor at Piedra de Lumbre Canyon.

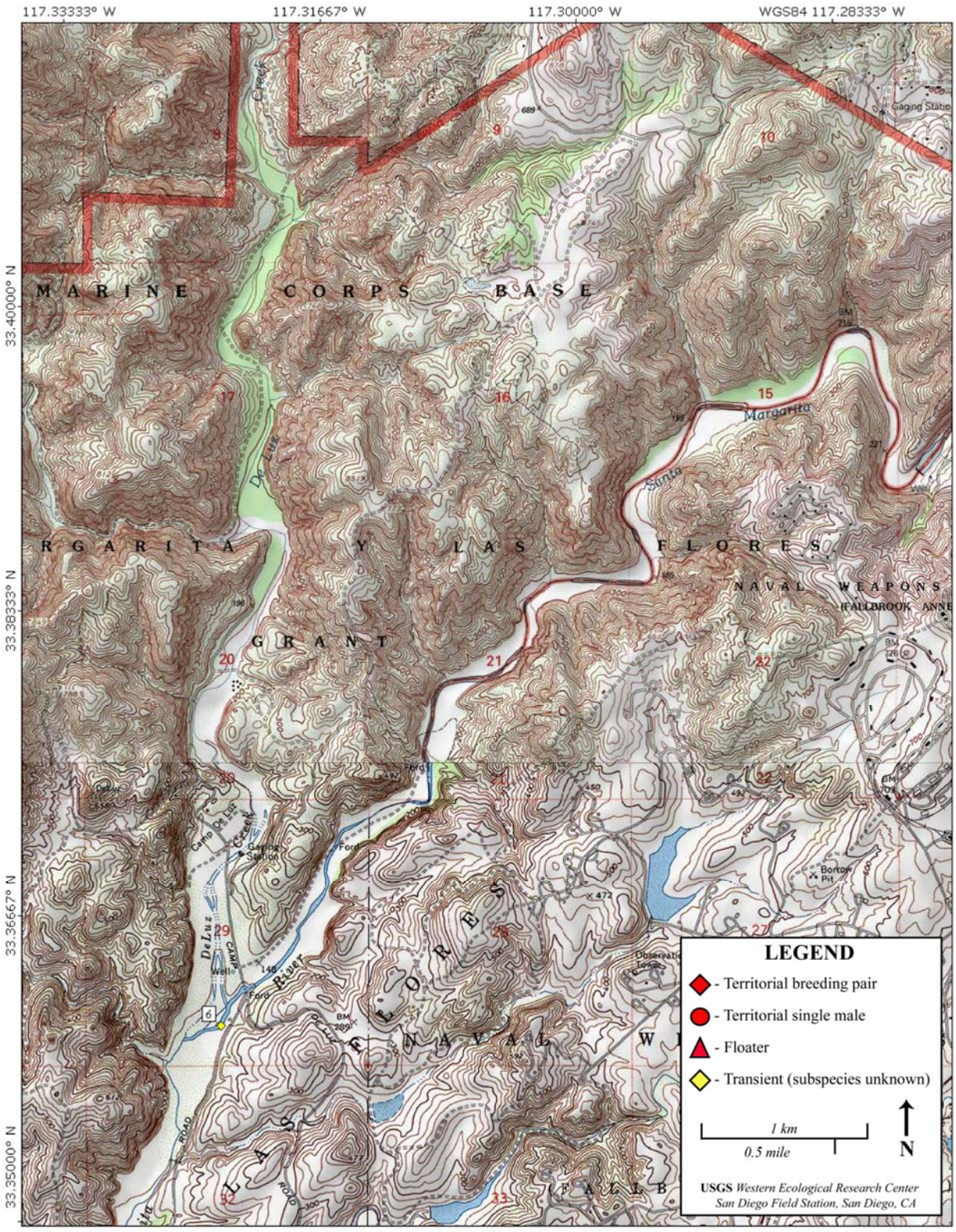

Figure 7. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2003: Santa Margarita River and De Luz Creek

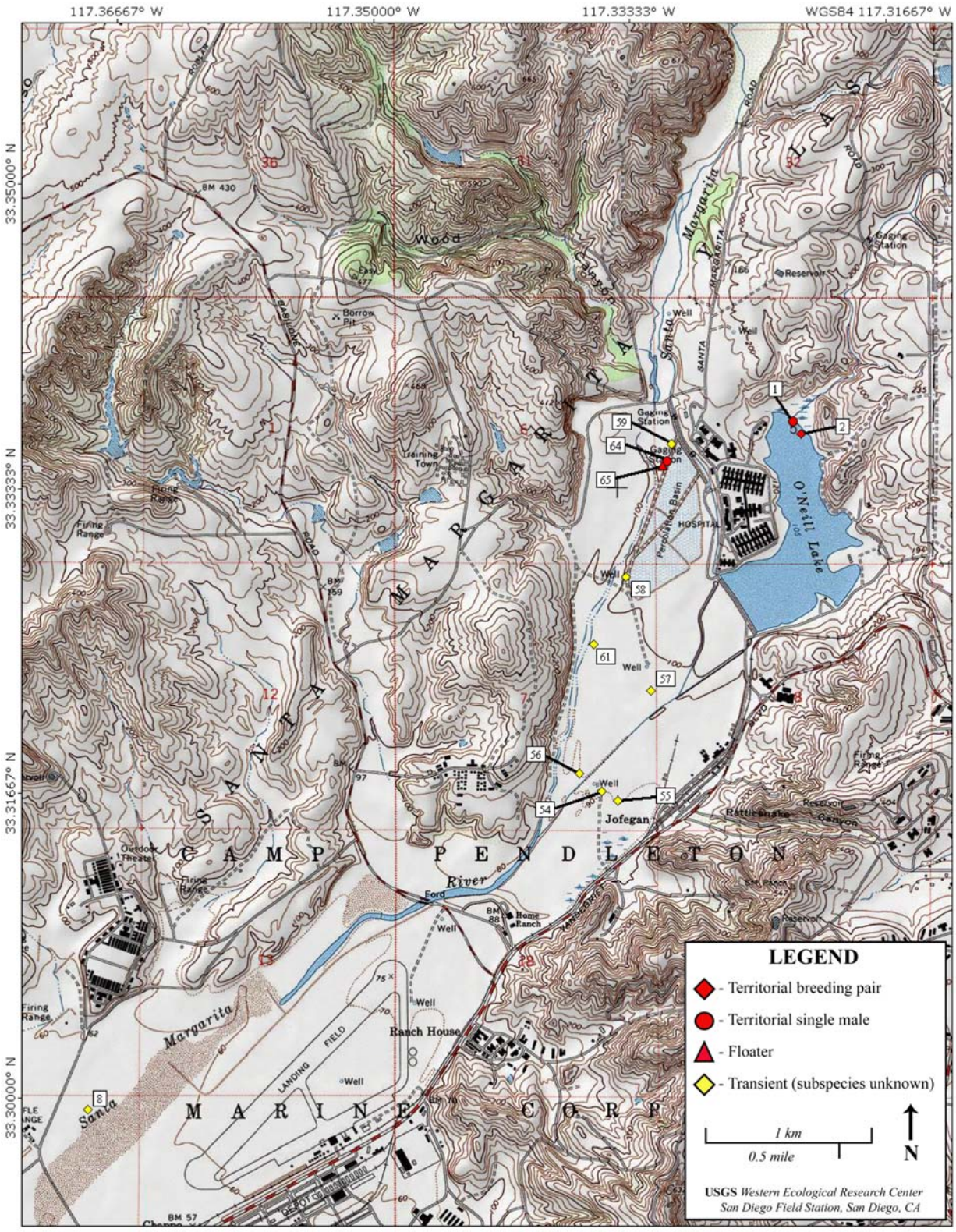

Figure 8. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2003: Santa Margarita River and Fallbrook Creek

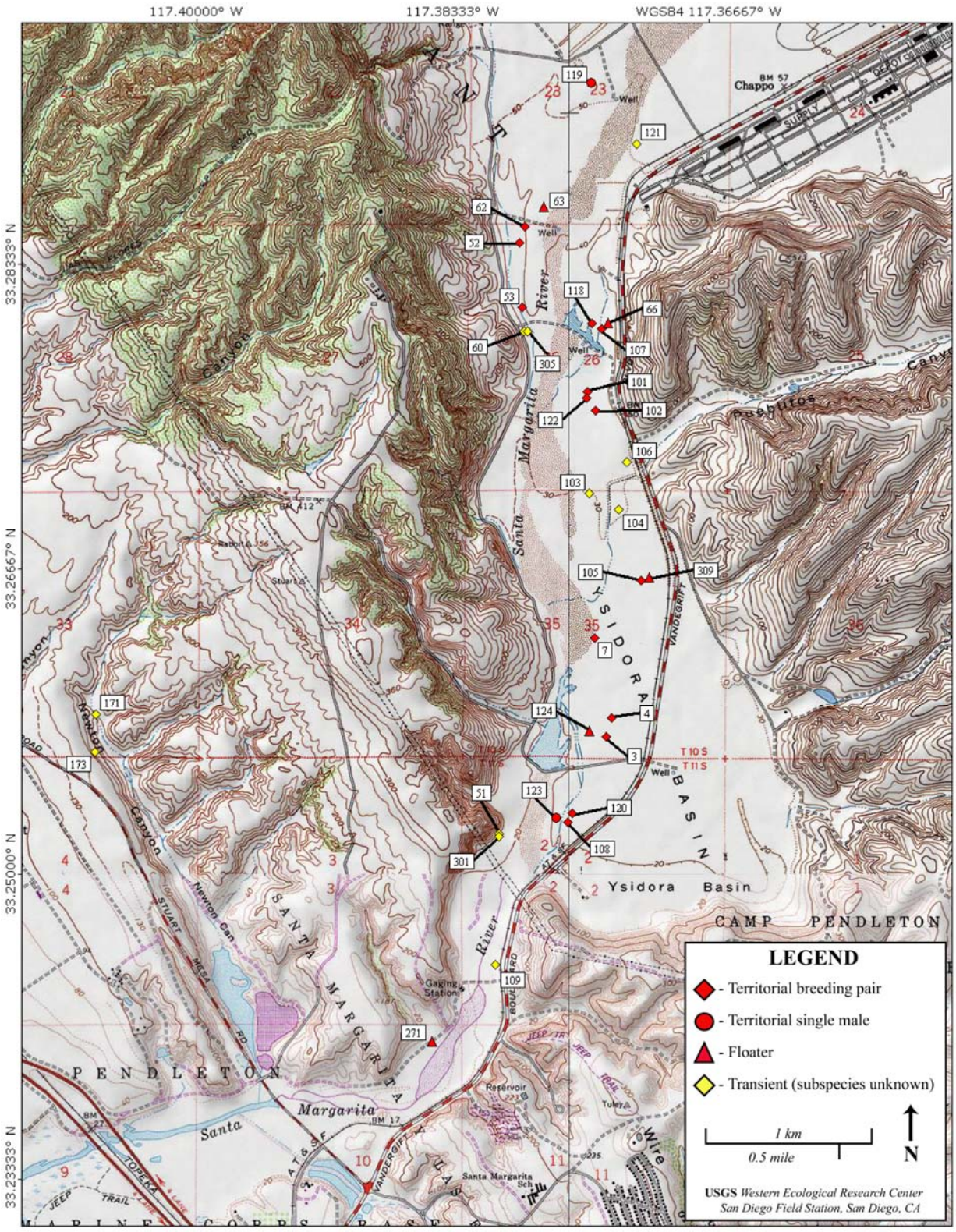

Figure 9. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2003: Santa Margarita River and Newton Canyon

