



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

2005 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

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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 24 August 2005. Thirty-five 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, oak-sycamore dominated riparian, riparian scrub, upland scrub, and non-native. The distance from transient locations to the nearest surface water averaged 108 ± 173 m (N = 35).

Twenty-one southwestern willow flycatcher territories were located. With the exception of one territory at Lake O' Neill on Fallbrook Creek, all territories were along the Santa Margarita River. All territories were located in mixed willow riparian habitat except one in riparian scrub. Exotic vegetation, particularly poison hemlock (*Conium maculatum*) was present in all territories, and was dominant (% cover > 50) in 25% (6/24) of resident flycatcher locations. Distance to surface water averaged 68 ± 65 m (N = 24).

The resident flycatcher population included three non-territorial "floater" birds, four unpaired males, and 17 pairs. Nesting was documented for all 17 pairs, which produced 1-3 nests each. Sixty percent (15/25) of nests were successful, and flycatchers fledged an average of 1.7 young per pair. No instances of cowbird parasitism were observed. Pairs placed nests in seven species of plants, including black willow (*Salix gooddingii*), arroyo willow (*S. lasiolepis*), mule fat (*Baccharis salicifolia*), stinging nettle (*Urtica dioica*), poison hemlock, blackberry (*Rubus ursinus*), and mugwort (*Artemisia douglasiana*).

Seven resident males and 14 females present in 2005 were banded previously at Camp Pendleton between 2001 and 2004. Thirty-one percent (11/35) of the banded adults in 2004 returned in 2005. Forty-five percent of those moved to different breeding areas. Seventeen percent (7/42) of nestlings banded in 2004 returned to the Base as adults in 2005. Four resident males and one female were captured and color banded in 2005, and 26 nestlings in 13 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 (Schuetz and Whitfield 2006), 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 2006). Outside of these sites, southwestern willow flycatchers occur as small, isolated populations of one to half a dozen pairs. 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 (Kus *et al.* 2003).

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 survivorship and movement of resident flycatchers, (3) document nesting activities, and (4) 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 2005. Field work was conducted by Luke Caldwell, Bob Chapman, Dan Evans, Dana Kamada, Kerry Kenwood, Barbara Kus, Jay Rourke, Helen Sofaer, 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).

Roblar Creek: from the confluence with De Luz Creek to a point approximately 1.5 km upstream (Figure 1).

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

Las Flores Creek: between the Pacific Ocean and a point approximately 800 m upstream of Basilone Road (Figure 4).

Cockleburr Canyon: between the Pacific Ocean and 0.25 km upstream of Interstate 5 (Figure 2).

Horno Canyon: between Old Highway 101 and the upstream limit of riparian habitat (Figure 4).

Piedra de Lumbre Canyon: between the confluence with Las Flores Creek and the upstream limit of riparian habitat (Figure 4).

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 Yankee training area boundary, including habitat south of the creek, and south and east of the agricultural fields (Figure 3). The portion of the creek upstream of the Yankee boundary was closed during the field season by the military because of adverse conditions and therefore not surveyed in 2005.

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 5).

Windmill Canyon: from the Base boundary to the golf course entrance (Figure 5).

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), 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 (WGS84). 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.

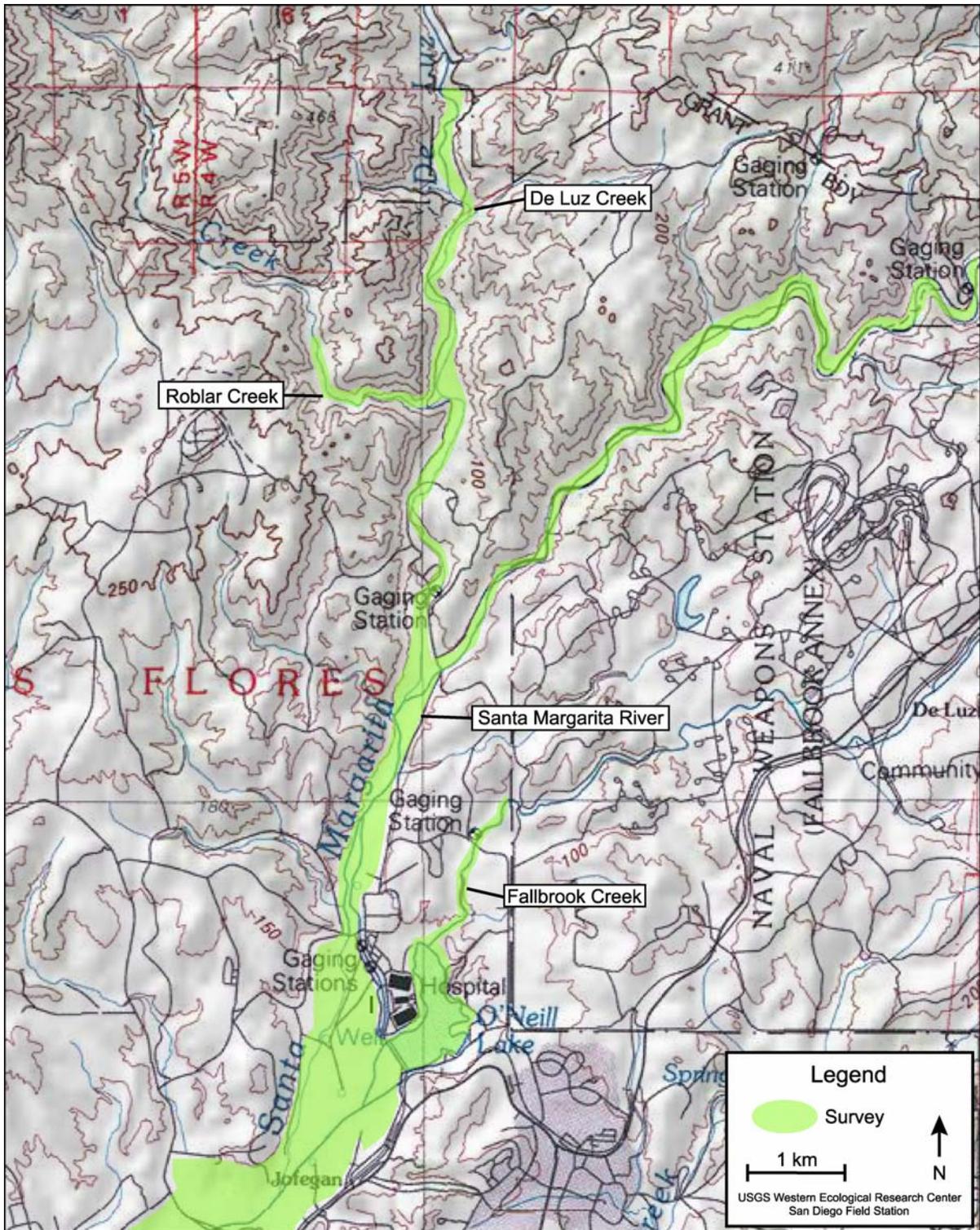


Figure 1. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2005: Santa Margarita River, Fallbrook Creek, De Luz Creek and Roblar Creek

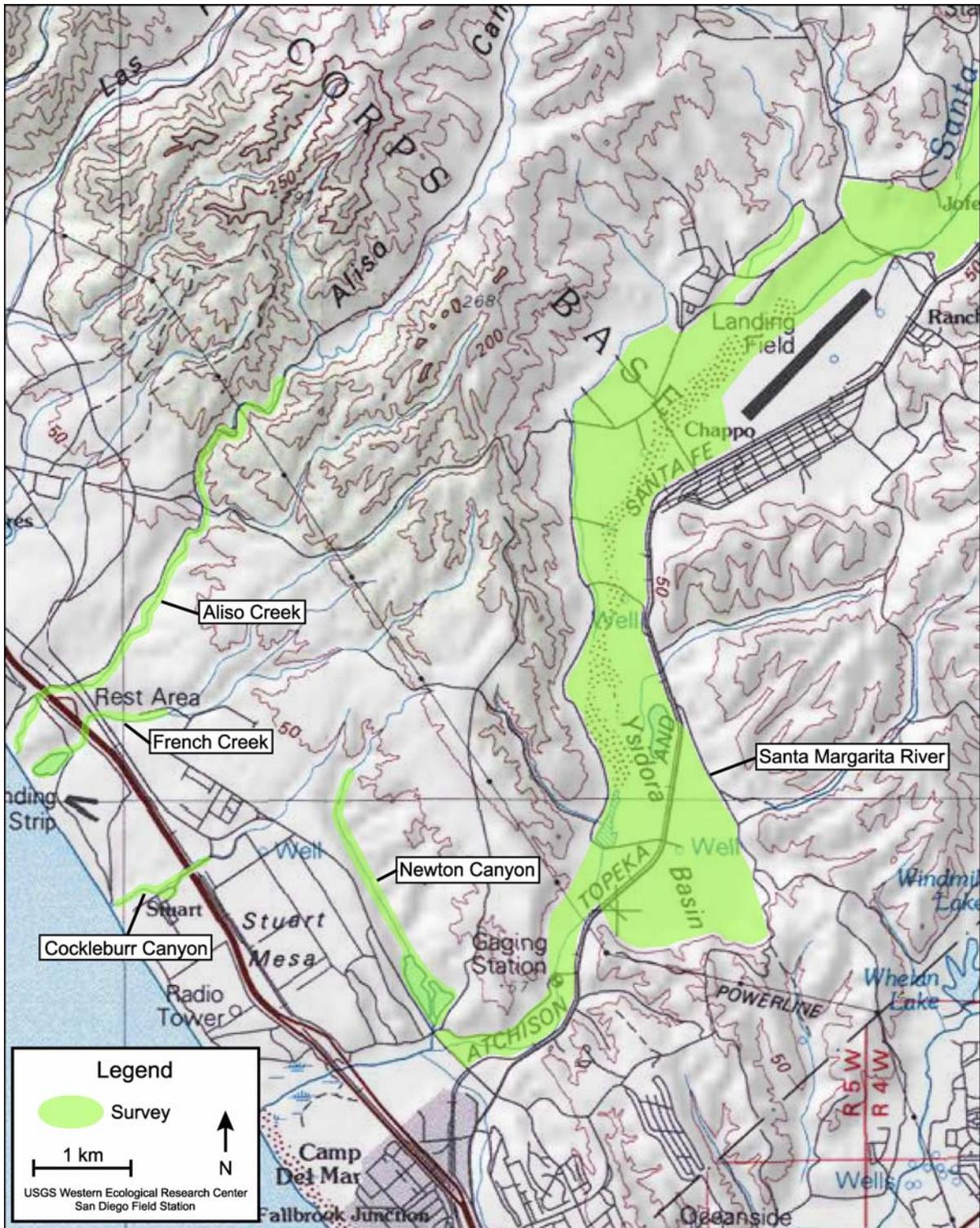


Figure 2. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2005: Santa Margarita River, Newton Canyon, Cocklebur Canyon, French Creek, and Aliso Creek