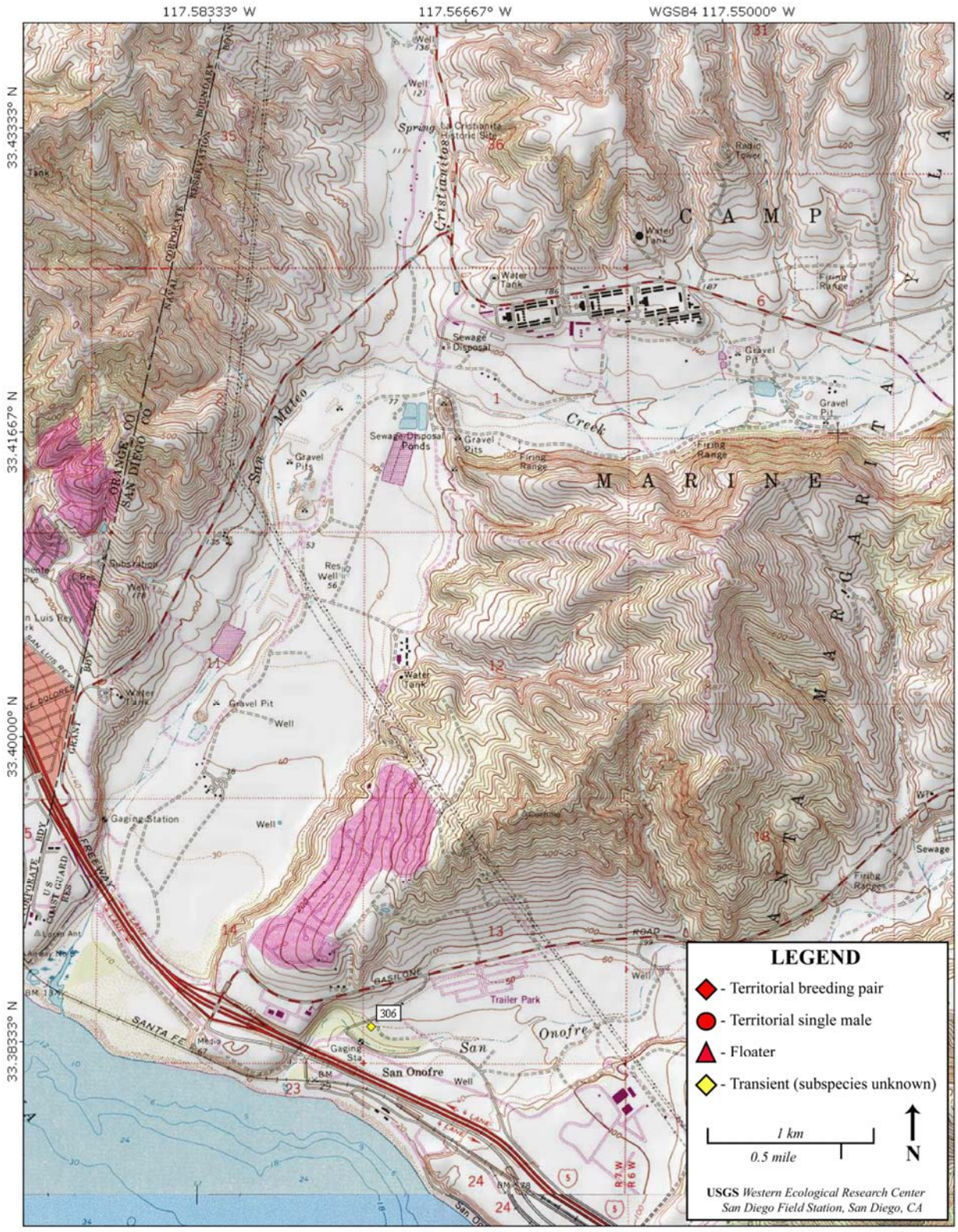

Figure 10. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2003: San Onofre Creek

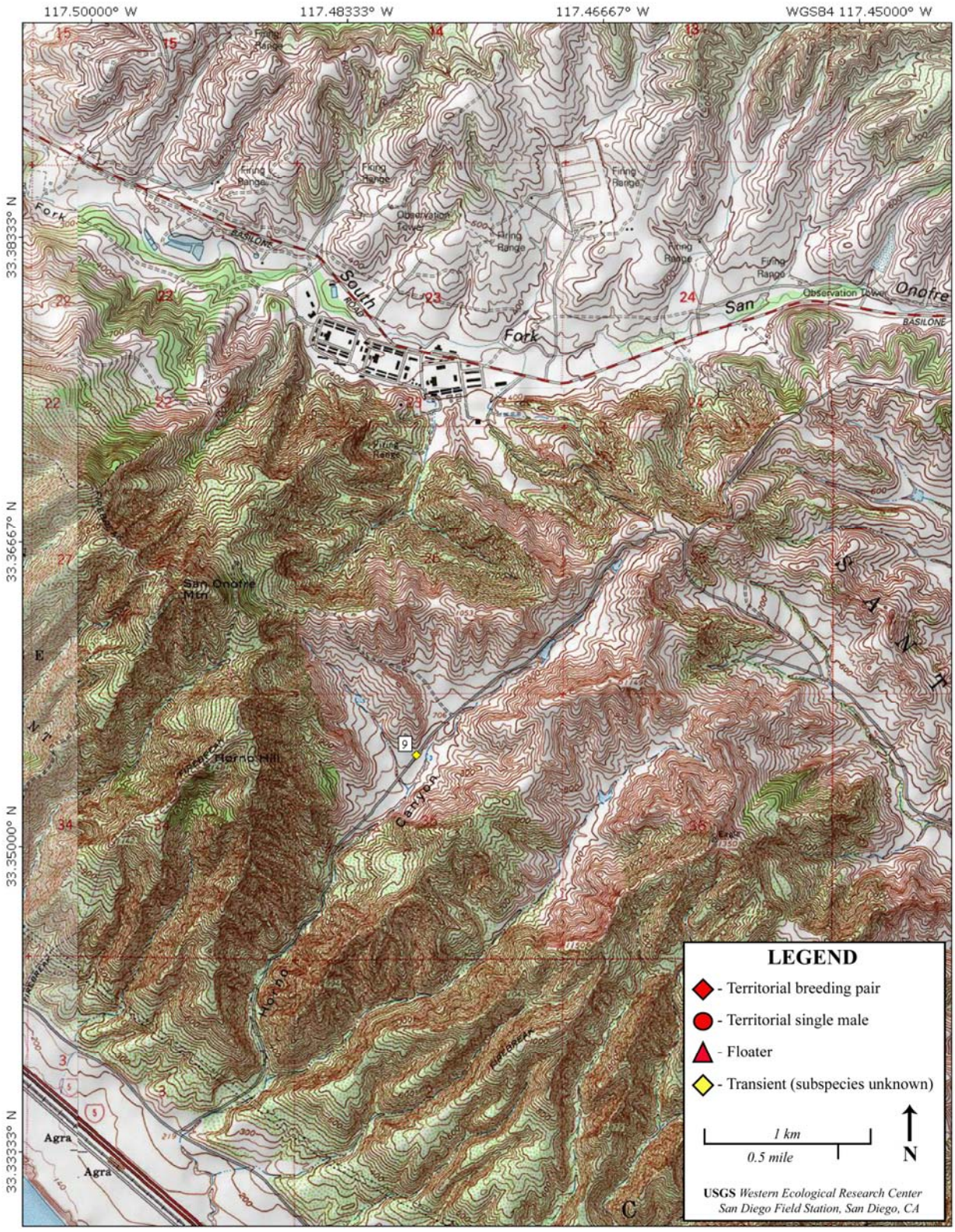

Figure 11. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2003: Horno Canyon

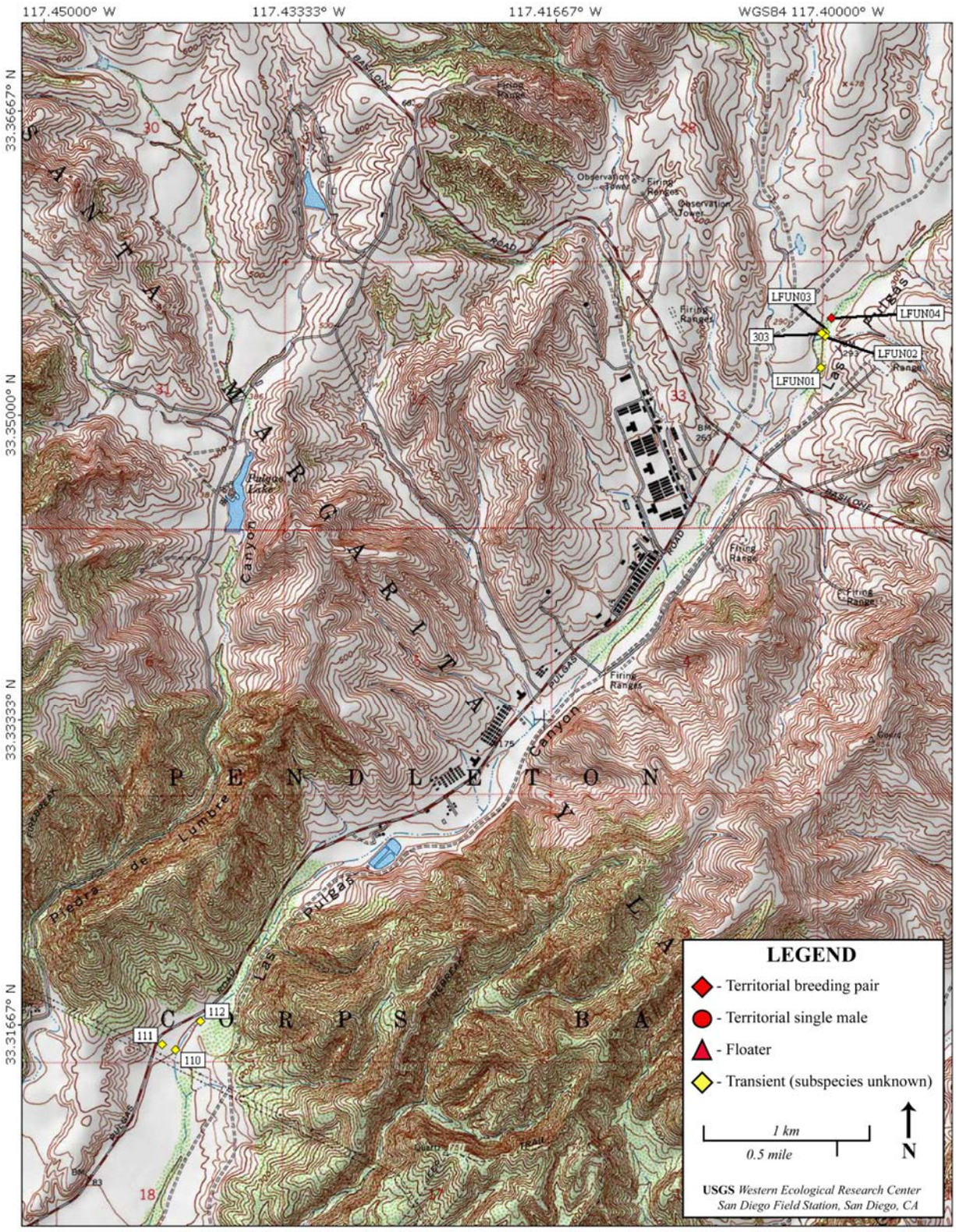

Figure 12. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2003: Las Flores Creek

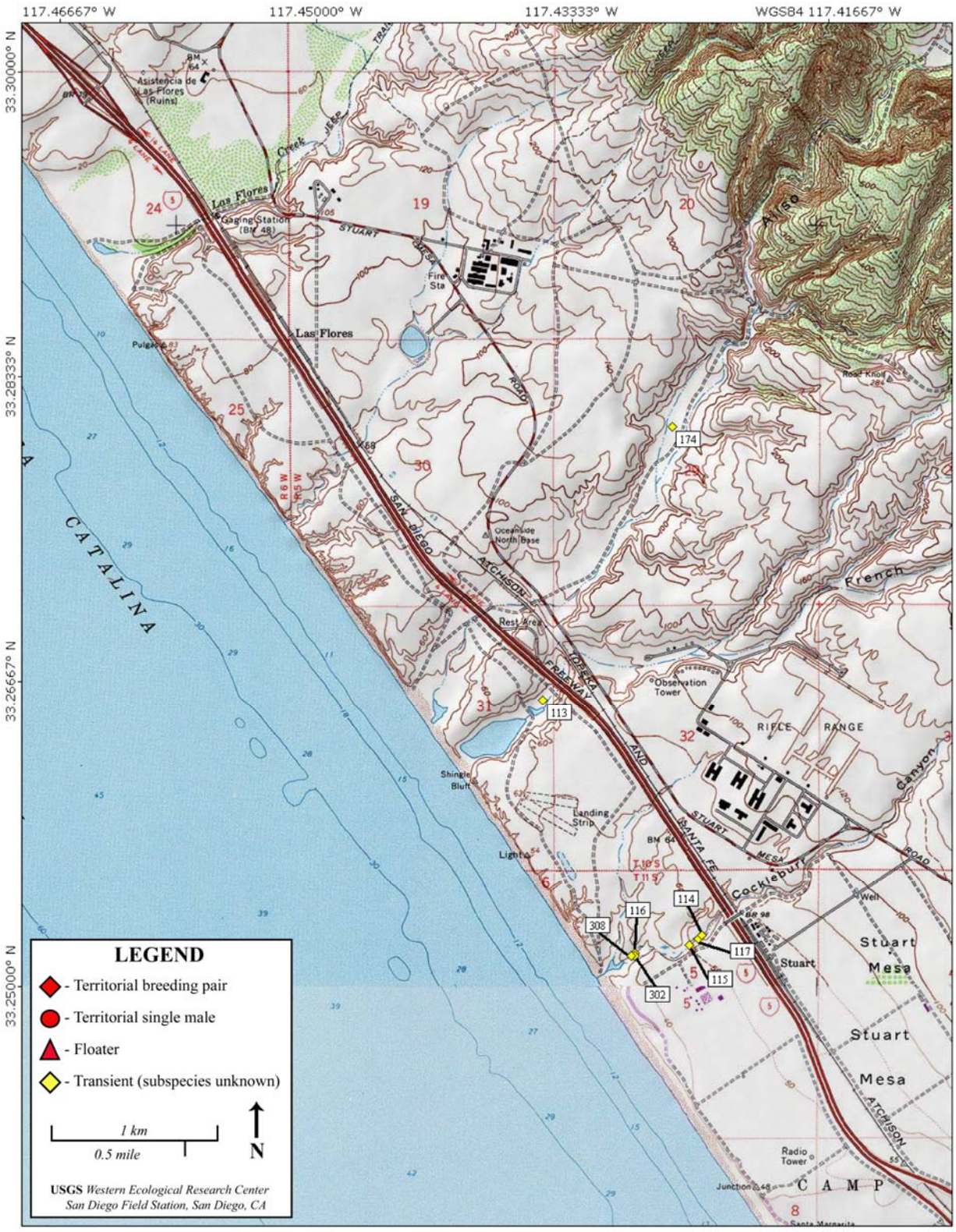

Figure 13. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2003: Aliso Canyon, French Creek, and Cockleburr Canyon