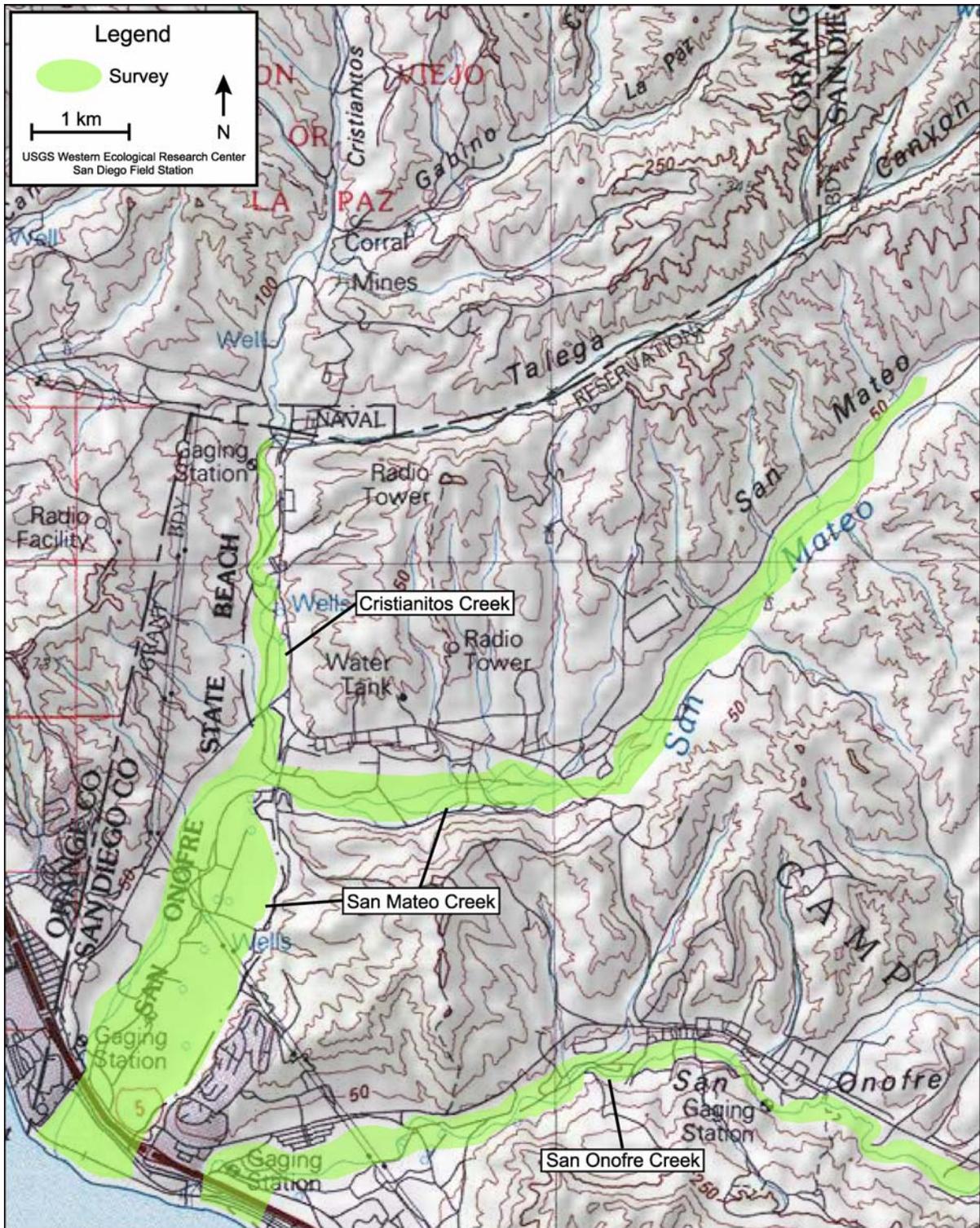


Figure 3. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2005: Cristianitos Creek, San Mateo Creek and San Onofre Creek

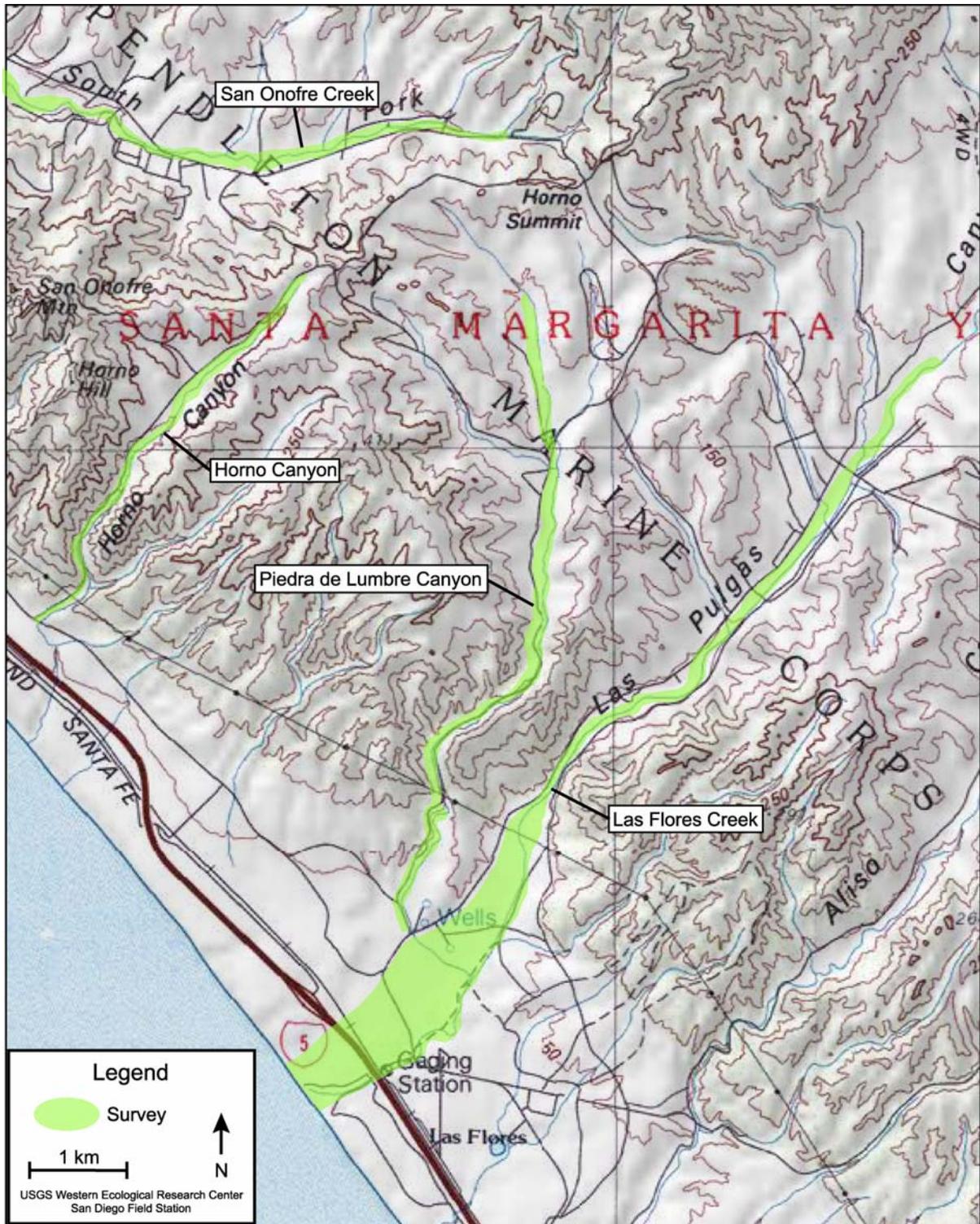


Figure 4. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2005: Las Flores Creek, Piedra de Lumbre Canyon, Horno Canyon, and San Onofre Creek

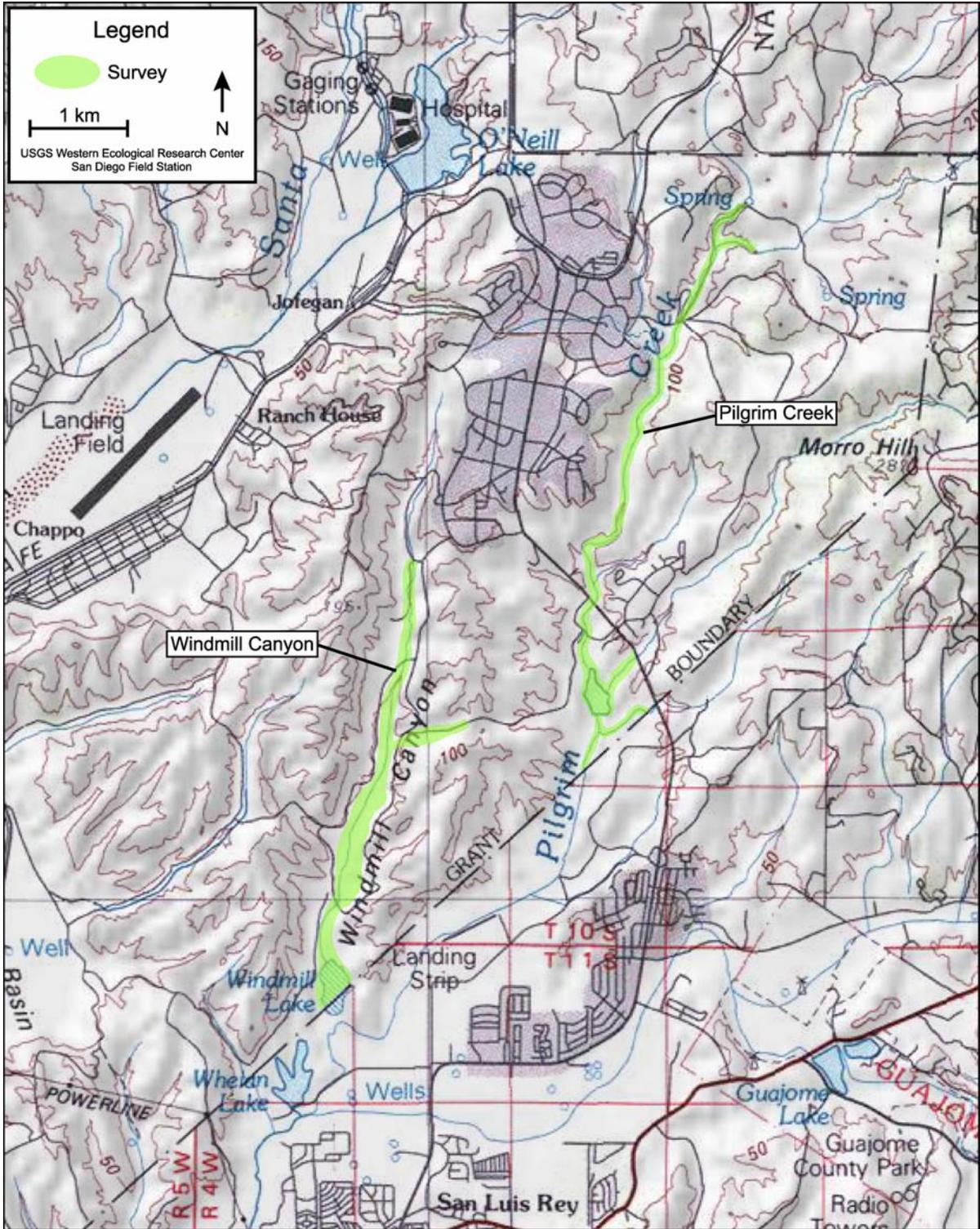


Figure 5. Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2005: Windmill Canyon and Pilgrim Creek

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.

Non-native: Sites vegetated exclusively with non-native species such as *Arundo donax*, *Conium maculatum*, *Brassica nigra*, 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 non-anodized aluminum federal numbered band on the right leg. Unbanded adults were captured in mist nets within their territories, and were banded with a numbered federal band on one leg and a bi-colored metal band on the other. Returning second year birds banded as nestlings in 2004 with one non-anodized aluminum federal numbered band on the left leg were recaptured in their territories and banded with a bi-colored metal band on the right leg to yield a full, unique combination.