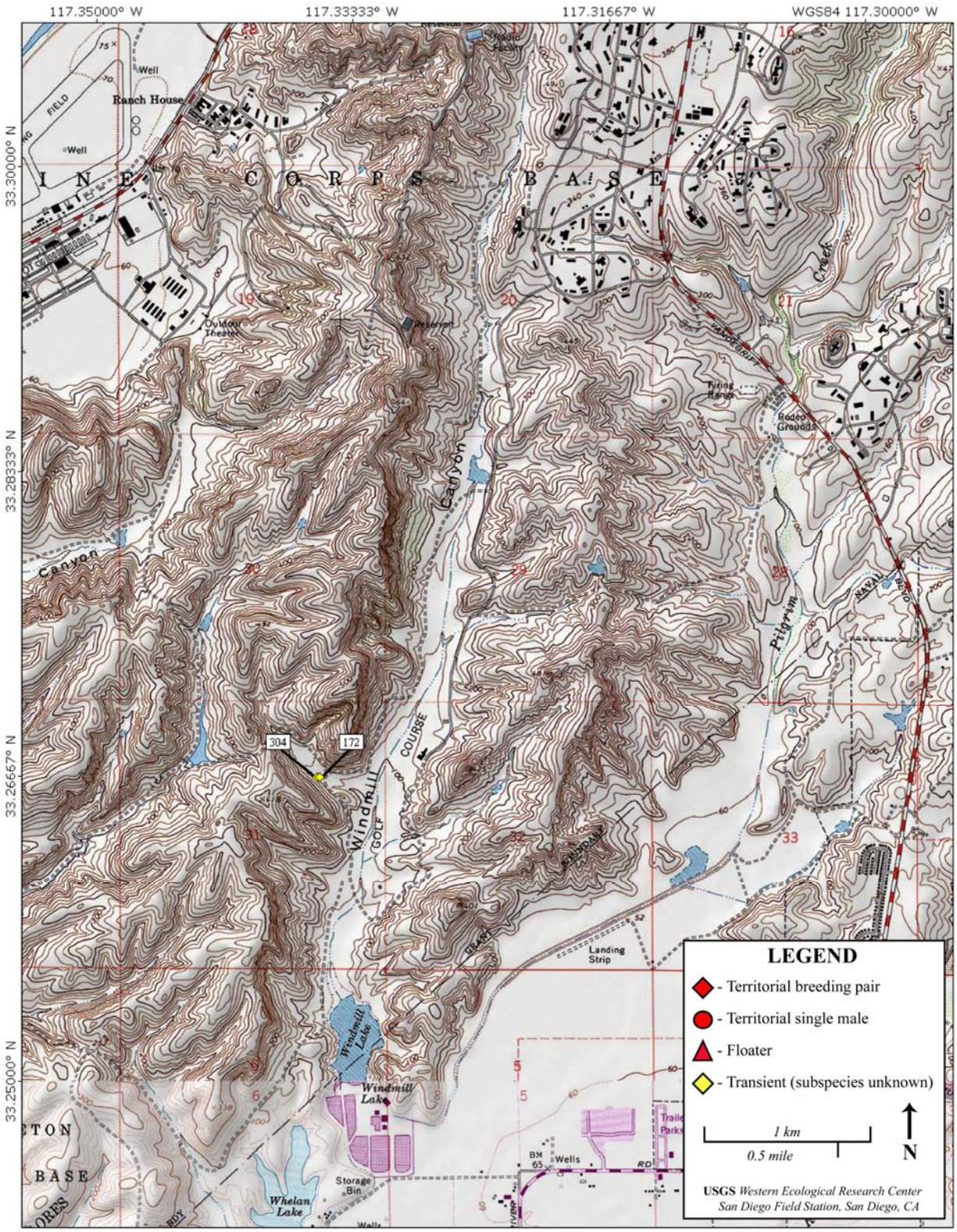

Figure 14. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2003: Windmill Canyon

Residents

Sixteen females, 16 males, and six non-territorial "floater" birds remained throughout the breeding season (Figures 8-9, 12, 15-28). Four of the males were single and 12 were paired. Four of the paired males were polygynous, each pairing with two females, while eight were monogamous, producing a total of 16 pairs. The six floaters, which held no fixed territories, were comprised of one known female, four probable males, and one bird of unknown sex. One of the four probable male floaters was detected in and around Territory 107 consistently during the latter half of July (Figure 20). Observed once, also in mid-July, were another of the probable male floaters near Territory 64 (Figure 16) and the floater of unknown sex near Territories 3 and 4 (Figures 24 and 25). The known female floater (Figure 22) and one of the probable males (Figure 18), both seen once, as well as another probable male floater (Figure 27), seen twice, were all detected in early June. Despite the early detection of these birds, they were determined to be floaters rather than transients by the fact that they had all been banded as residents at Camp Pendleton in previous years.

The majority of territories in 2003 were on the Santa Margarita River. The distribution of resident flycatchers along the Santa Margarita River expanded to include habitat on the west side of the river adjacent to the rifle range on Rifle Range Road (Figure 17). Flycatchers also occupied territories at Lake O'Neill on Fallbrook Creek for the second year in a row, and colonized a new site on Las Flores Creek where a pair was observed breeding approximately one km northeast of where Basilone Road intersects the creek (Figure 28).

Habitat Characteristics

Seventy-six percent (48/63, excluding floater 66 seen within Territory 107 and floater 309 seen within Territory 105; Figures 20 and 22, respectively) of all the flycatcher sightings occurred in habitat classified as mixed willow riparian (Table 1), with a dense understory of blackberry (*Rubus ursinus*), stinging nettles (*Urtica dioica*), or poison hemlock (*Conium maculatum*) often present. Six percent (4/63) of the locations were in willow-sycamore dominated habitats, primarily along San Onofre and Las Flores Creeks. An additional 14% (9/63) of sites were in scrub habitats, while 3% (2/63) were in habitats that were predominantly non-native. While transients used all habitat types, resident flycatchers were found almost exclusively (96%) in mixed willow riparian (20/20 territories, 3/4 floaters, again excluding floaters 66 and 309).

Exotic vegetation was recorded in 89% (56/63) of flycatcher locations, and was the dominant vegetation (% cover of exotics > 50; Table 1) in 20% (11/56) of those sites, with no difference noted between transients and residents in this regard. The most common exotic plants in habitat used by flycatchers were poison hemlock, giant reed, and mustard (*Brassica nigra*).

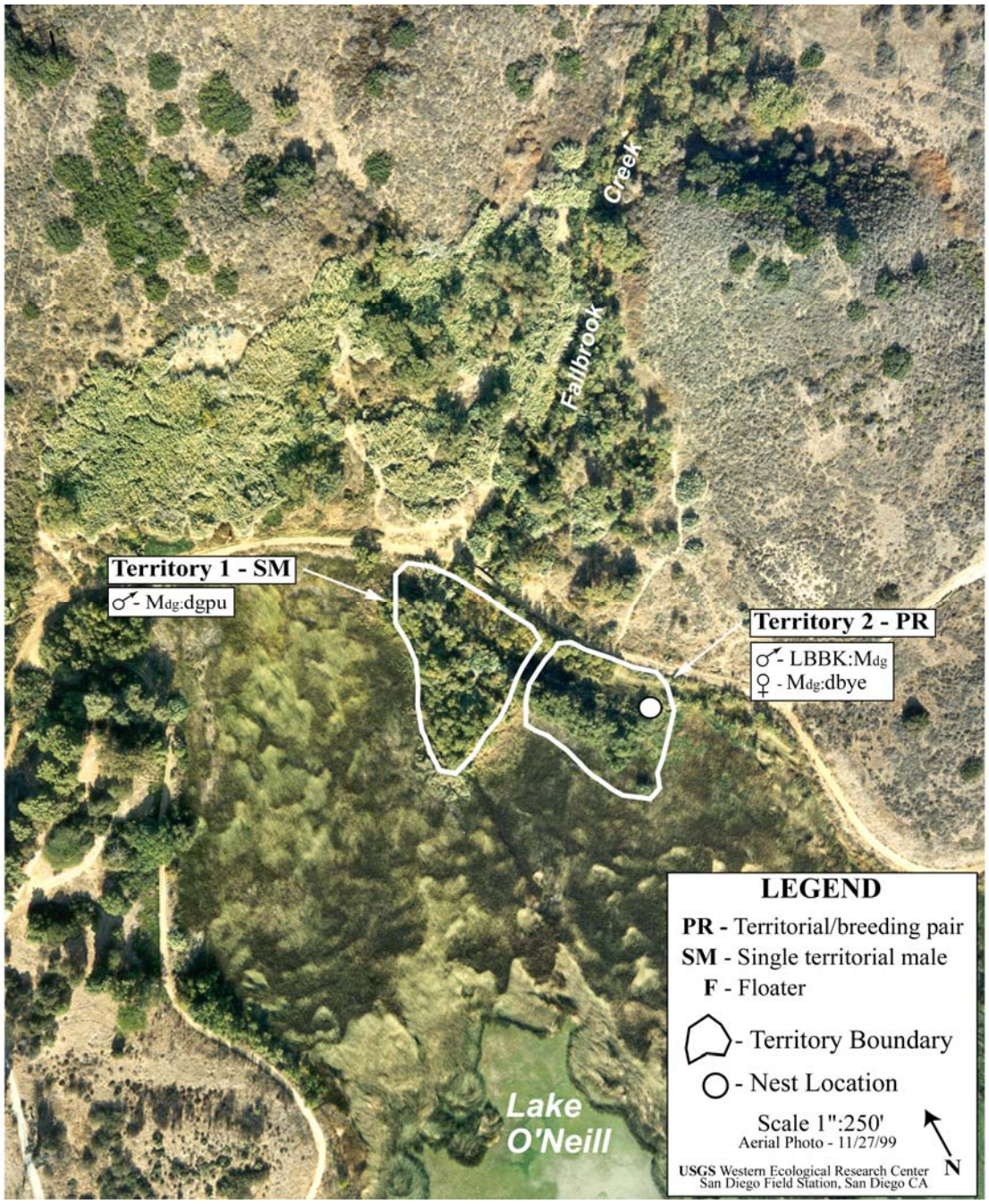

Figure 15. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Lake O'Neill, Fallbrook Creek

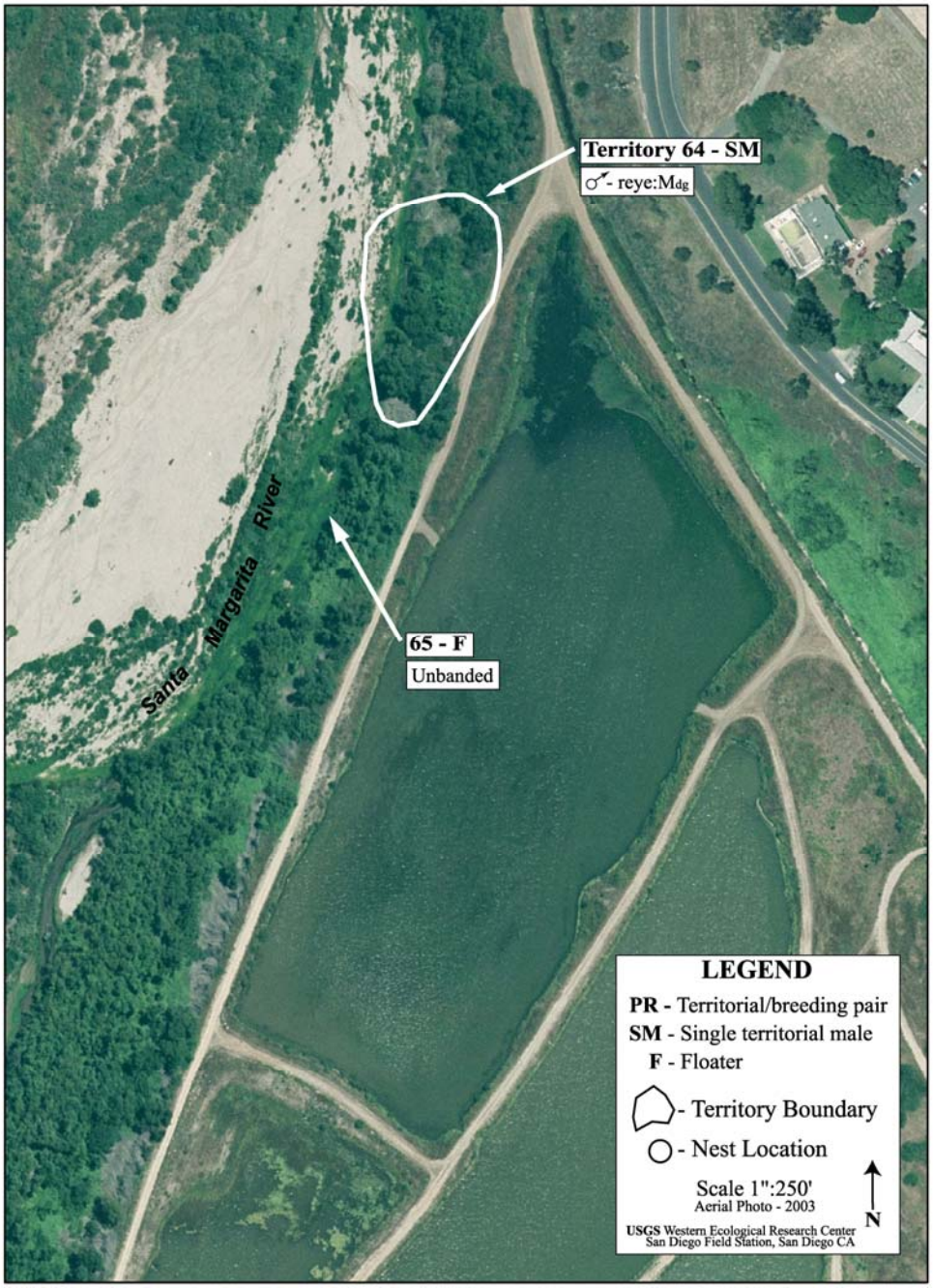

Figure 16. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Below Hospital, Santa Margarita River

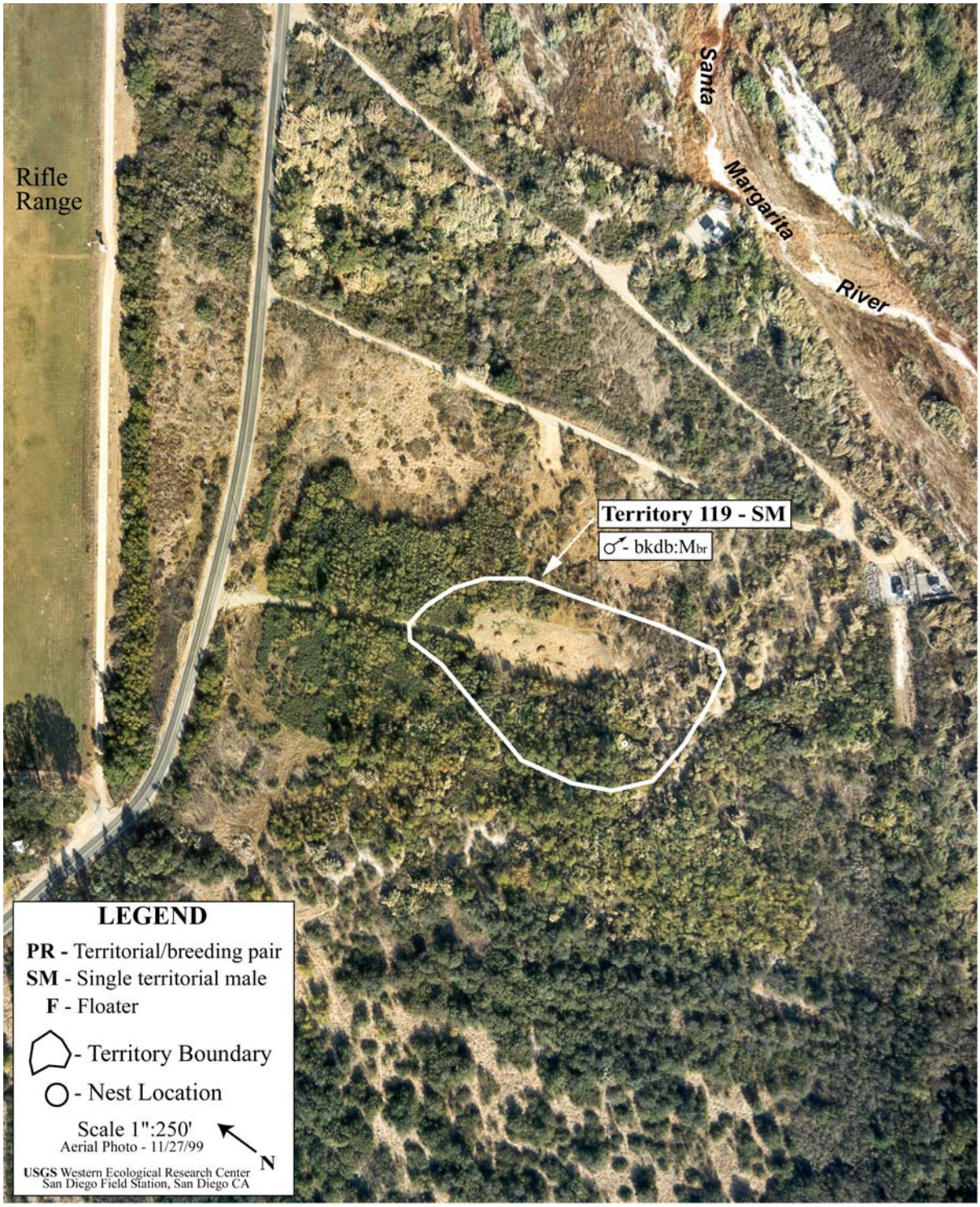

Figure 17. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Rifle Range Area, Santa Margarita River

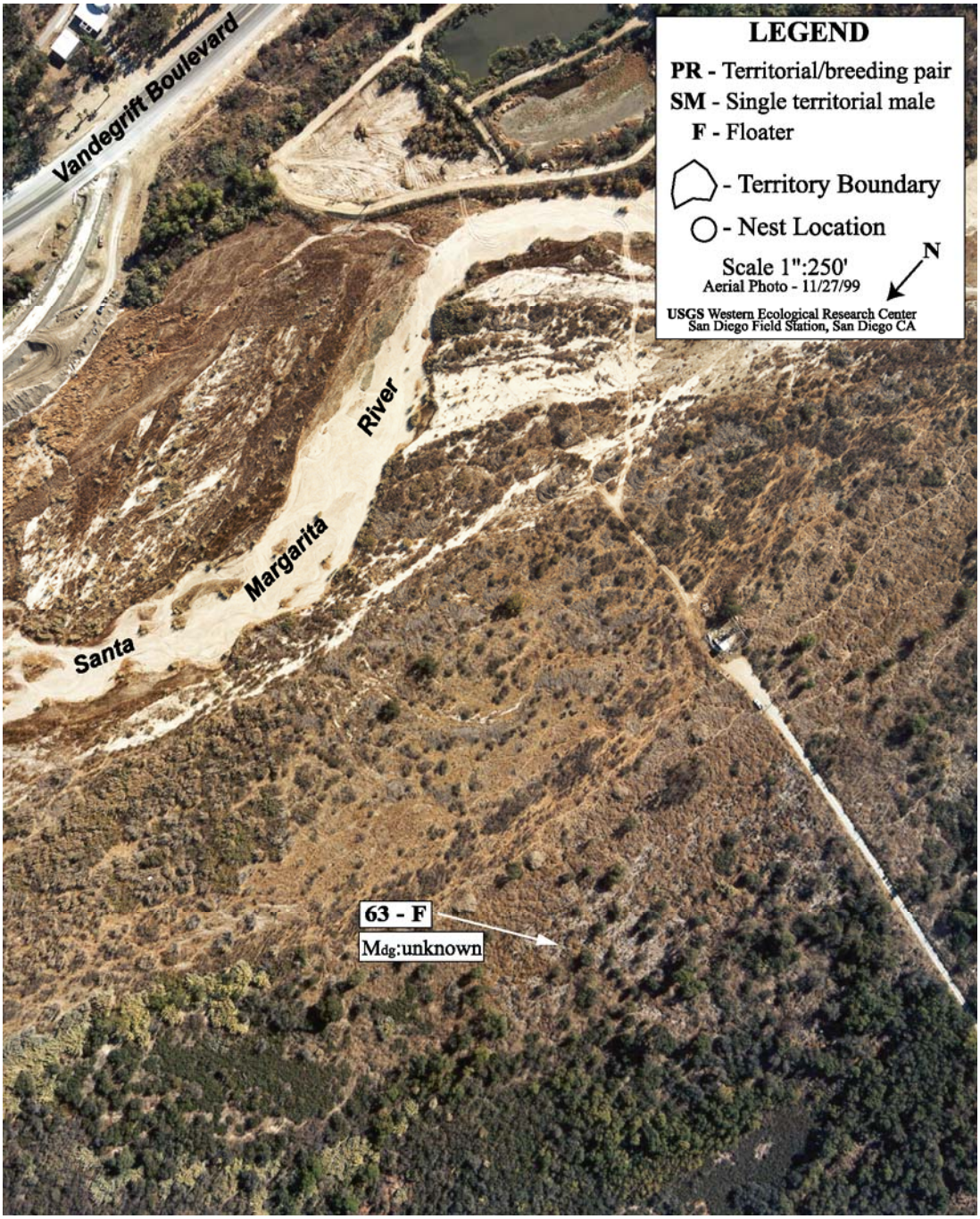

Figure 18. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Above Pump Road, Santa Margarita River

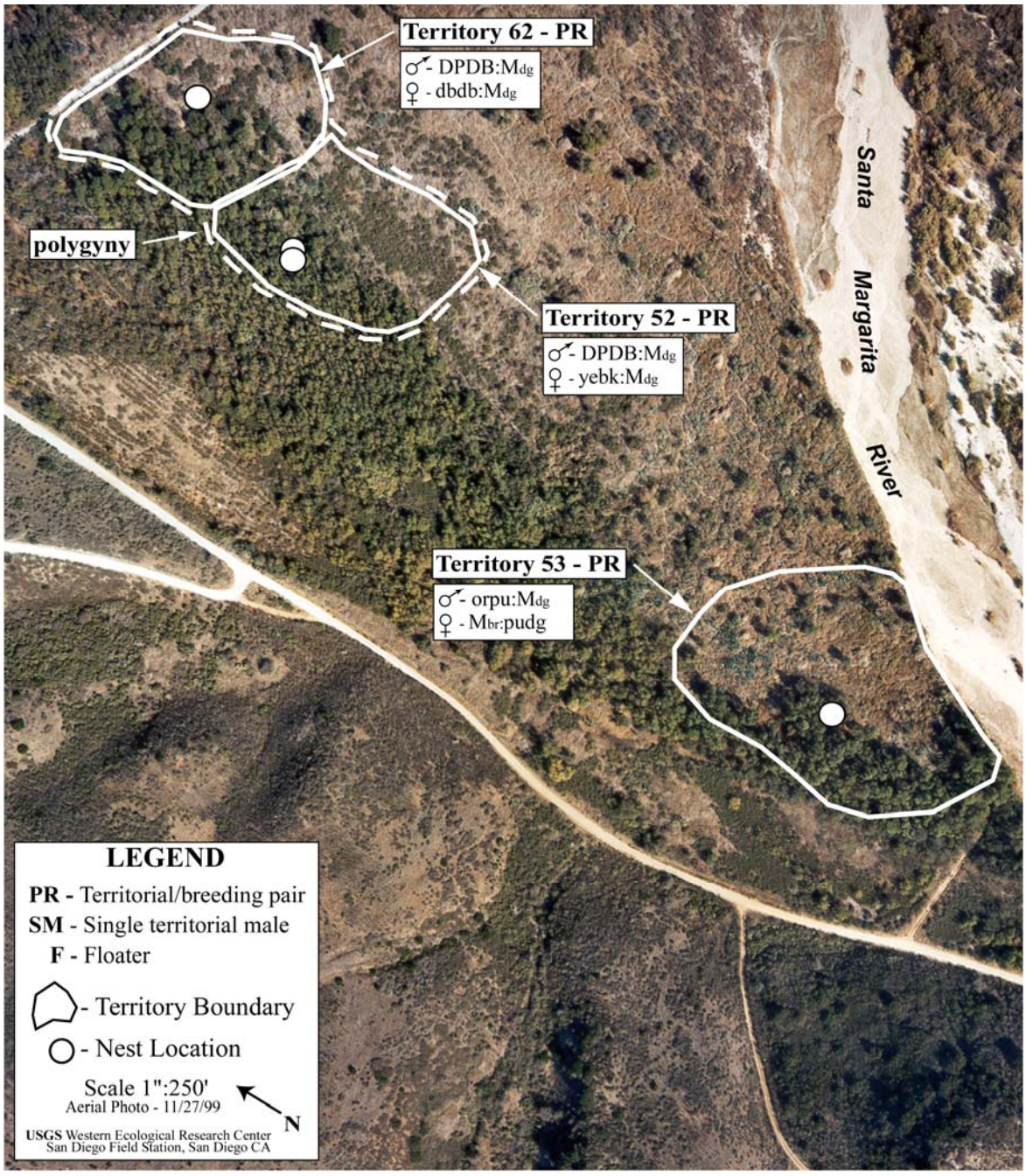

Figure 19. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Pump Road, Santa Margarita River