RESULTS

Population Size and Distribution

Transients

Thirty-five willow flycatchers of unknown sub-species were observed during Base-wide

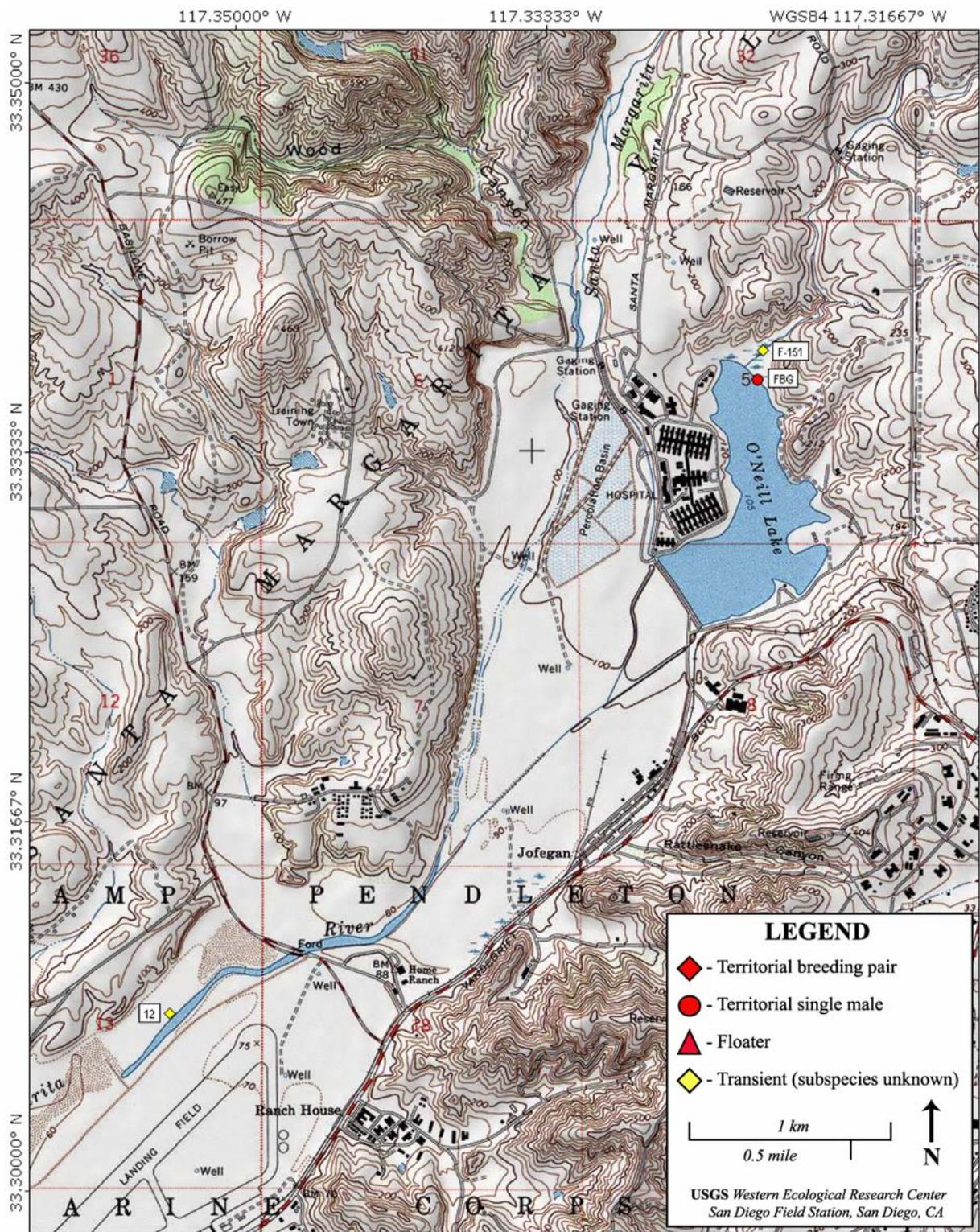


Figure 7. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2005: Santa Margarita River and Fallbrook Creek

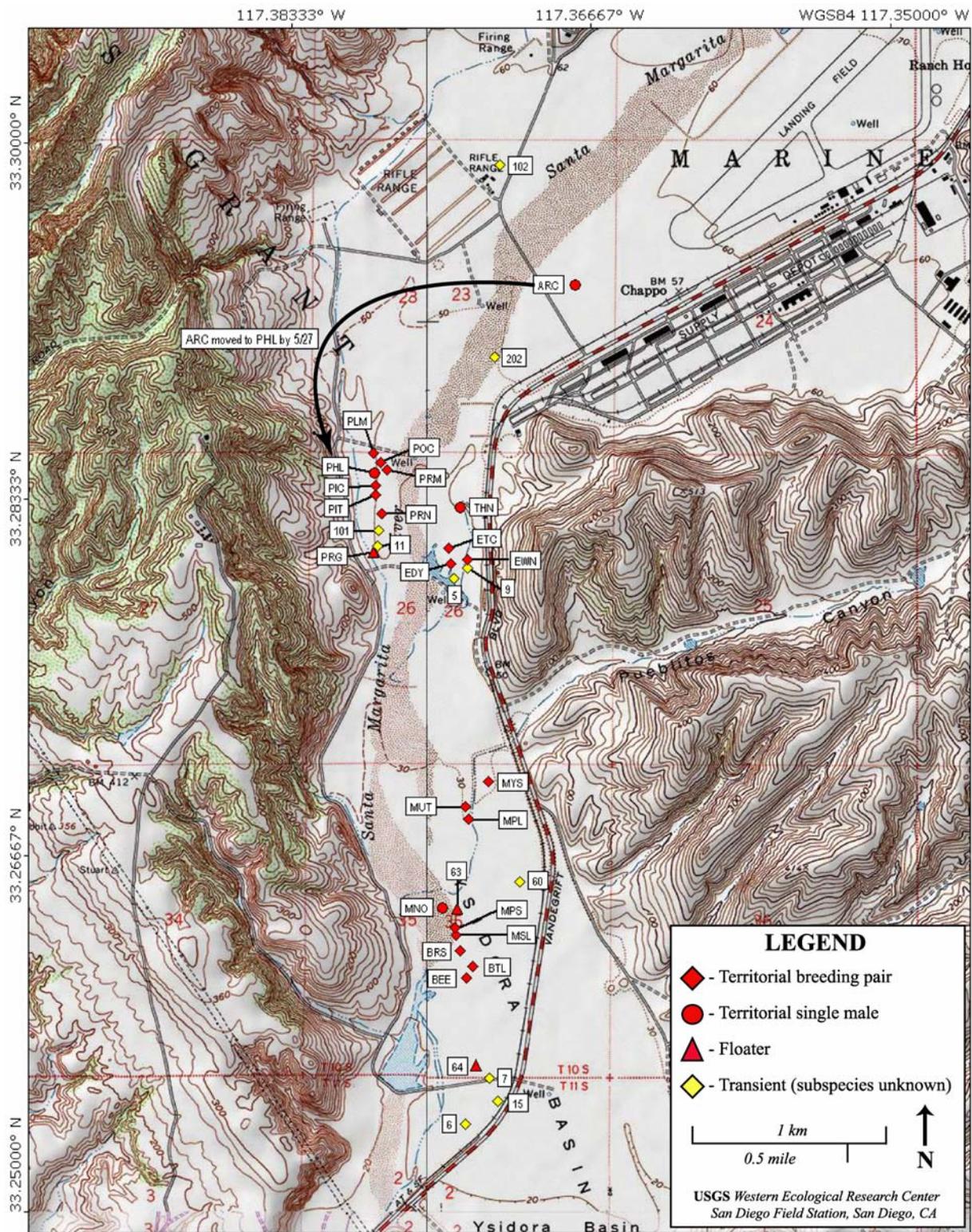


Figure 8. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2005: Santa Margarita River (downstream)

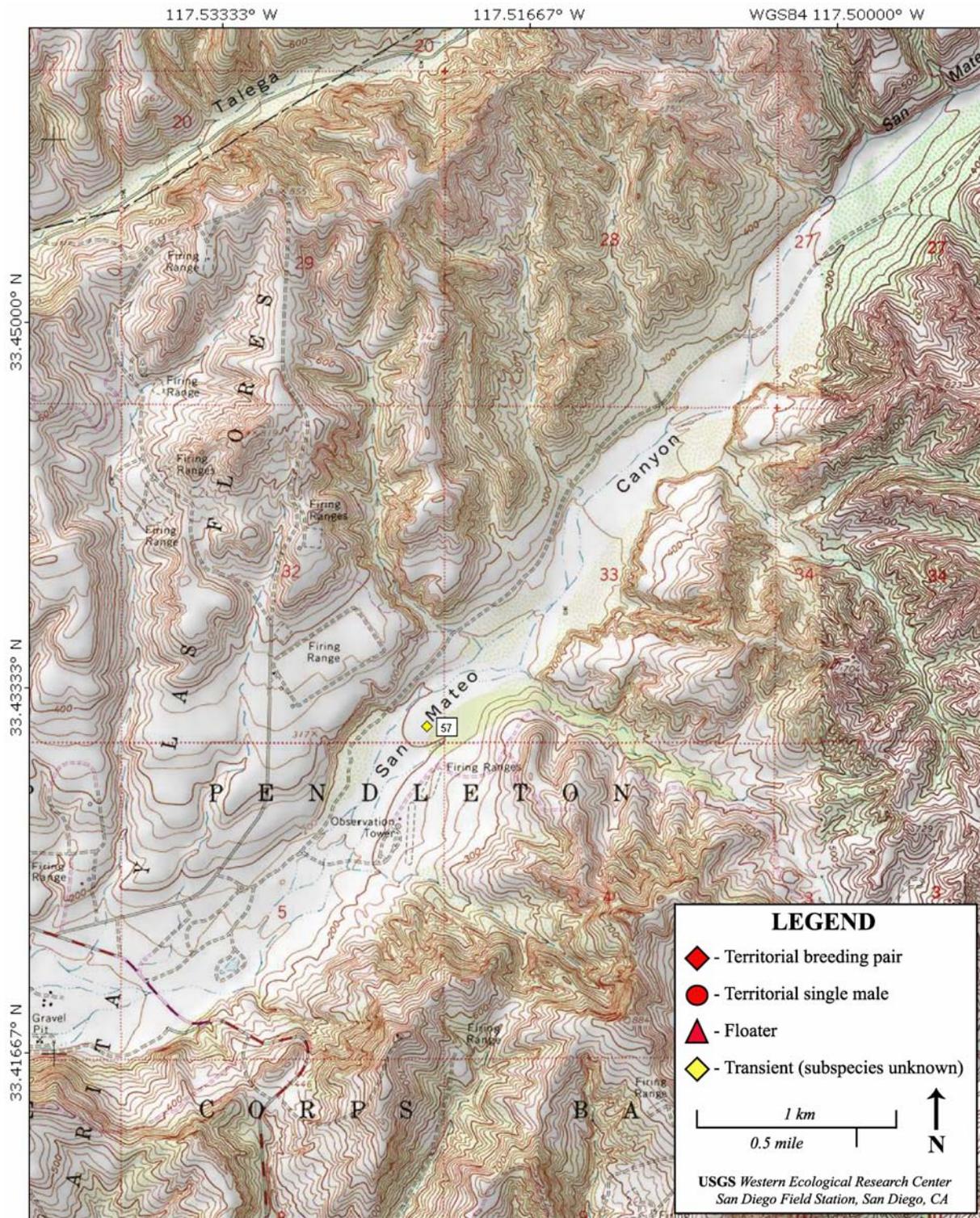


Figure 9. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2005: San Mateo Creek (upstream)