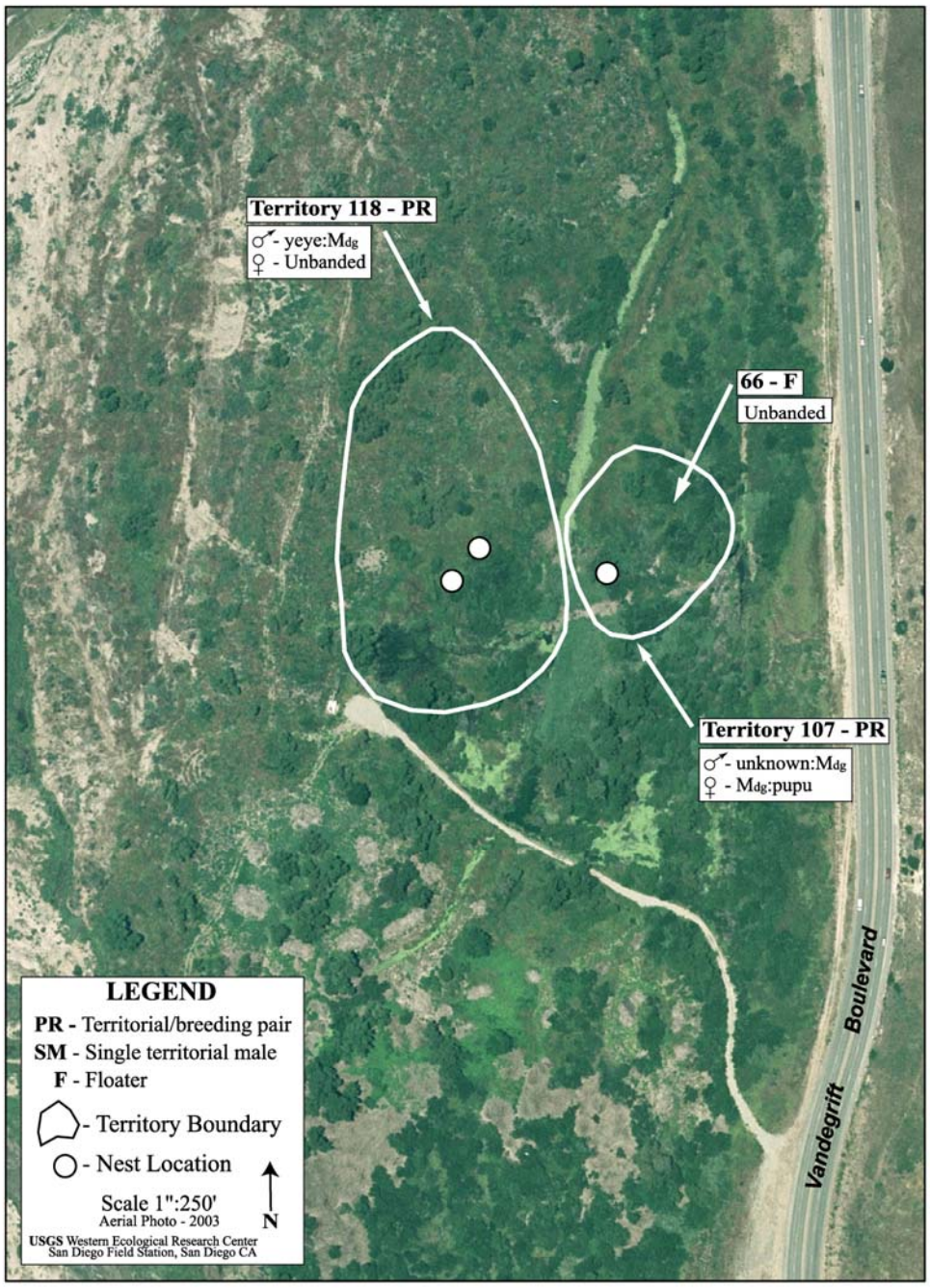

Figure 20. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Above Pueblitos Area, Santa Margarita River

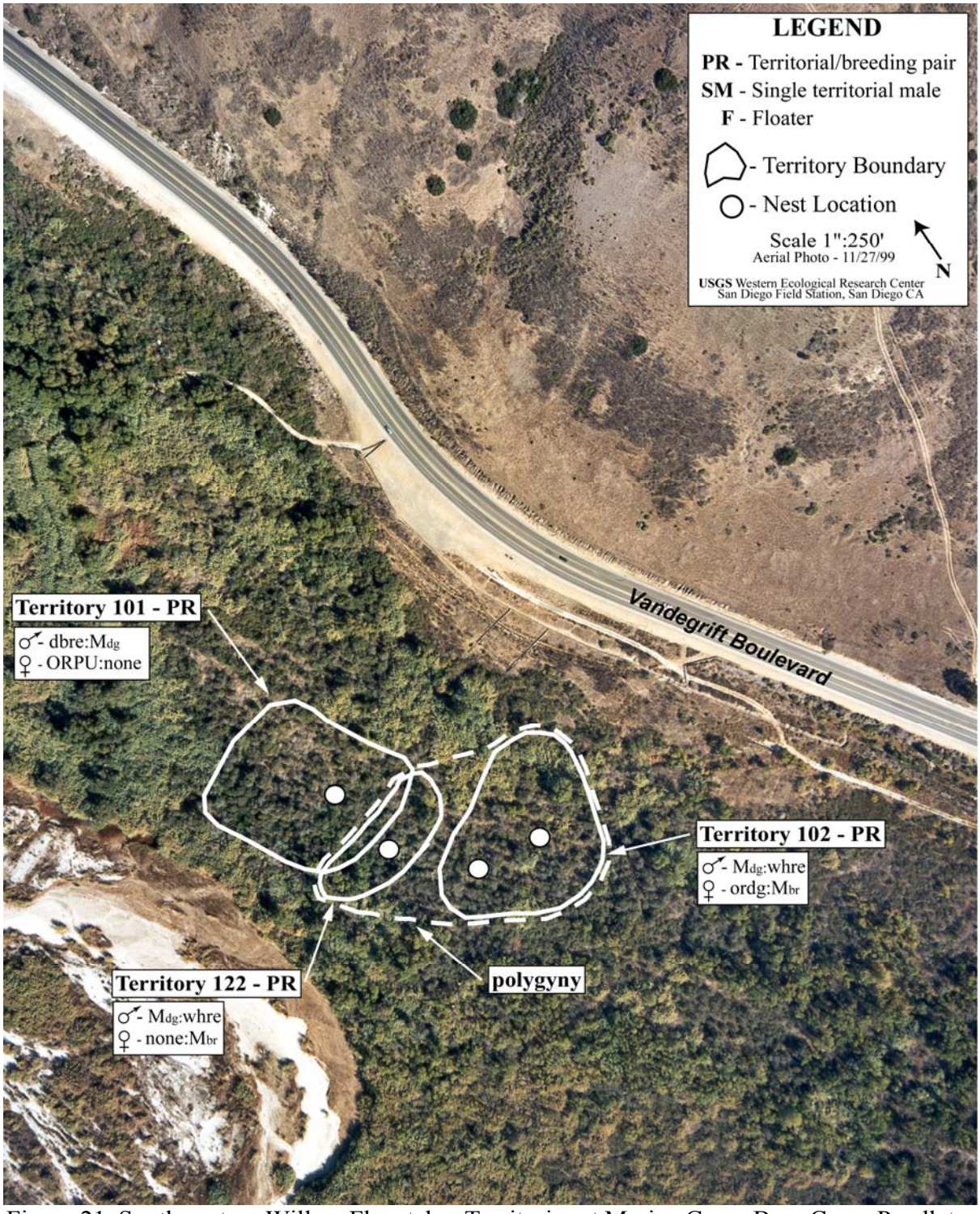

Figure 21. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Pueblitos Area, Santa Margarita River

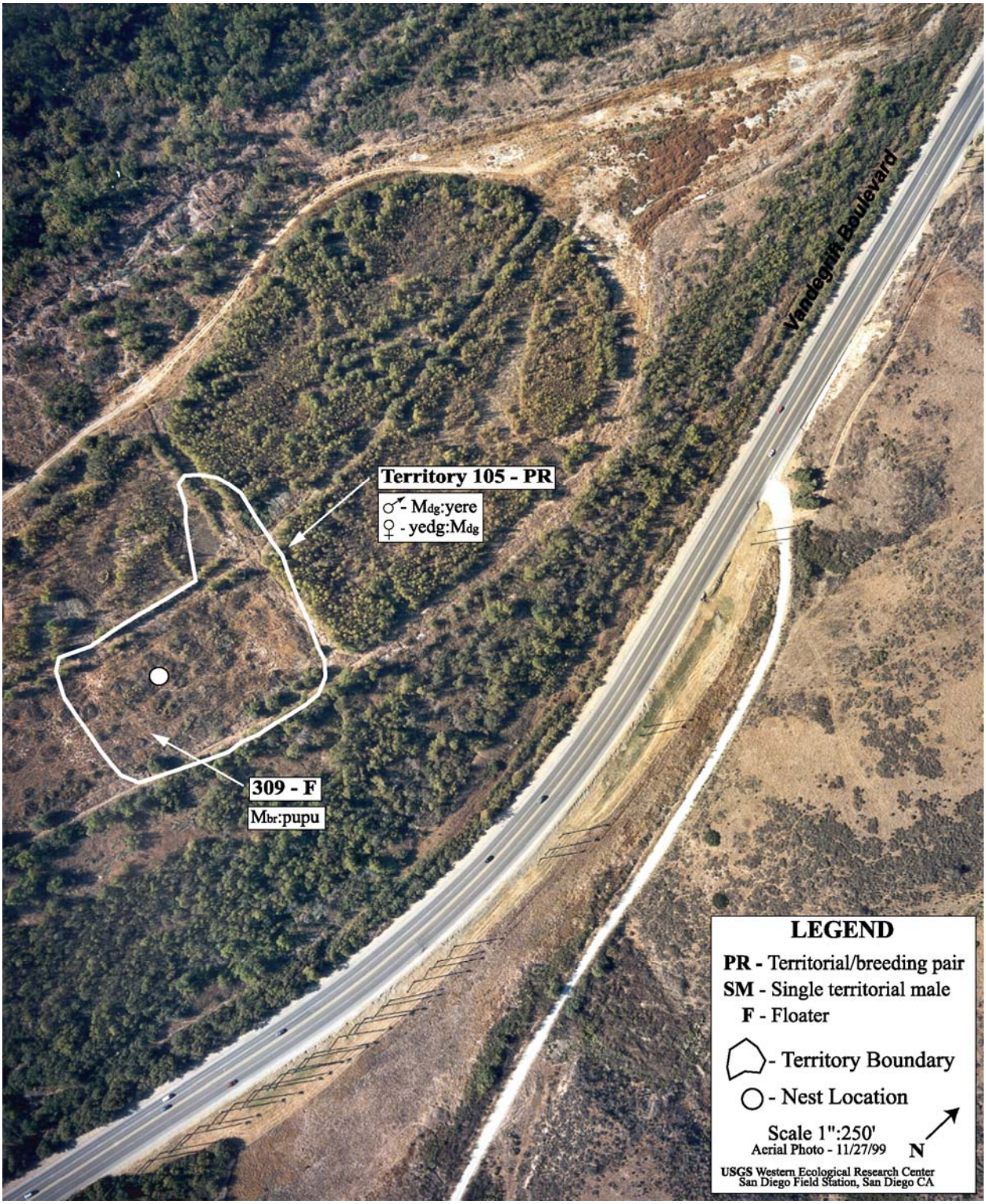

Figure 22. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Northeast Ysidora Basin, Santa Margarita River

Figure 23. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: North Central Ysidora Basin, Santa Margarita River

Figure 24. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: South Central Ysidora Basin, Santa Margarita River

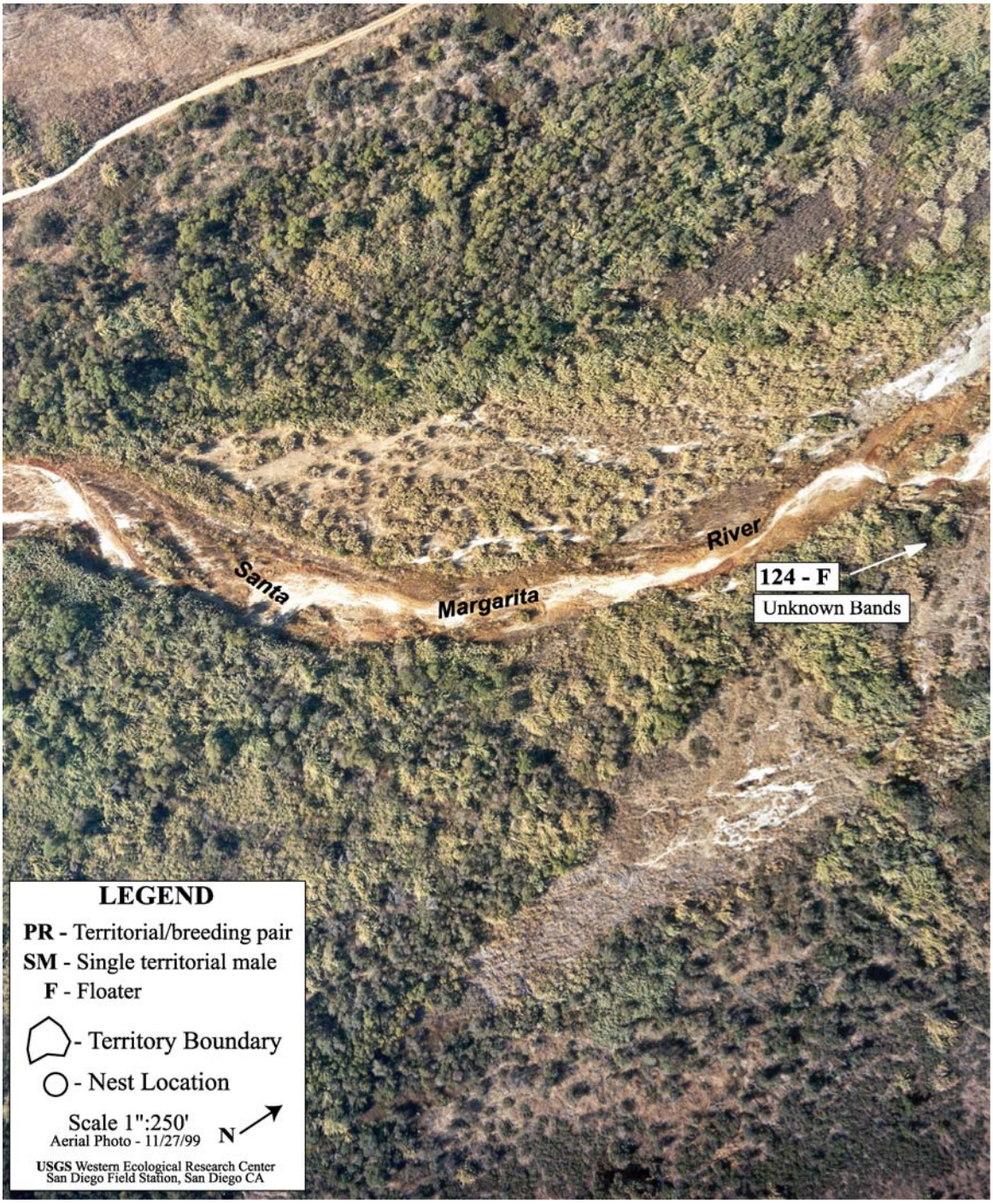

Figure 25. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Southwest Central Ysidora Basin, Santa Margarita River

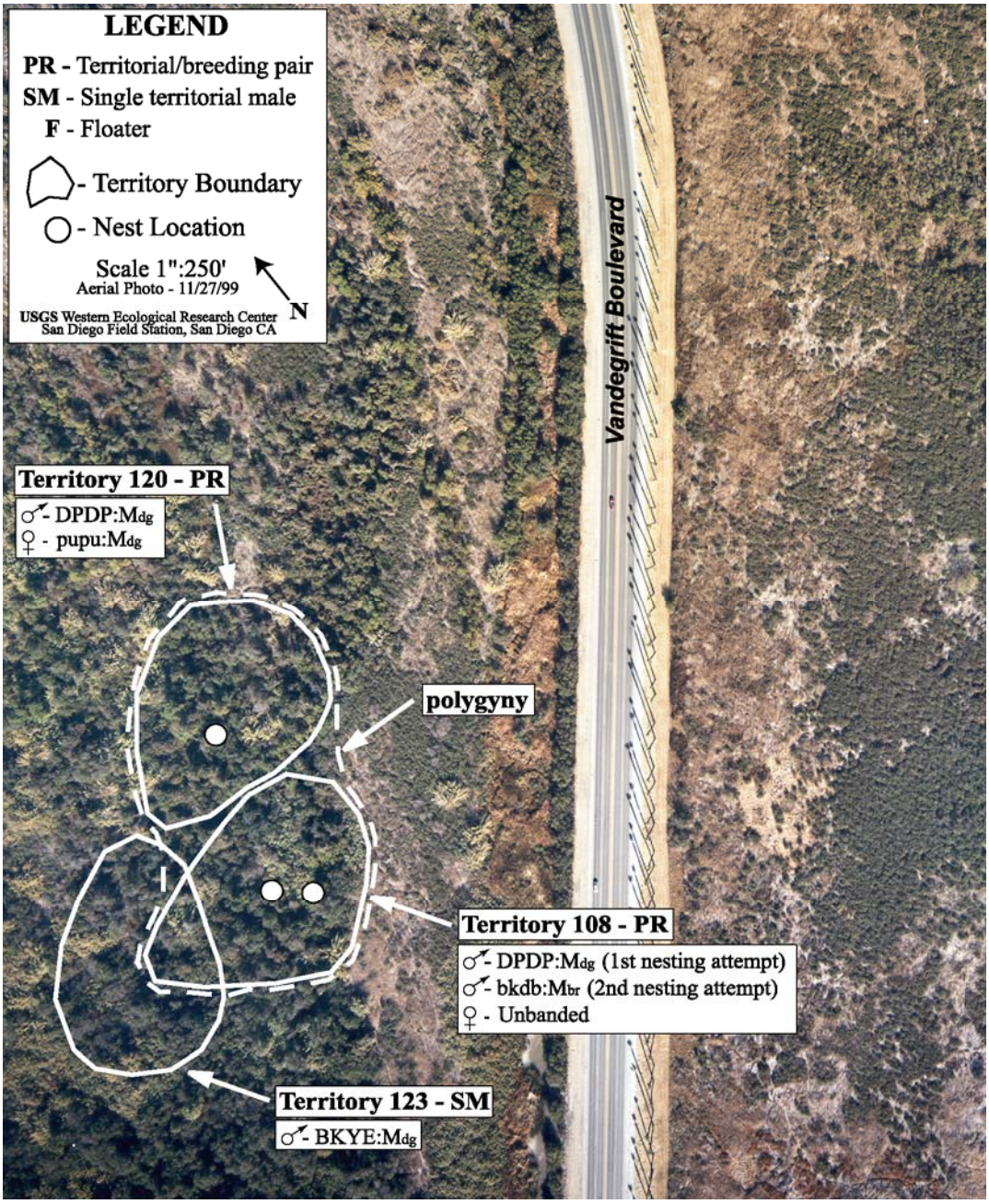

Figure 26. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Southwest Ysidora Basin, Santa Margarita River

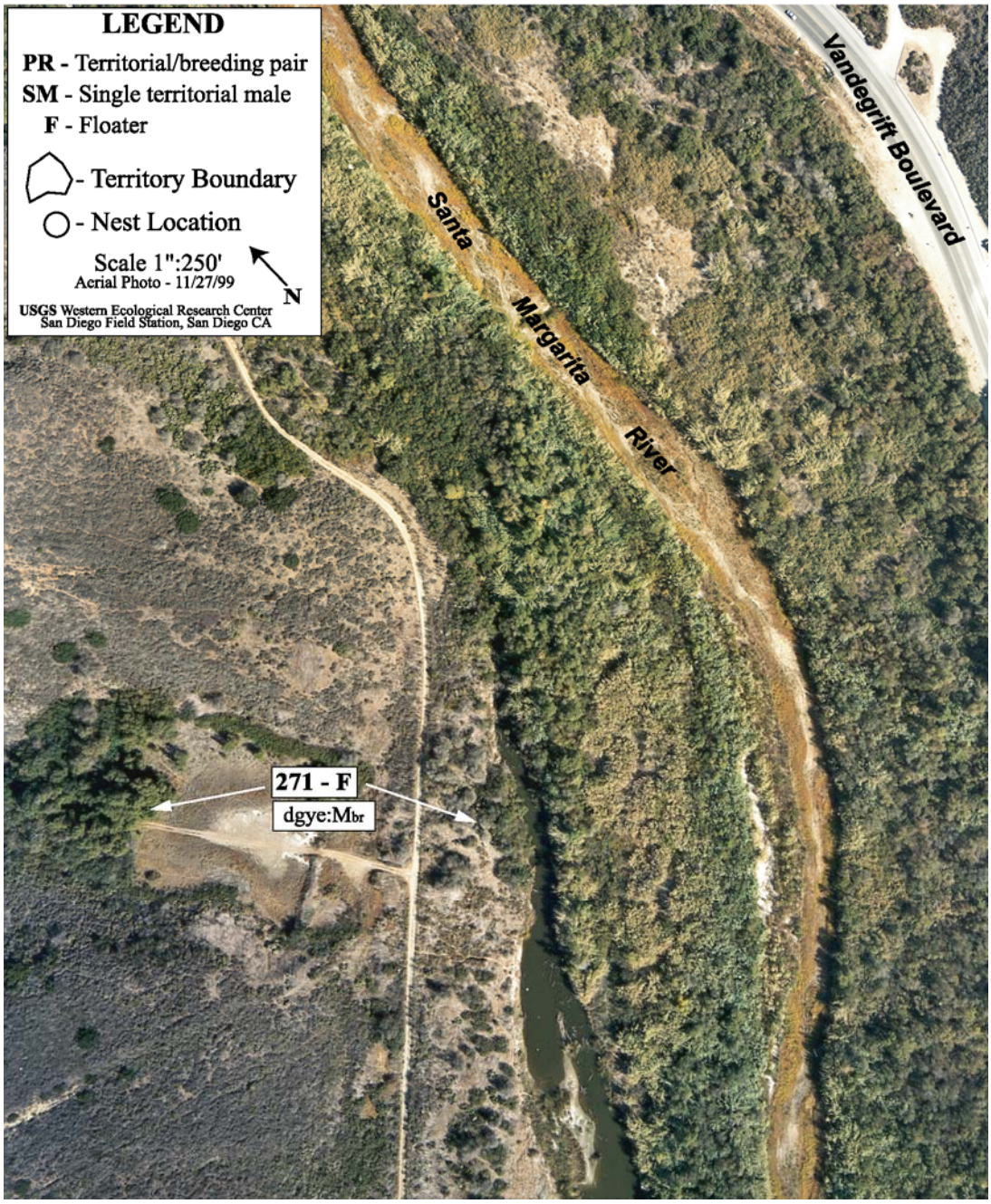

Figure 27. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Below Ysidora, Santa Margarita River

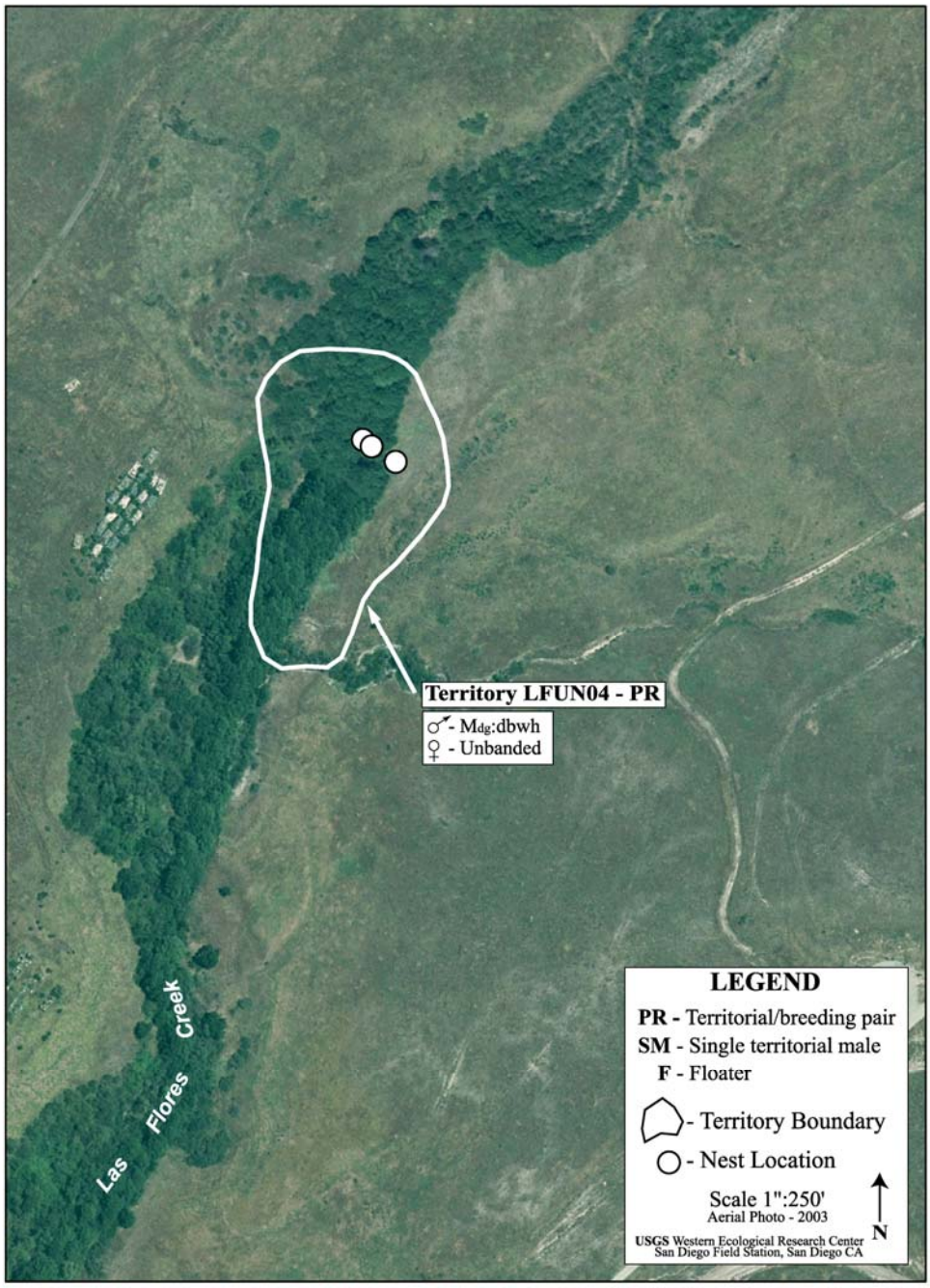

Figure 28. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2003: Above Basilone, Las Flores Creek

Flycatcher locations differed in their proximity to surface water (Table 1). The majority of transients, 68%, were within 75 m of water, while the rest occurred at distances greater than

115 m from it. Eighty percent of resident birds were within 75 m of surface water, and the rest further than 95 m from it. On average, transients were three times as far from surface water as were residents (transients: $\bar{x} = 200 \pm 399$ m (standard deviation here and throughout), residents: $\bar{x} = 63 \pm 92$ m), similar to 2002 (Kus and Kenwood 2003).