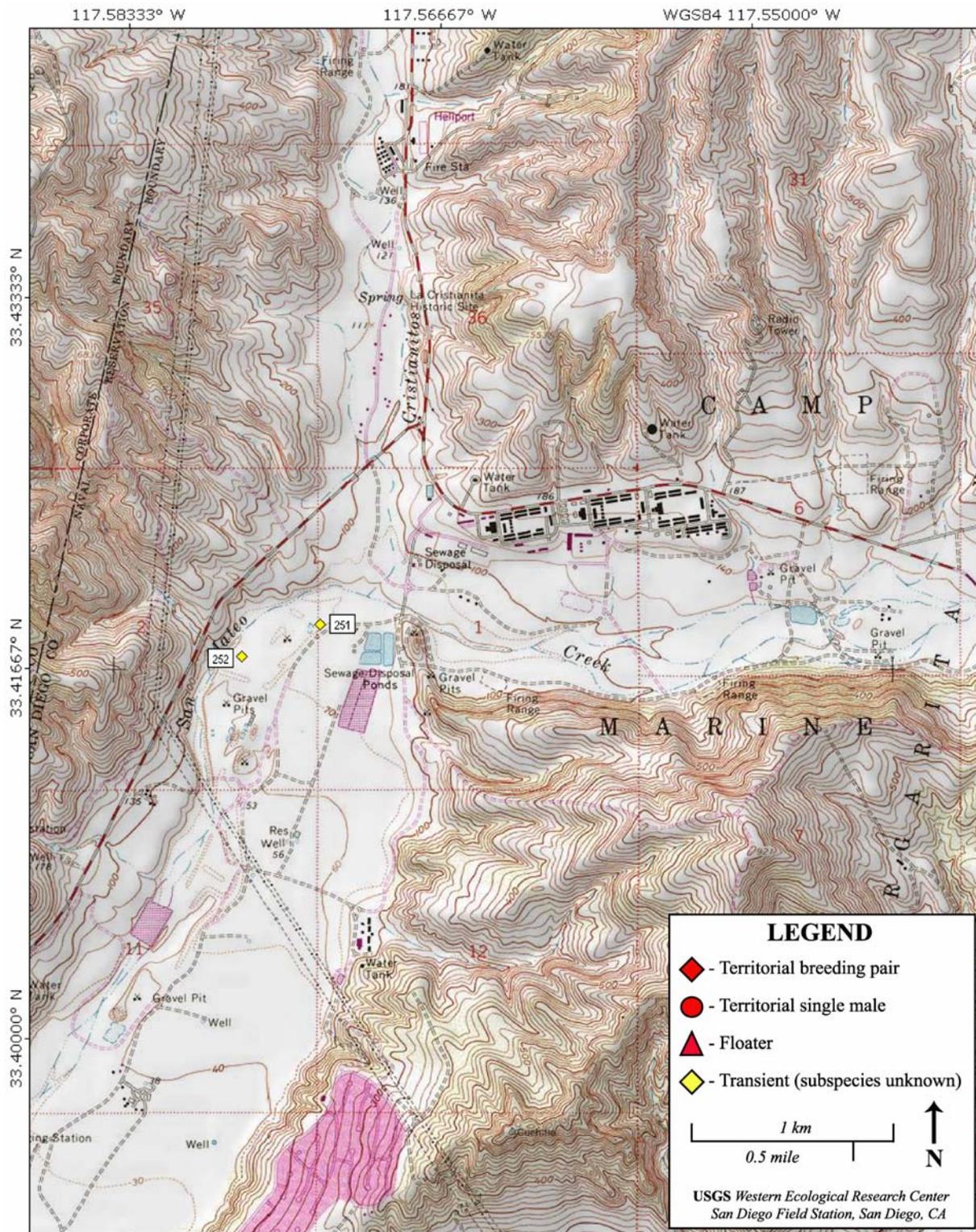


Figure 10. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2005: San Mateo Creek (downstream)



Figure 11. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2005: San Onofre Creek (upstream)

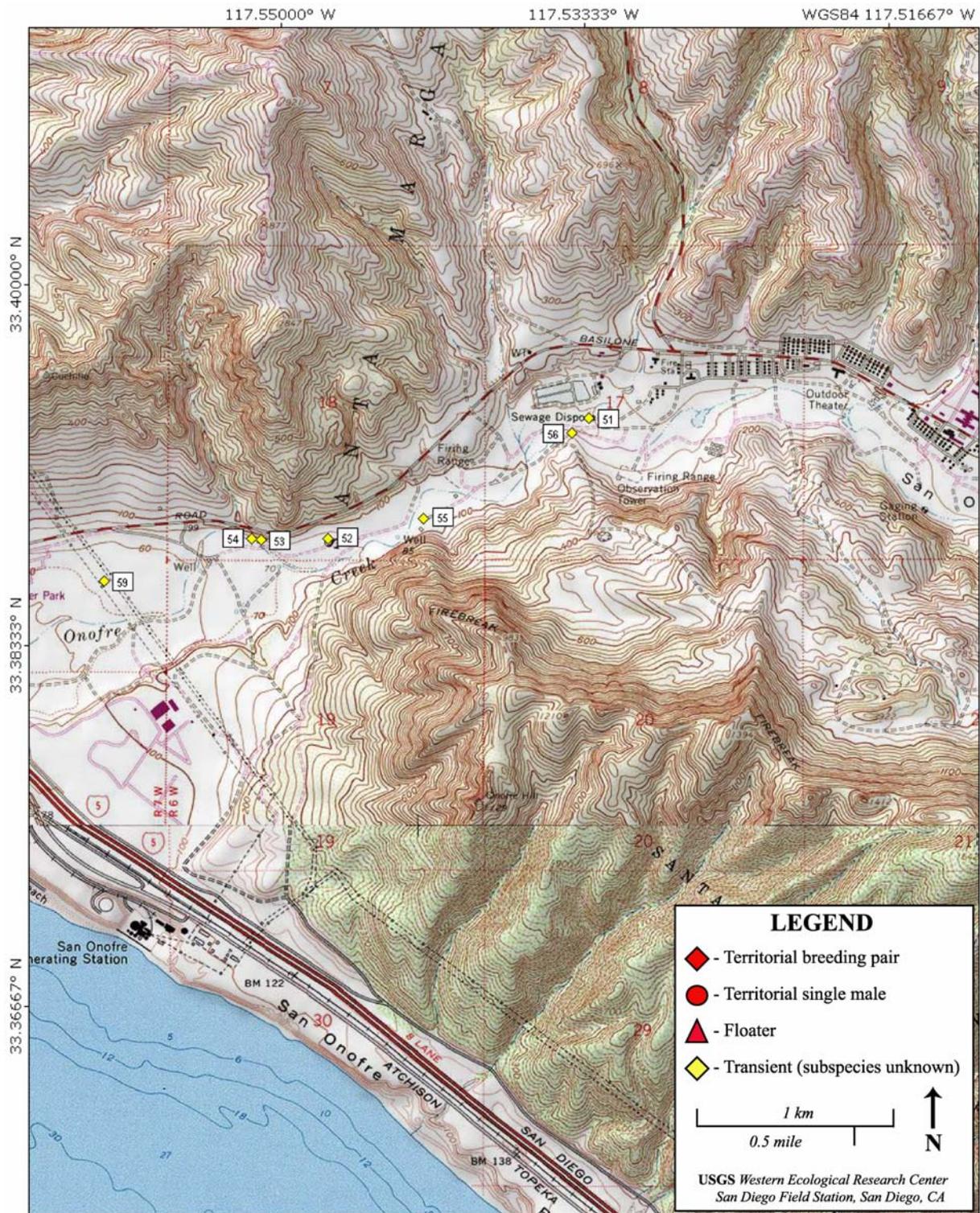


Figure 12. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2005: San Onofre Creek (downstream)

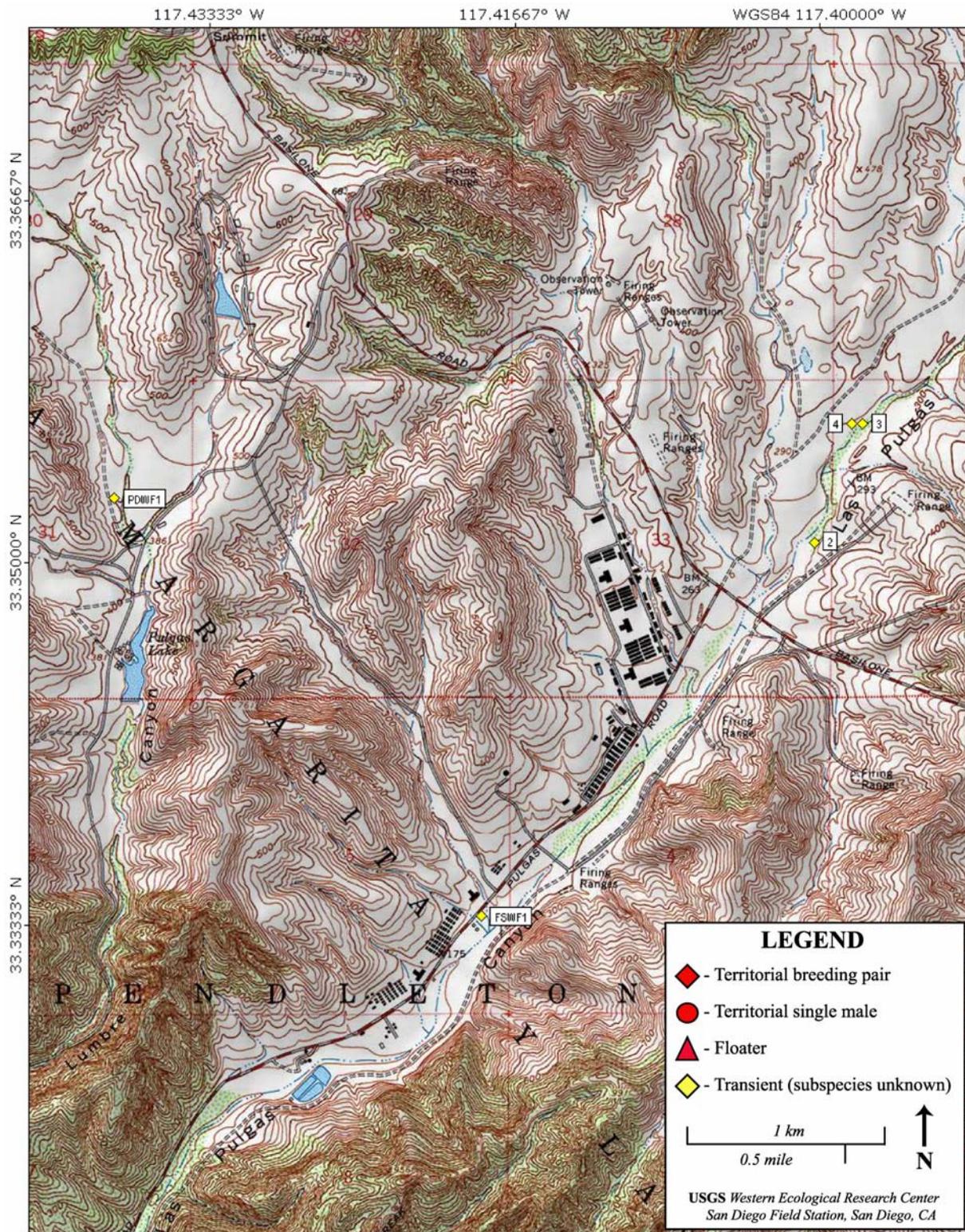


Figure 13. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2005: Piedra de Lumbre Canyon and Las Flores Creek (upstream)