Table 1. Habitat characteristics of willow flycatcher locations at Marine Corps Base Camp Pendleton in 2003.

Bird ID	Drainage	Status[a]	Habitat Type	% Cover Exotics[b]	Dominant Exotic[c]	Distance to Surface Water (m)
174	Aliso	T	Riparian scrub	2	BRA, ARU	
114	Cockleburr	T	Mixed willow riparian	1	CON	15
115	Cockleburr	T	Mixed willow riparian	1	CON	0
116	Cockleburr	T	Mixed willow riparian	1	None	0
117	Cockleburr	T	Upland scrub	1	CON	0
302	Cockleburr	T	Mixed willow riparian	1	None	0
308	Cockleburr	T	Mixed willow riparian	1	BRA, ARU	0
1	Fallbrook	S	Mixed willow riparian	2	ARU	0
2	Fallbrook	P	Mixed willow riparian	1	FOE, TAM	0
113	French	T	Mixed willow riparian	1	None	0
9	Horno	T	Riparian scrub	2	FOE	20
110	Las Flores	T	Riparian scrub	2	CON	335
111	Las Flores	T	Willow-sycamore	2	CON	335
112	Las Flores	T	Willow-sycamore	2	CON	75
303	Las Flores	T	Mixed willow riparian	1	None	0
LFUN01	Las Flores	T	Mixed willow riparian	1	BRA	0
LFUN02	Las Flores	T	Mixed willow riparian	1	BRA	0
LFUN03	Las Flores	T	Mixed willow riparian	1	None	0
LFUN04	Las Flores	P	Mixed willow riparian	1	BRA	15
171	Newton	T	Mixed willow riparian	3	CON	1505
173	Newton	T	Upland scrub	3	CON	1330
306	San Onofre	T	Willow-sycamore	2	CON	50
101	Santa Margarita	P	Mixed willow riparian	1	CON	30
102	Santa Margarita	P	Mixed willow riparian	1	CON	95
103	Santa Margarita	T	Mixed willow riparian	1	ARU	250
104	Santa Margarita	T	Mixed willow riparian	2	CON	50
105	Santa Margarita	P	Mixed willow riparian	1	PIC, SIL	10
106	Santa Margarita	T	Mixed willow riparian	2	CON	20
107	Santa Margarita	P	Mixed willow riparian	2	ARU, CON	38
108	Santa Margarita	P	Mixed willow riparian	1	CON	70
109	Santa Margarita	T	Mixed willow riparian	1	CON	54
118	Santa Margarita	P	Mixed willow riparian	2	CON	19
119	Santa Margarita	S	Mixed willow riparian	3	CON	240
120	Santa Margarita	P	Mixed willow riparian	1	CON	65
121	Santa Margarita	T	Mixed willow riparian	1	CON	62
122	Santa Margarita	P	Mixed willow riparian	1	ARU, CON	10
123	Santa Margarita	S	Mixed willow riparian	2	CON	37

Bird ID	Drainage	Status[a]	Habitat Type	% Cover Exotics[b]	Dominant Exotic[c]	Distance to Surface Water (m)
124	Santa Margarita	F	Mixed willow riparian	3	ARU, CON	38
271	Santa Margarita	F	Riparian scrub	3	CON, BRA	60
3	Santa Margarita	P	Mixed willow riparian	2	CON	20
301	Santa Margarita	T	Mixed willow riparian	2	CON	185
305	Santa Margarita	T	Mixed willow riparian	2	CON	5
309	Santa Margarita	F	Mixed willow riparian	2	SIL	0
4	Santa Margarita	P	Mixed willow riparian	2	CON	10
51	Santa Margarita	T	Mixed willow riparian	2	CON	185
52	Santa Margarita	P	Mixed willow riparian	2	CON	20
53	Santa Margarita	P	Mixed willow riparian	2	CON	20
54	Santa Margarita	T	Riparian scrub	1	CON	140
55	Santa Margarita	T	Mixed willow riparian	1	CON	232
56	Santa Margarita	T	Riparian scrub	3	BRA, CON	36
57	Santa Margarita	T	Mixed willow riparian	2	BRA	115
58	Santa Margarita	T	Mixed willow riparian	1	BRA	0
59	Santa Margarita	T	Mixed willow riparian	2	CON, BRA	60
6	Santa Margarita	T	Willow-sycamore	1	CON	30
60	Santa Margarita	T	Mixed willow riparian	2	CON	5
61	Santa Margarita	T	Riparian scrub	1		75
62	Santa Margarita	P	Mixed willow riparian	3	CON	340
63	Santa Margarita	F	Mixed willow riparian	3	CON	275
64	Santa Margarita	S	Mixed willow riparian	2	CON	0
65	Santa Margarita	F	Mixed willow riparian	1	None	0
66	Santa Margarita	F	Mixed willow riparian	2	ARU, CON	30
7	Santa Margarita	P	Mixed willow riparian	2	CON	100
8	Santa Margarita	T	Mixed willow riparian	3	ARU	30
172	Windmill	T	Non-native	4	BRA, ARU	1204
304	Windmill	T	Non-native	4	BRA, SIL	1204

[a] T = transient, P = breeding pair, S = single resident male, F = floater resident bird.
[b] 1 = <5%, 2 = 5-50%, 3 = 50-95%, 4 = >95%.
[c] BRA = *Brassica nigra*, ARU = *Arundo donax*, CON = *Conium maculatum*, FOE = *Foeniculum vulgare*, TAM = *Tamarix sp.*, PIC = *Picris echioides*, SIL = *Silybum sp.*

Breeding Activities

Nesting was observed for all of the 16 pairs (Table 2). The earliest confirmed lay date was 27 May, and the latest was 24 July. Sixty-nine percent (11/16) of pairs had initiated nesting by 10 June, and 94% (15/16) had initiated by 30 June. Only one pair (6%) initiated nesting later than this, on 4 July. Eight pairs attempted more than one nest. Of these, three pairs attempted a second nest after an unsuccessful initial nest, four attempted a second nest after a successful initial nest (with three pairs double-brooding), and one pair attempted three nests (the first and third of which were successful). Nesting continued through August, with the last young fledged on 20 August. Eighty-one percent of pairs (13/16) fledged at least one young by the end of the season.

A total of 25 nests were located and monitored. Seventeen nests (68%) were successful, fledging 2-4 young each. Eight nests (32%) failed to fledge young. Six of the unsuccessful nests were depredated, half during the egg stage and half during the nestling stage. Two nests were abandoned after only one egg was laid. In both of these instances (Pairs 102 and LFUN04, Table 2), the pairs renested and successfully fledged young.

Clutch size, estimated from 18 nests containing full clutches, averaged 3.3 ± 0.6 eggs. Forty-eight fledglings were produced, yielding an estimate of seasonal productivity of 3.0 young per pair (48 young/16 pairs).

Table 2. Nesting activity of southwestern willow flycatcher pairs at Marine Corps Base Camp Pendleton in 2003.

Pair ID	Lay Date	# Eggs	# Nestlings	# Fledglings	Comments
101	10 June	3	0	0	Depredated.
102	5 June[a]	1	0	0	Nest abandoned after only 1 egg laid.
	16 June	4	4	3	1 nestling disappeared.
105	30 June	3	3	3	
107	4 June	4	4	4	
108	1 June	3	2	2	1 egg damaged (hole in side) and removed.
	13 July	3	2	2	1 egg did not hatch after ≥17 days (disappeared during nestling stage).
118	1 June	4	3	3	1 egg did not hatch after ≥21 days.
	10 July	3	3	3	
120	7 June[a]	2+[b]	2	2	Nest found at nestling stage.
122	25 June[a]	2	0	0	Depredated.
2	27 May	4	4	4	
3	10 June	3	1	0	2 eggs disappeared; depredated.
	4 July[a]	3+[b]	3	3	Nest found at nestling stage.
4	9 June	4	2	2	2 eggs did not hatch after ≥20 days (1 disappeared during nestling stage and 1 found on ground under nest).
	19 July	3	2	0	1 egg did not hatch after ≥15 days; depredated.
52	6 June	3	3	3	
	16 July	3	2	2	1 egg did not hatch after ≥20 days.
53	4 July[a]	3	0	0	Depredated.
62	2 June	4	3	3	1 egg did not hatch after ≥22 days.
7	28 May[a]	3+[b]	3	0	Nest contents not seen until nestling stage; depredated.
	24 June	4	4	4	
LFUN04	18 June[a]	3+[c]	3+[c]	3	Nest found at fledgling stage.
	20 July[a]	1	0	0	Nest abandoned after only 1 egg laid.
	24 July	3	2	2	1 egg did not hatch after ≥21 days.

[a] Date estimated.
[b] Minimum number, nest contents not seen during egg stage.
[c] Minimum number, based on number of fledglings observed.

Nest Site Characteristics

Flycatchers placed nests in ten species of plants (Table 3), including black willow *(S. gooddingii*), arroyo willow (*S. lasiolepis*), sand bar willow (*S. exigua*), mule fat, stinging nettle, tamarisk, poison hemlock, wild rose, coast live oak, and wild grape (*Vitis girdiana*). The majority of nests (84%) were placed in native species: 40% (10/25) in willows, 20% (5/25) in stinging nettle, 8% (2/25) in both mule fat and wild grape, and 4% (1/25) in both wild rose and coast live oak. Sixteen percent of nests were placed in exotic species: 12% (3/25) in poison hemlock, and 4% (1/25) in tamarisk. Nest height averaged 1.7 $\pm$ 0.6m (N = 25), while host height averaged 5.1 $\pm$ 2.7m (N = 25).

Table 3. Nest site characteristics of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in 2003.

Pair ID	Host Species	Host Height (m)	Nest Height (m)
101	*Salix lasiolepis*	6.2	1.0
102	*Urtica californica*	3.1	2.0
102	*Salix lasiolepis*	5.4	1.6
105	*Salix exigua*	4.0	3.0
107	*Urtica californica*	2.8	1.6
108	*Salix lasiolepis*	4.7	1.8
108	*Tamarix ramosissima*	3.8	2.1
118	*Conium maculatum*	2.6	1.4
118	*Salix lasiolepis*	6.5	1.6
120	*Rosa californica*	1.96	1.5
122	*Salix lasiolepis*	12.0	2.5
2	*Salix gooddingii*	10.0	1.0
3	*Quercus agrifolia*	6.6	2.1
3	*Baccharis salicifolia*	2.4	1.7
4	*Salix gooddingii*	12.0	1.1
4	*Baccharis salicifolia*	3.3	3.0
52	*Urtica californica*	4.2	1.3
52	*Salix lasiolepis*	6.5	1.2
53	*Urtica californica*	3.5	1.8
62	*Conium maculatum*	3.4	1.8
7	*Conium maculatum*	3.4	2.1
7	*Salix lasiolepis*	5.0	2.2
LFUN04	*Urtica californica*	3.0	1.4
LFUN04	*Vitis girdiana*	5.5	0.9
LFUN04	*Vitis girdiana*	5.5	1.3

Cowbird Parasitism

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

Banded Birds

All 16 territorial males, all 16 territorial females, and five of the six floaters were observed closely enough to determine with confidence whether they were color banded (Table 4). Ten of the males (63%), 11 females (69%), and three floaters (50%) were birds banded in previous years. Three of the banded birds were second year birds, banded as nestlings in 2002. These three birds represent 27% of the 11 nestlings and hatching year birds banded in 2002. Of the remaining 21 birds, three were not identified to individual because only partial band combinations were obtained, but at least two of these birds were known by their color bands to be older than second year birds banded at Camp Pendleton or the San Luis Rey River (Kus unpubl. data). The 18 identifiable individuals known to be older than second year birds represent 55% (16/29) of the banded adults present at Camp Pendleton in 2002, and 62% (18/29) of the Pendleton-banded adults known to be alive in 2002 (one male and one female were present in 2001 but not detected again until 2003). Female return rate between 2002 and 2003 (82%, 9/11) was over twice that of males (39%, 7/18).

None of the transients observed well enough to detect bands (10/39) were banded.

Age and Sex Composition of Resident Birds

Age could not be determined for the three unidentified returning banded birds, so these birds are excluded from the following analyses. Eight of the remaining 21 banded birds were banded as nestlings or hatching year birds in previous years, and thus were of known age. Of these, three (38%; two males and one female) were one year old (see above), three (38%; 1 male and two females) were two years old, and two (25%; one male and one female) were three years old. Of 13 birds banded in previous years as adults for whom exact ages are not known, four (31%; all females) were at least two years old (i.e., banded as adults in 2002), and nine (69%; six males and three females) were at least three years old.

The eight birds originally banded as nestlings or hatching year birds included six birds fledged from nests at Camp Pendleton and two birds fledged from territories off-Base at Whelan Lake along the San Luis Rey River (see below). At least 26% (6/23, including two unidentified birds known to be adults) of the 2003 resident flycatcher population at Camp Pendleton was thus derived through local recruitment.

Immigration and Emigration

Two birds in the 2003 Camp Pendleton flycatcher population were immigrants from Whelan Lake (Table 4). These birds, a male and a female, were siblings banded in the same nest in 2000, and present at Camp Pendleton since 2001.

One unpaired male, banded as an adult at Camp Pendleton in 2003, later emigrated to Guajome Park on the San Luis Rey River, where he obtained a mate and nested.

Within and Between Season Movement

Two flycatchers changed territory locations over the course of the 2003 season. A 1-year-old unpaired male in the vicinity of Rifle Range Road (Territory 119, Table 4) moved approximately 9 km to the lower Santa Margarita River, where he paired and nested with a female previously paired with another male. The second bird, a female (Territory 120, Table 4), was a 1-year-old bird banded in 2003 on the Santa Margarita River approximately 3 km upstream from where she eventually nested. Interestingly, this female paired with the male replaced by male 119 (above).

Seven of the 21 identifiable returning birds (33%; four females and three males) changed breeding locations between 2002 and 2003, moving by from 1-4.5 km. Two of these individuals were second year birds, who moved 2.8 and 4.5 km, respectively, from their natal sites. One female (17, Table 4), whose mate from 2002 was present, moved and became a floater in 2003. The remaining four birds (one male and three females) paired with new mates in 2003, even though the previous mate was present at the Base in at least one instance. The former mate was absent in a second instance, and of unknown identity (because unbanded) in the other two instances of between year movement.

Twelve birds (57%) did not change breeding locations between years. These included one pair (Territory 2, Table 4) that returned to the same territory and mates in 2003, and one polygynous male (Territories 3 and 4, Table 4) who paired with a returning mate from 2002 and a new female in 2003. Three birds had been unpaired in 2002, and one was single in 2003. Of the remaining five birds returning to the same breeding location, all paired with new mates, even though the previous mate was present in two instances.

Table 4. Band status of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in 2003.

Territory/ Bird ID	Status[a]	Male Banded?[b]	Female Banded?[b]	Nestlings Banded?	Comments
101	P	dbre:Mdg	ORPU:none		Male and female banded as adults in 2001.
102	P	Mdg:whre	ordg:Mbr	3	Male polygynous. Male banded in 2003. Female banded as nestling in 2001 in Territory 43.
105	P	Mdg:yere	yedg:Mdg		Male and female banded in 2003.
107	P	unknown:Mdg[c]	Mdg:pupu	4	Female banded as adult in 2002.
108	P	DPDP:Mdg	No	2	Two different males for each nest. Male of 1st nest polygynous and banded as adult in 2000. Male of 2nd nest moved from territory 119 this year, but was banded as hatch year at MAPS in 2002.
118	P	yeye:Mdg	No	6	Male banded as adult in 2001.
119	S	bkdb:Mbr	NA		Male moved to territory 108 later in season. Male was banded as hatch year at MAPS in 2002.
120	P	DPDP:Mdg	pupu:Mdg		Male polygynous. Male banded as adult in 2000. Female banded in 2003 at a different location than where bred.

Territory/ Bird ID	Status[a]	Male Banded?[b]	Female Banded?[b]	Nestlings Banded?	Comments
122	P	Mdg:whre	none:Mbr[d]		Male polygynous. Male banded in 2003.
123	S	BKYE:Mdg	NA		Male banded as adult in 2001.
124	F	Unknown	NA		Near territory 3 and 4.
1	S	Mdg:dgpu	NA		Male banded in 2003.
271	F	dgye:Mbr	NA		Bird banded as nestling in 2002 in Territory 41.
2	P	LBBK:Mdg	Mdg:dbye	4	Male banded as adult in 2001. Female banded as adult in 2002.
309	F	NA	Mbr:pupu		Female banded as nestling at Whelan Lake, San Luis Rey River in 2000. In territory 105.
3	P	Mbr:rewh	none:Mbr	3	Male polygynous. Male banded as nestling at Whelan Lake, San Luis Rey River in 2000. Female banded as nestling in 2001 in Territory 42.
4	P	Mbr:rewh	yewh:Mdg	2	Male polygynous. Male banded as nestling at Whelan Lake, San Luis Rey River in 2000. Female banded as adult in 2002.
52	P	DPDB:Mdg	yebk:Mdg	5	Male polygynous. Male banded in 2001. Female banded as adult in 2002.
53	P	orpu:Mdg	Mbr:pudg		Male banded in 2003. Female banded as nestling in 2002 in Territory 62.
62	P	DPDB:Mdg	dbdb:Mdg	3	Male polygynous. Male banded in 2001. Female banded as adult in 2001.
63	F	Mdg:unknown[c]	NA		Near territory 62.
64	S	reye:Mdg	NA		Male banded in 2003, then moved to breed at Guajome Park, San Luis Rey River.
65	F	No	NA		Near territory 64.
66	F	No	NA		In territory 107.
7	P	WHBK:Mbr	PUPU:Mdg		Male banded as nestling in 2001 in Territory N10. Female banded as adult in 2001.
LFUN04	P	Mdg:dbwh	No	2	Male banded in 2003.

[a] P = pair, S = single male, F = floater.
[b] Band combinations: left leg:right leg; Mdg = anodized green federal band, Mbr = anodized bronze federal band. *Celluloid bands:* DPDP = dark pink, PUPU = purple, ORPU = orange-purple split, BKYE = black-yellow split, LBBK = light blue-black split, DPDB = dark pink-dark blue split, WHBK = white-black split. *Metal bands:* pupu = purple, yeye = yellow, dbdb = dark blue, dbre = dark blue-red split, whre = white-red split, ordg = orange-dark green split, yere = yellow-red split, yedg = yellow-dark green split, bkdb = black-dark blue split, dgpu = dark green-purple split, dgre = dark green-red split, dbye = dark blue-yellow split, rewh = red-white split, yewh = yellow-white split, yebk = yellow-black split, orpu = orange-purple split, pudg = purple-dark green split, reye = red-yellow split, dbwh = dark blue-white split.
[c] Bird was banded, but color combination undetermined.
[d] Bird was banded, but band on one leg missing; therefore individual identity undetermined.

2003 Banding Activities

Six adult males and two adult females were captured and banded in 2003 (Table 4). In addition, 34 nestlings in 12 nests were color banded (Appendix 1); all are believed to have fledged.

DISCUSSION AND RECOMMENDATIONS

The composition, distribution, habitat use, and productivity of willow flycatchers at Camp Pendleton changed in 2003 relative to 2002, possibly a reflection of increased precipitation alleviating the extreme drought conditions that prevailed in 2002. First, the number of transients detected in 2003 (39) was roughly one-third the number observed in 2002 (102, Kus and Kenwood 2003). Because survey effort during the two years was comparable in scope and timing, this appears to represent an actual decline in abundance of birds migrating through Camp Pendleton. Whether this is the result of an overall population decline associated with the drought, or a difference in migratory pathways between the two years, is not known. Second, transients occurred on average over twice as close to surface water in 2003 as in 2002. This probably reflects an increased presence of water in drainages rather than a shift in habitat use by birds.

The number of territories defended by resident flycatchers increased slightly from 17 in 2002 (Kus and Kenwood 2003) to 20 in 2003. Birds expanded their use of the Santa Margarita River to include an area near the range on Rifle Range Road, and colonized a new site on Las Flores Creek. Like transients, resident flycatchers were 30% closer to surface water in 2003 than in 2002; again, probably the result of increased presence of water in the areas traditionally used by flycatchers.

Although the number of flycatcher territories increased in 2003, the breeding population remained the same in both years at 16 pairs. Unlike in 2002, when all breeding males appeared to be monogamous, one-third (4/12) of the mated males in 2003 were polygynous, pairing with two females each. Thus, half of the breeding females (8/16) shared mates in 2003. This is curious, in that a total of 21 males were documented at Camp Pendleton, and potentially available as mates. Four males maintained territories but remained single all season, while five males were non-territorial floaters. The social and other factors contributing to polygyny in willow flycatchers, and the genetic consequences of polygyny, warrant further investigation.

As in previous years, flycatchers used exotic species for nest support, although to a much lesser extent than in 2002. Despite the availability of robust stands of poison hemlock, one of the most frequently used exotic host plants at Camp Pendleton, only 16% of nests in 2003 were placed in exotics, half the proportion (31%, Kus and Kenwood 2003) in exotics in 2002. In addition to poison hemlock, used to support 12% of nests in 2003, flycatchers used salt cedar to support 4% of nests. Giant reed, which supported 19% of nests in 2002, was not used as a nest host in 2003.

Flycatcher productivity in 2003 doubled relative to 2002, when pairs fledged an average of 1.5 young, the lowest seasonal productivity documented for this population since monitoring

began in 1999 (Kus and Kenwood 2003). Contributing to this increase were a larger average clutch size (2003: 3.3 ± 0.6 eggs; 2002: 2.8 ± 0.4 eggs), and higher nest success rate (2003: 68%; 2002: 53%). Egg "hatchability", or the proportion of eggs surviving until expected hatch date that actually hatched, increased substantially to 87%, well above the 66% documented in 2002 (Kus and Kenwood 2003) and 71% documented in 2001 (Kus and Ferree 2002). Declining hatchability has been suggested by Whitfield (2002) as a potential causative factor contributing to recent declines in willow flycatcher abundance at the Kern River, formerly the largest population in California. Improved hatchability at Camp Pendleton is an encouraging sign that the factors depressing it may have been temporary.

Returns of color banded birds allowed us to document several aspects of flycatcher demography and life history essential for an understanding of the factors limiting populations. Survival of adult birds between 2002 and 2003, estimated at between 55% and 62%, was comparable to the rate of 70% observed between 2001 and 2002 (Kus and Kenwood 2003). Juvenile survival, estimated at 4% between 2001 and 2002, increased to 27% between 2002 and 2003. Although no new immigration into the Camp Pendleton population occurred in 2003, emigration was documented for the first time, consistent with the notion that the Base serves as a source of dispersers to nearby flycatcher populations.

Approximately one-third of the adults returning to Camp Pendleton in 2003 changed breeding locations, and many changed mates, despite the presence of former mates. In fact, only three birds: two members of a pair, and a polygynous male, retained the same mate from 2002 to 2003. Between and within season movement of breeding birds, combined with mate-switching, may act to enhance the genetic variability of this small population, and perhaps counter any negative effects on genetic variability resulting from polygyny. Further study of banded flycatchers should yield insight into what is emerging as a complex breeding system and enhance our understanding of flycatcher population dynamics.

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APPENDIX 1

Band combinations and identification of southwestern willow flycatcher nestlings banded on Marine Corps Base Camp Pendleton in 2003.

Territory ID	Nest ID	Nestling Band Combination[a]	Federal Band Number
2	A	Mre : yedb	219035639
2	A	Mre : redb	219035640
2	A	Mre : whdb	219035641
2	A	Mre : dgdg	219035642
3	B	Mre : dgor	219035601
3	B	Mre : orwh	219035602
3	B	oror : Mre	219035603
4	A	dgre : Mre	219035658
4	A	dgpu : Mre	219035659
52	A	dbdb : Mre	219035651
52	A	yedb : Mre	219035652
52	A	redb : Mre	219035653
52	B	Mre : reor	219035608
52	B	Mre : reye	219035609
62	A	Mre : puwh	219035648
62	A	Mre : yewh	219035649
62	A	Mre : dgwh	219035650
102	B	Mre : yeye	219035660
102	B	Mre : yere	219035661
102	B	Mre : pure	219035662
107	A	yeye : Mre	219035654
107	A	yere : Mre	219035655
107	A	yepu : Mre	219035656
107	A	bkye : Mre	219035657
108	A	dgye : Mre	219035643
108	A	yewh : Mre	219035644
118	A	rebk : Mre	219035645
118	A	rewh : Mre	219035646
118	A	pupu : Mre	219035647
118	B	whwh : Mre	219035605
118	B	Mre : whwh	219035606
118	B	Mre : oror	219035607
LFUN04	C	Mre : orre	219035663
LFUN04	C	Mre : whor	219035664

[a] Band combinations: left leg : right leg; Mre = anodized red federal band. Metal bands: pupu = purple, yeye = yellow, dbdb = dark blue, dgdg = dark green, whwh = white, oror = orange, yere = yellow-red split, dgpu = dark green-purple split, rewh = red-white split, yewh = yellow-white split, reye = red-yellow split, yedb = yellow-dark blue split, redb = red-dark blue split, whdb = white-dark blue split, dgye = dark green-yellow split, rebk = red-black split, puwh = purple-white split, dgwh = dark green-white split, yepu = yellow-purple split, bkye = black-yellow split, dgre = dark green-red split, pure = purple-red split, orre = orange-red split, whor = white-orange split, dgor = dark green-orange split, orwh = orange-white split, reor = red-orange split .