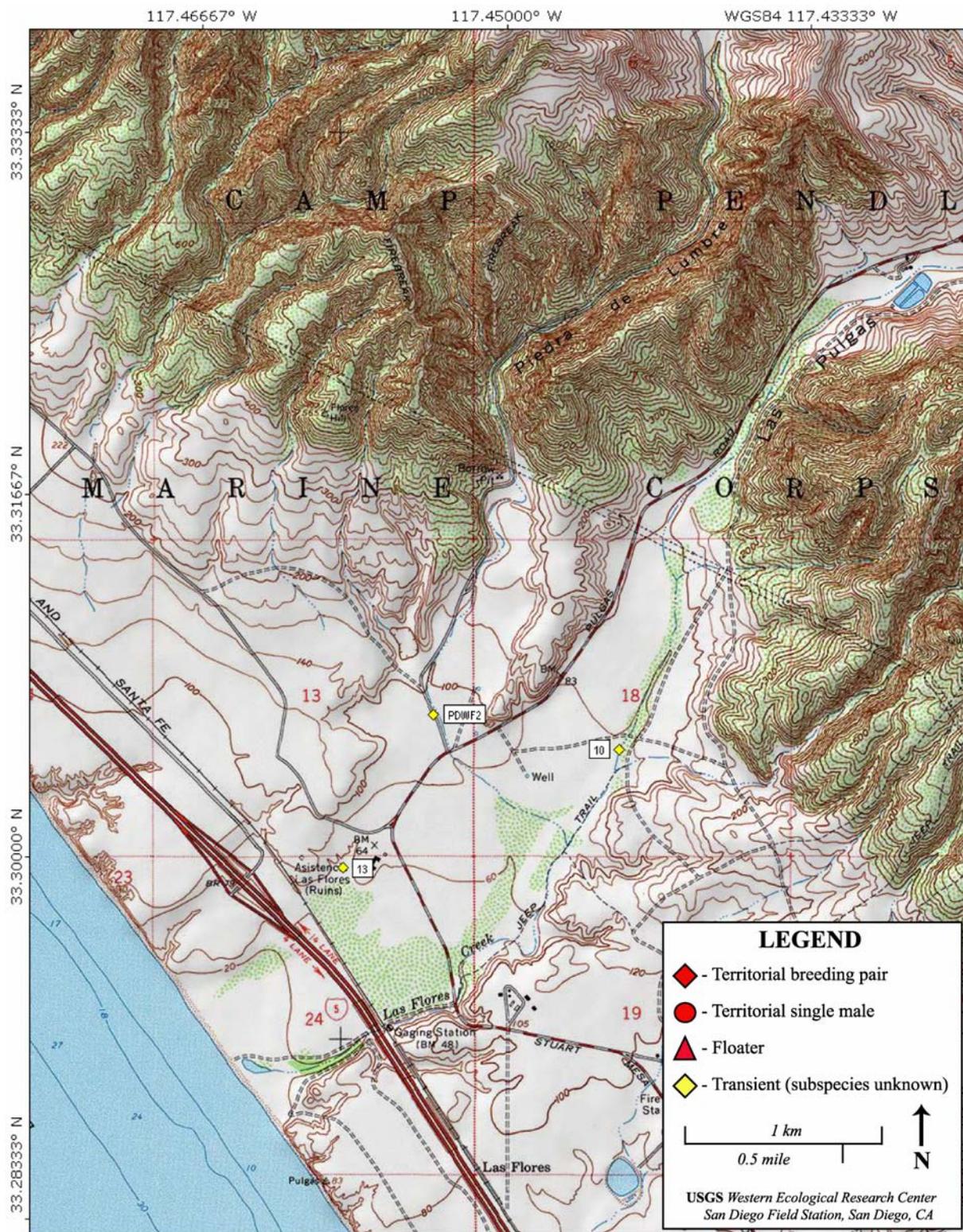


Figure 14. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2005: Piedra de Lumbré Canyon and Las Flores Creek (downstream)

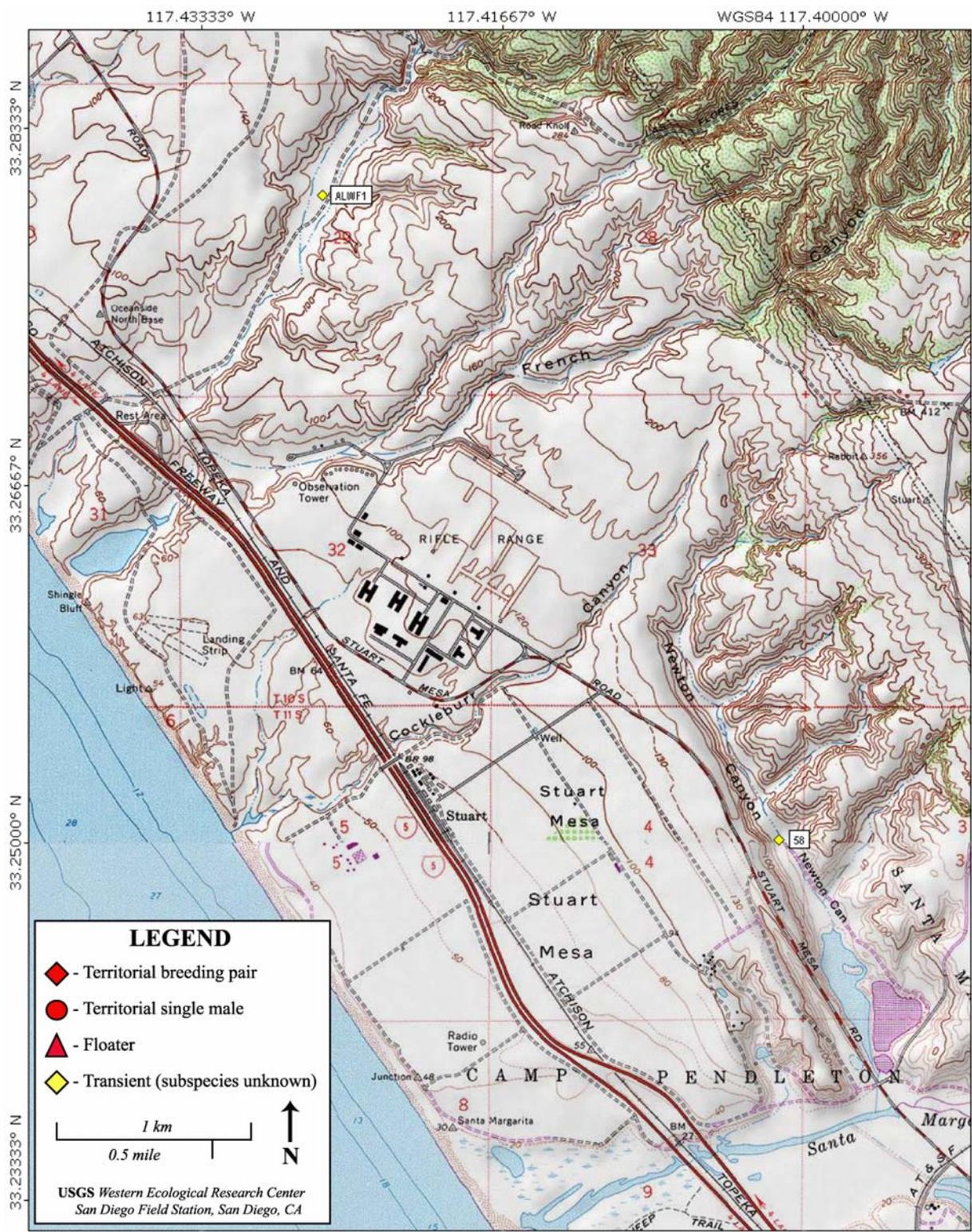


Figure 15. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2005:
Aliso Creek and Newton Canyon

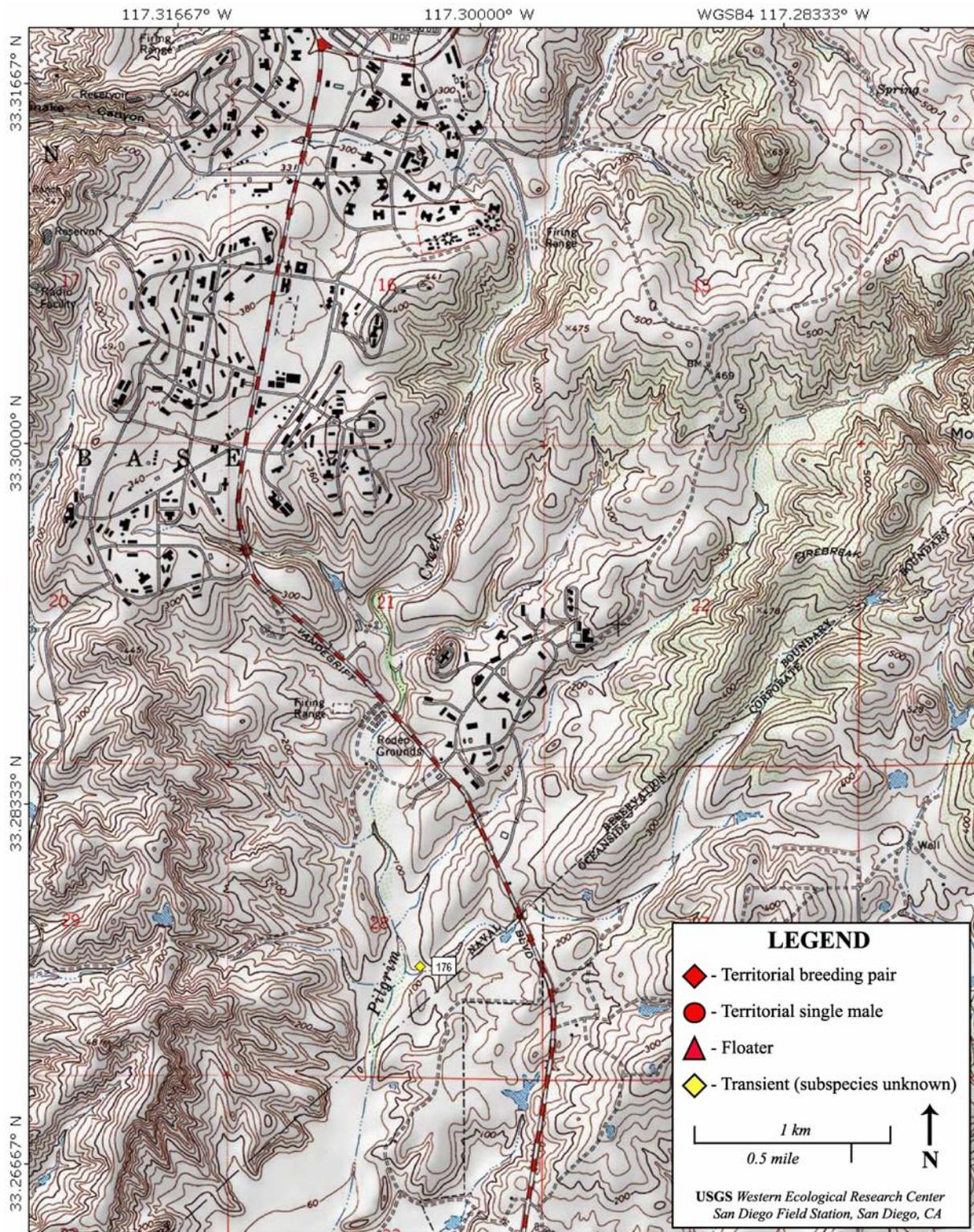


Figure 16. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2005:
Pilgrim Creek

surveys (Figures 6-16). All transients were detected between 8 May and 22 June. Transients occurred on every drainage surveyed except Cristianitos, Horno, French, Cockleburr, Roblar, and Windmill Creeks.

Residents

Seventeen females, 12 males, and three non-territorial “floater” birds were detected throughout the breeding season (Figures 7-8, 17-26). Four of the males were single and eight were paired. Six of the eight paired males were polygynous, three pairing with two females each and three pairing with three females each, for a total of 17 pairs (Figures 19, 20, 22-25). The three floaters, which held no fixed territories, were all probable males. One was detected near territory MPS once in early July (Figure 24). Another bird also detected in July occupied an area historically known to include breeding territories (Figure 26). The third floater was also detected in an area that in 2003 included a breeding pair (Figure 20).

Resident flycatchers were restricted to the Santa Margarita River and Lake O’Neill on Fallbrook Creek. Flycatcher distribution on the Santa Margarita River contracted relative to previous years, with no birds detected (for the second year in a row) in the northern (Hospital) or southern (transmission lines) regions of habitat typically occupied by flycatchers. Breeding flycatchers in 2004 (Kus and Kenwood 2006) re-colonized the vicinity of the Air Station on the east side of the river, and this area was occupied again in 2005 by a single male (ARC; Figure 18), who moved mid-season to a site downstream on the Santa Margarita River (PHL; Figure 19). Similarly, habitat in the Treatment Ponds area, adjacent to the sewage treatment plant, was re-colonized in 2005 by a single male who was present early in the season but later disappeared (Figure 21). Portions of the Santa Margarita River that historically included resident flycatchers (southern parts of the Bell and Pueblitos areas and as the eastern section of Ysidora Ponds) were void of territories in 2005. Conversely, territories were established in new locations (northern and southern parts of Ysidora Ponds; Figures 23, 24). The distribution of resident flycatchers away from the Santa Margarita River included a single male at Lake O’Neill in a territory historically occupied by breeding pairs (Figure 17). No resident flycatchers were detected on Las Flores Creek, which was colonized in 2003 (Kus and Kenwood 2005) and occupied by a single male in 2004 (Kus and Kenwood 2006).

Habitat Characteristics

Sixty percent (36/60, including both ARC and PHL locations where the same single male was detected) of all flycatcher sightings occurred in habitat classified as mixed willow riparian (Table 1), with a dense understory of stinging nettles (*Urtica dioica*), poison hemlock (*C. maculatum*), or blackberry (*Rubus ursinus*) often present. Twenty-three percent (14/60) of the locations were in riparian scrub habitat, primarily on San Onofre Creek and the Santa Margarita River. The remaining birds were detected in habitats characterized as willow-sycamore (5%, 3/60) or oak-sycamore (3%, 2/60) woodlands, upland scrub (5%, 3/60), and non-native (3%,

2/60), where the vegetation was composed entirely or nearly entirely of exotic species. While transients used all habitat types, resident flycatchers were found almost exclusively (88%) in mixed willow riparian (21/22 territories, 1/3 floaters, again including both ARC and PHL locations occupied by the same single male).

Exotic vegetation was recorded in 98% (59/60) of flycatcher locations, and was the dominant vegetation (% cover of exotics > 50; Table 1) in 25% (15/60) of those sites. Slightly more of the exotic-dominated sites (9/15) were occupied by transient flycatchers than by residents (6/15). The most common exotic plants in habitat used by flycatchers in 2005 were poison hemlock, mustard (*B. nigra*), and thistle (*Silybum* sp.).

On average, transients were almost twice as far from surface water as were residents (transients: $\bar{x} = 108 \pm 173$ m, residents: $\bar{x} = 68 \pm 64$ m). This differs from 2004 (Kus and Kenwood 2006) when transients and residents were fairly similar with regard to proximity to water, but is similar to previous years when transients were typically 2-3 times as far from water as were residents (Kus and Kenwood 2003, 2005).

Table 1. Habitat characteristics of willow flycatcher locations at Marine Corps Base Camp Pendleton in 2005.

Bird ID	Drainage	Status ^a	Habitat Type ^b	% Cover Exotics ^c	Dominant Exotic ^d	Distance to Surface Water (m)
ALWF1	Aliso Creek	T	Riparian Scrub	2	CON	300
201	De Luz Creek	T	Oak-sycamore	2	CON	150
F-151	Fallbrook Creek	T	Riparian Scrub	1	SIL	5
FBG	Fallbrook Creek	S	Mixed Willow Riparian	2	TAM, CON	0
2	Las Flores Creek	T	Mixed Willow Riparian	1	ANN	35
3	Las Flores Creek	T	Mixed Willow Riparian	1	SIL	0
4	Las Flores Creek	T	Mixed Willow Riparian	1	SIL	0
10	Las Flores Creek	T	Mixed Willow Riparian	1	BRA	0
13	Las Flores Creek	T	Mixed Willow Riparian	1	BRA	275
FSWF1	Las Flores Creek	T	Upland Scrub	2	CON	75
58	Newton Canyon	T	Mixed Willow Riparian	3	CON	500
PDWF1	Piedra de Lumbre Canyon	T	Mixed Willow Riparian	1	None	30
PDWF2	Piedra de Lumbre Canyon	T	Mixed Willow Riparian	1	CON	500
176	Pilgrim Creek	T	Willow-sycamore	2	EUC	0
57	San Mateo Canyon	T	Oak-sycamore	2	BRA	50
251	San Mateo Canyon	T	Non-native	4	CON	65
252	San Mateo Canyon	T	Willow-sycamore	3	SIL, CON	70

Table 1 (continued). Habitat characteristics of willow flycatcher locations at Marine Corps Base Camp Pendleton in 2005.

Bird ID	Drainage	Status^a	Habitat Type^b	% Cover Exotics^c	Dominant Exotic^d	Distance to Surface Water (m)
51	San Onofre Creek	T	Riparian Scrub	2	BRA	50
52	San Onofre Creek	T	Upland Scrub	4	CON	0
53	San Onofre Creek	T	Riparian Scrub	3	CON	20
54	San Onofre Creek	T	Riparian Scrub	3	CON	50
55	San Onofre Creek	T	Riparian Scrub	3	CON	50
56	San Onofre Creek	T	Riparian Scrub	1	BRA, CON	0
59	San Onofre Creek	T	Upland Scrub	3	CON	800
F-152	San Onofre Creek	T	Riparian Scrub	1	SIL	10
5	Santa Margarita River	T	Mixed Willow Riparian	2	CON	0
6	Santa Margarita River	T	Mixed Willow Riparian	1	BRA, CON	100
7	Santa Margarita River	T	Riparian Scrub	2	CON, BRA	200
9	Santa Margarita River	T	Mixed Willow Riparian	2	CON	50
11	Santa Margarita River	T	Mixed Willow Riparian	2	CON	20
12	Santa Margarita River	T	Riparian Scrub	2	ARU	75
15	Santa Margarita River	T	Riparian Scrub	3	CON	70
60	Santa Margarita River	T	Mixed Willow Riparian	2	PIC	20
63	Santa Margarita River	F	Non-native	3	CON, ARU	150
64	Santa Margarita River	F	Riparian Scrub	4	CON, EUC	200
101	Santa Margarita River	T	Mixed Willow Riparian	2	CON	0
102	Santa Margarita River	T	Riparian Scrub	2	BRA, CON	200
202	Santa Margarita River	T	Willow-sycamore	2	CON	25
ARC	Santa Margarita River	S	Mixed Willow Riparian	1	CON	0
BEE	Santa Margarita River	P	Mixed Willow Riparian	2	CON	140
BRS	Santa Margarita River	P	Mixed Willow Riparian	2	CON	130
BTL	Santa Margarita River	P	Riparian Scrub	3	CON	175
EDY	Santa Margarita River	P	Mixed Willow Riparian	2	CON	30
ETC	Santa Margarita River	P	Mixed Willow Riparian	2	CON	50
EWN	Santa Margarita River	P	Mixed Willow Riparian	2	CON	35
MNO	Santa Margarita River	S	Mixed Willow Riparian	2	TAM	75
MPL	Santa Margarita River	P	Mixed Willow Riparian	2	CON, BRA	70
MPS	Santa Margarita River	P	Mixed Willow Riparian	3	CON	150
MSL	Santa Margarita River	P	Mixed Willow Riparian	2	CON	140
MUT	Santa Margarita River	P	Mixed Willow Riparian	2	CON	100
MYS	Santa Margarita River	P	Mixed Willow Riparian	2	CON	60
PHL	Santa Margarita River	S	Mixed Willow Riparian	2	LEP	0
PIC	Santa Margarita River	P	Mixed Willow Riparian	2	CON	0
PIT	Santa Margarita River	P	Mixed Willow Riparian	2	CON	0
PLM	Santa Margarita River	P	Mixed Willow Riparian	2	CON	0
POC	Santa Margarita River	P	Mixed Willow Riparian	3	CON	20
PRG	Santa Margarita River	F	Mixed Willow Riparian	2	CON	0

Table 1 (continued). Habitat characteristics of willow flycatcher locations at Marine Corps Base Camp Pendleton in 2005.

Bird ID	Drainage	Status ^a	Habitat Type ^b	% Cover Exotics ^c	Dominant Exotic ^d	Distance to Surface Water (m)
PRM	Santa Margarita River	P	Mixed Willow Riparian	3	CON	100
PRN	Santa Margarita River	P	Mixed Willow Riparian	2	CON	75
THN	Santa Margarita River	S	Mixed Willow Riparian	2	CON	0

^a T = transient, P = breeding pair, S = single resident male, F = floater resident bird.

^b For paired birds, habitat type is considered within the male's territory boundary except for those pairs that include polygynous males, in this case habitat type is assessed within the female's use area.

^c 1 = <5%, 2 = 5-50%, 3 = 50-95%, 4 = >95%.

^d CON = *Conium maculatum*, SIL = *Silybum* sp., TAM = *Tamarix* sp., ANN = Annual grasses, BRA = *Brassica nigra*, EUC = *Eucalyptus* sp., ARU = *Arundo donax*, PIC = *Picris ephoides*, LEP = *Lepidium latifolium*.

Breeding Activities

Nesting was observed for all of the 17 pairs (Table 2). The earliest confirmed lay date was 24 May and the latest was 18 July. Sixty-five percent (11/17, Table 2) of pairs had initiated nesting by 15 June and all but one pair (16/17, 94%) were nesting by 22 June; the remaining pair initiated on 10 July. Six pairs attempted more than one nest, all but one following an unsuccessful initial attempt (although not all pairs unsuccessful on their first attempt re-nested). Of the re-nesting pairs, two attempted a third nest; one after two unsuccessful attempts and one after a successful first attempt and a failed second attempt. Nesting continued through August, with the last young fledged on 16 August. Eighty-two percent of pairs (14/17) fledged at least one young by the end of the season.

A total of 25 nests were located (Table 2) and monitored throughout the period they were active. Fifteen nests (60%) were successful, fledging 1-4 young each. Ten nests (40%) failed to fledge young. Four of the unsuccessful nests (40%) were depredated; three during the egg stage, and one during the nestling stage. One nest was abandoned during building. Two nests, one in poison hemlock and one in stinging nettle, that appeared to have been damaged, probably as a result of partial collapse of the supporting plant, were later abandoned. In these instances, one nest was tipped but didn't lose any eggs, and the other lost one egg which was found cracked under the nest. Two nests, one placed in poison hemlock and one in stinging nettle, failed when the supporting plant collapsed. Both of these nests failed around hatch date. The nestlings produced by pair BEE (Table 2) developed slowly for unknown reasons and ultimately died late in the nestling stage.

Clutch size, estimated from 17 nests containing known full clutches, averaged 3.2 ± 0.7 eggs. Twenty-nine fledglings were produced, yielding an estimate of seasonal productivity of 1.7 young per pair (29 young/17 pairs).

Table 2. Nesting activity of southwestern willow flycatcher pairs at Marine Corps Base Camp Pendleton in 2005.

Pair ID	Lay Date	# Eggs	# Nestlings	# Fledglings	Comments
BEE	18-Jun-05	4	3	0	1 egg did not hatch after ≥ 23 days; poor nestling development - died in nest.
BRS	06-Jun-05	4	0	0	1 egg disappeared during incubation; host plant collapsed spilling contents.
BRS	29-Jun-05	3	1	1	2 eggs did not hatch after ≥ 23 days.
BTL	10-Jul-05	2 ^a	2	1	1 nestling disappeared.
EDY	22-Jun-05	3	2	1	1 nestling disappeared; other young disappeared either during egg or nestling stage.
ETC	12-Jun-05	3	1	0	1 egg did not hatch after ≥ 18 days; collapsing host plant spilled 1 egg; depredated.
ETC	10-Jul-05	3	2	1	1 nestling disappeared; other young disappeared either during egg or nestling stage.
EWN	21-Jun-05	3 ^b	3 ^c	3	
MPL	08-Jun-05	3	0	0	Depredated.
MPS	24-May-05	4	1	1	2 eggs disappeared; 1 egg did not hatch after ≥ 24 days.
MPS	30-Jun-05	3	0	0	Depredated.
MPS	18-Jul-05	2	2	1	1 nestling disappeared.
MSL	04-Jun-05	3	3	2	1 nestling disappeared.
MUT	09-Jun-05	2	1	1	1 individual disappeared either during egg or nestling stage.
MYS	22-Jun-05	3 ^b	3 ^c	3	
PIC	11-Jun-05	2	0	0	1 egg cracked below nest and other egg abandoned after this event.
PIC	22-Jun-05	3	2	1	1 egg did not hatch after ≥ 26 days (disappeared during nestling stage); 1 nestling disappeared.
PIT	04-Jun-05	4	4	4	
PLM	29-May-05	4	0	0	Host plant collapsed, spilling nest contents.
PLM	18-Jun-05	3	0	0	Depredated.
PLM	03-Jul-05	3	2	2	1 egg did not hatch after ≥ 22 days.
POC	01-Jun-05	2	0	0	Host plant collapsed tipping nest - 2 eggs remained but nest abandoned.
PRM	Not applicable	0	0	0	Nest abandoned before laying.
PRM	13-Jun-05	4	4	4	
PRN	21-Jun-05	3	3	3	

^a Minimum number; nest contents not seen until late in incubation stage.

^b Minimum number; nest contents not seen during incubation stage.

^c Minimum number; nest contents not seen until late in nestling stage.

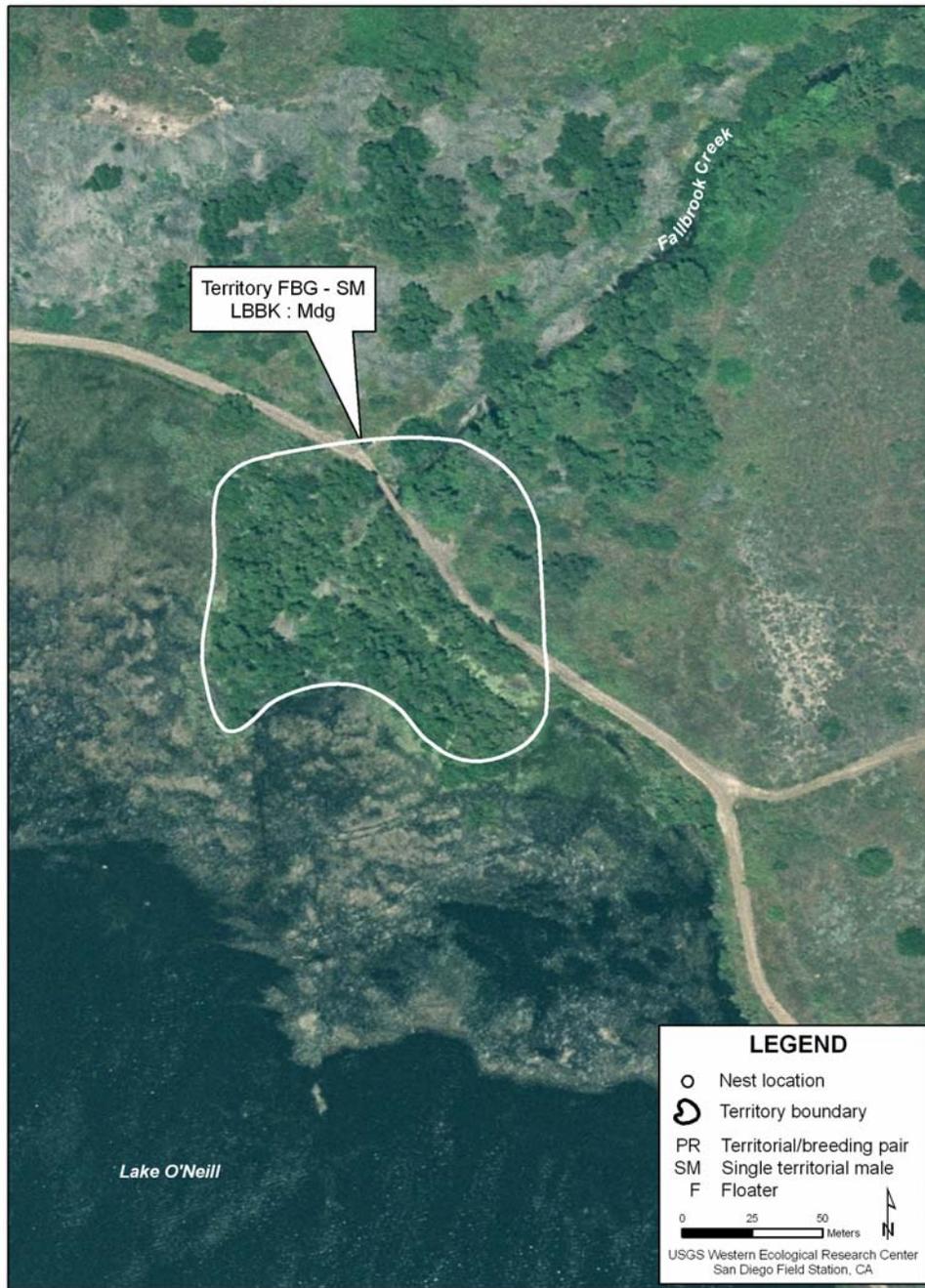


Figure 17. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2005: Lake O’Neill, Fallbrook Creek



Figure 18. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2005: Air Station, Santa Margarita River

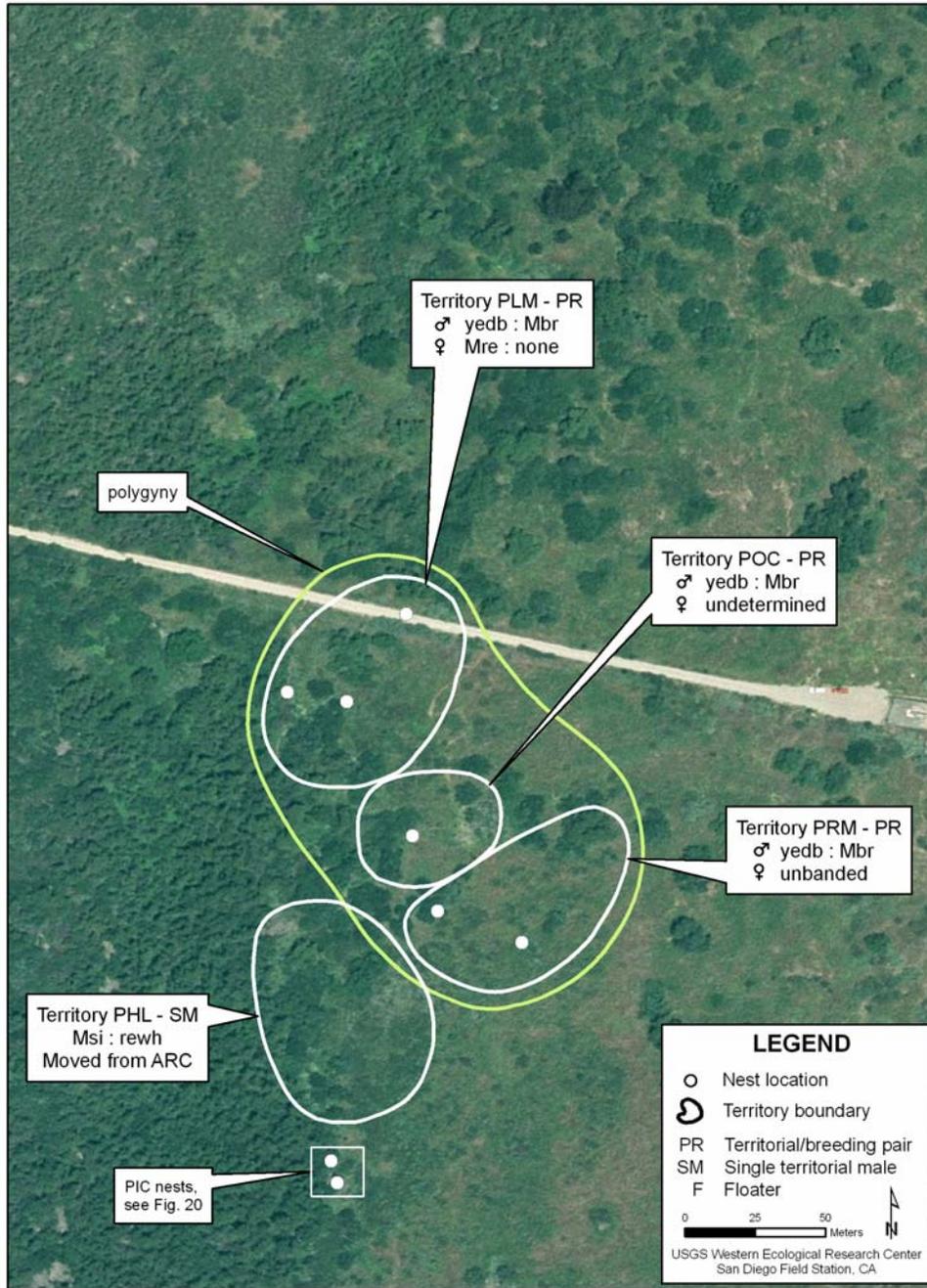


Figure 19. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2005: Pump Road (upper), Santa Margarita River

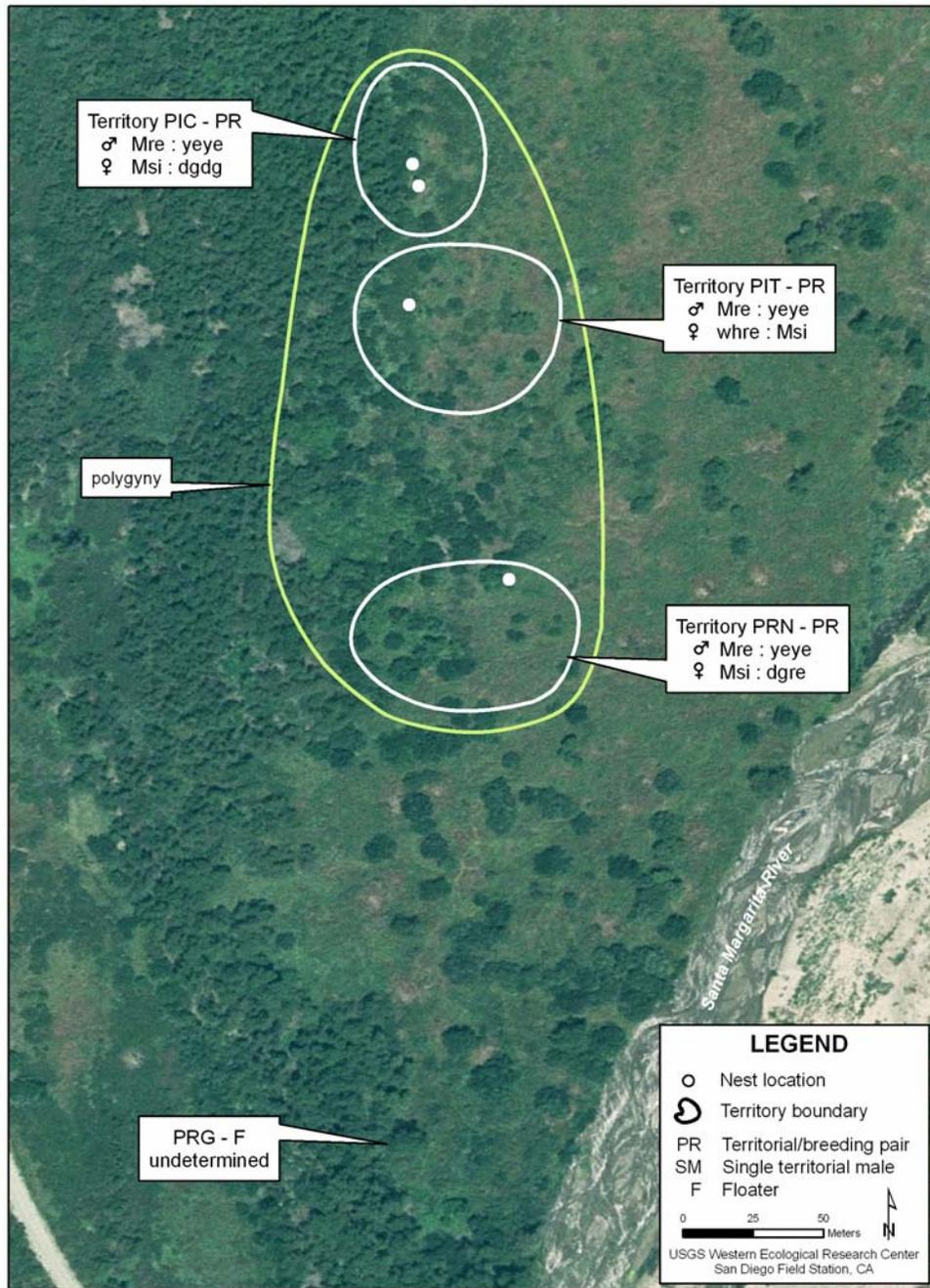


Figure 20. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2004: Pump Road (lower), Santa Margarita River

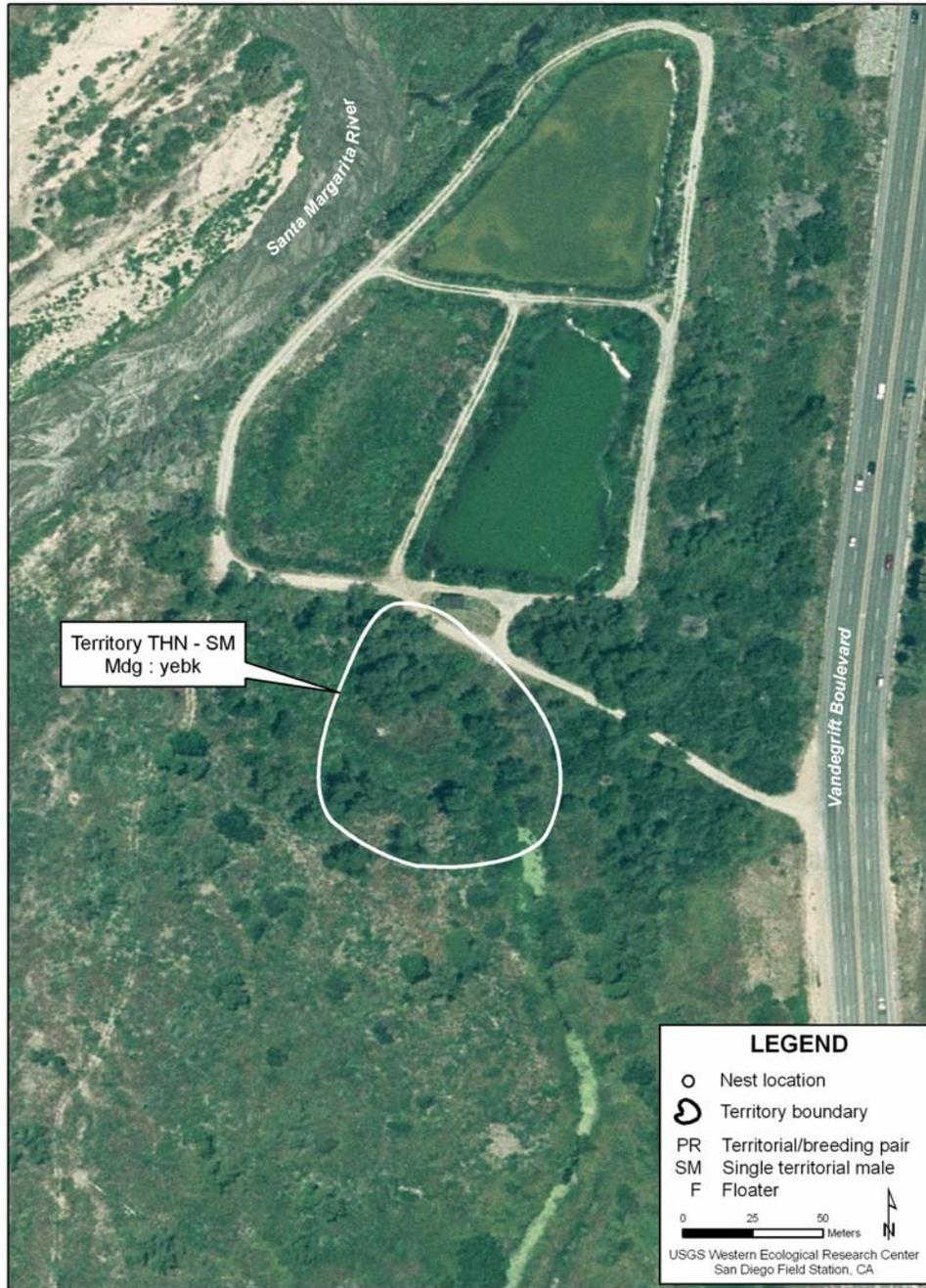


Figure 21. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2005: Treatment Ponds, Santa Margarita River

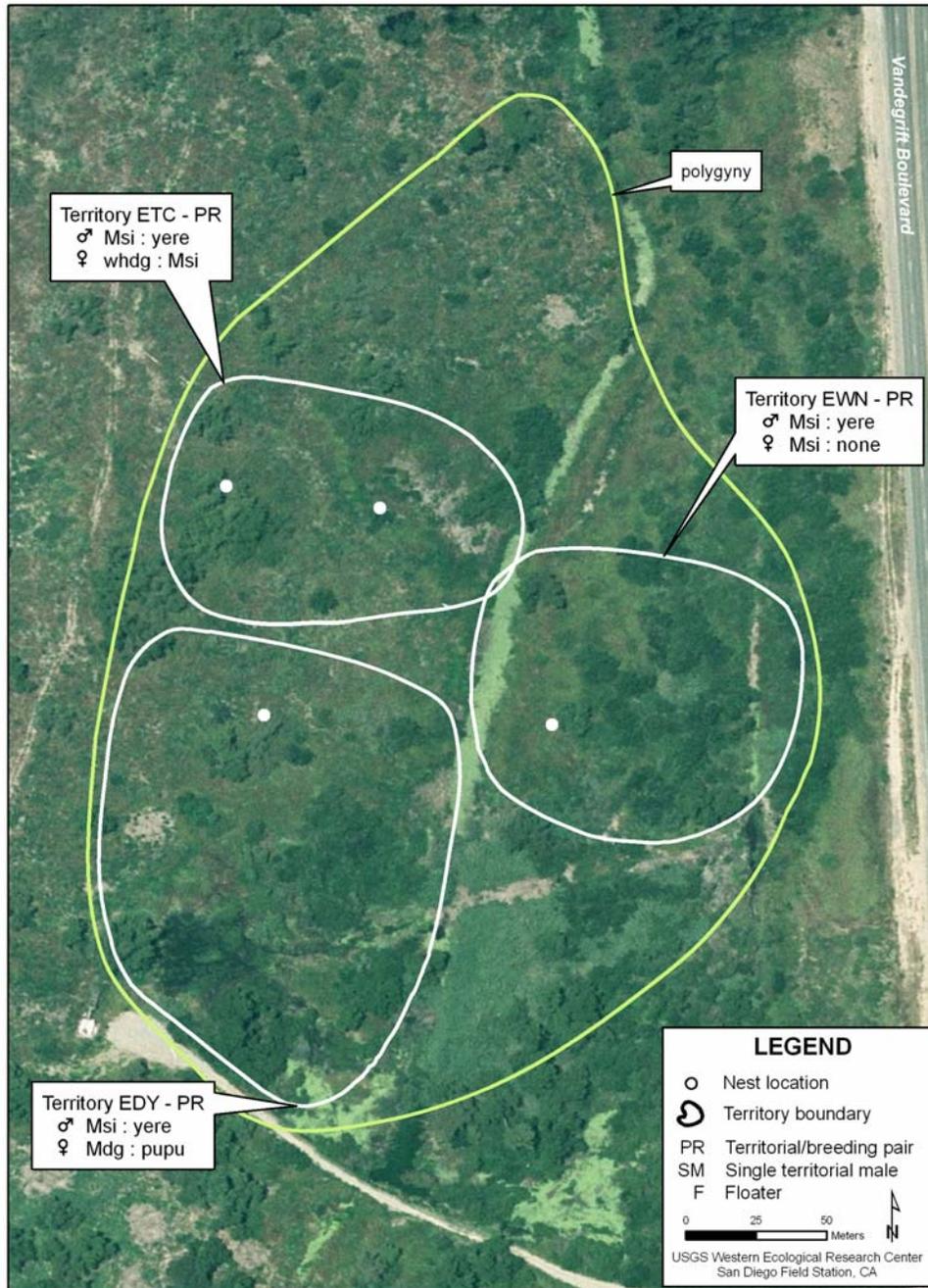


Figure 22. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2005: Pueblitos, Santa Margarita River

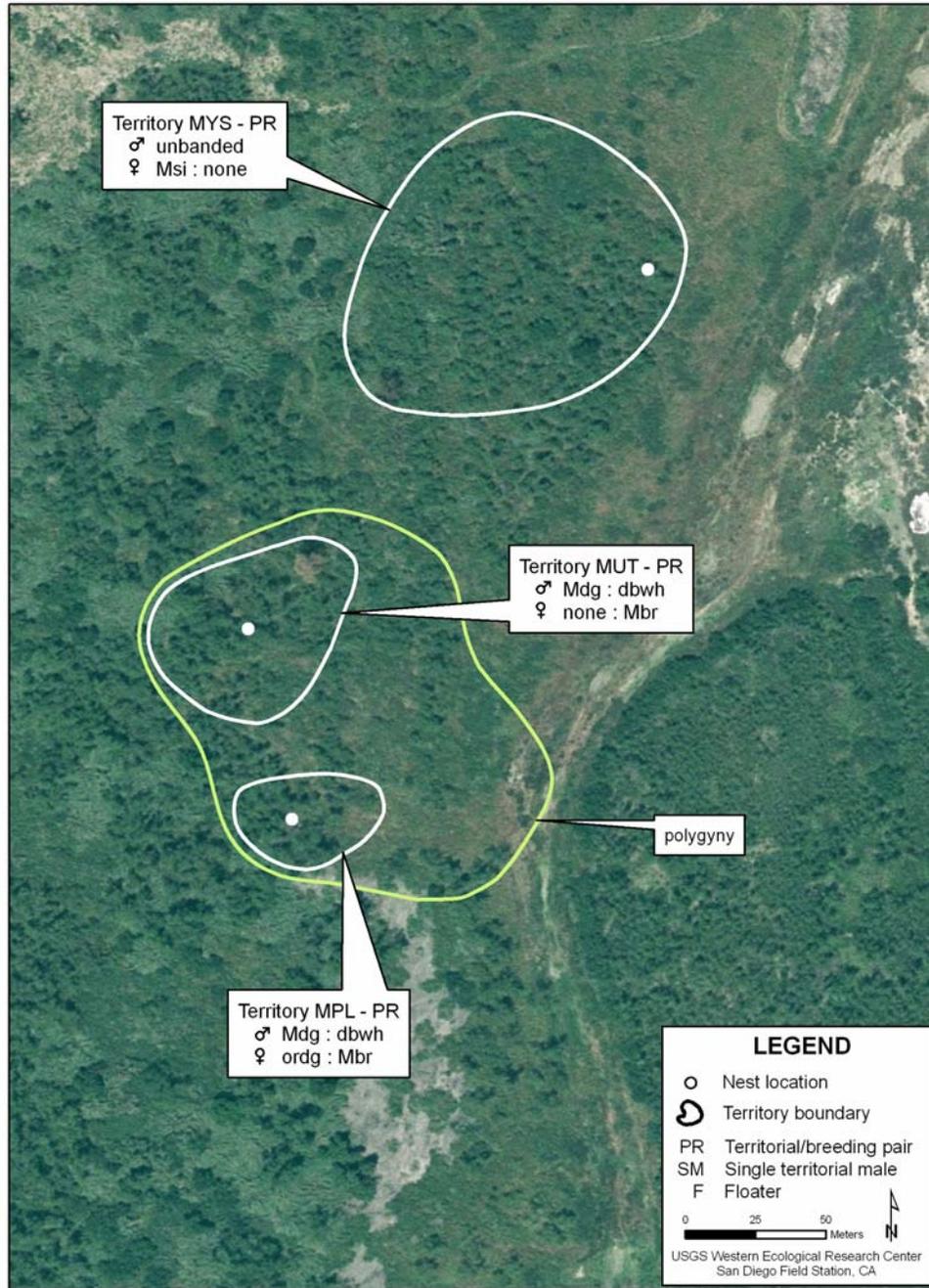


Figure 23. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2005: Ysidora Ponds (upper), Santa Margarita River

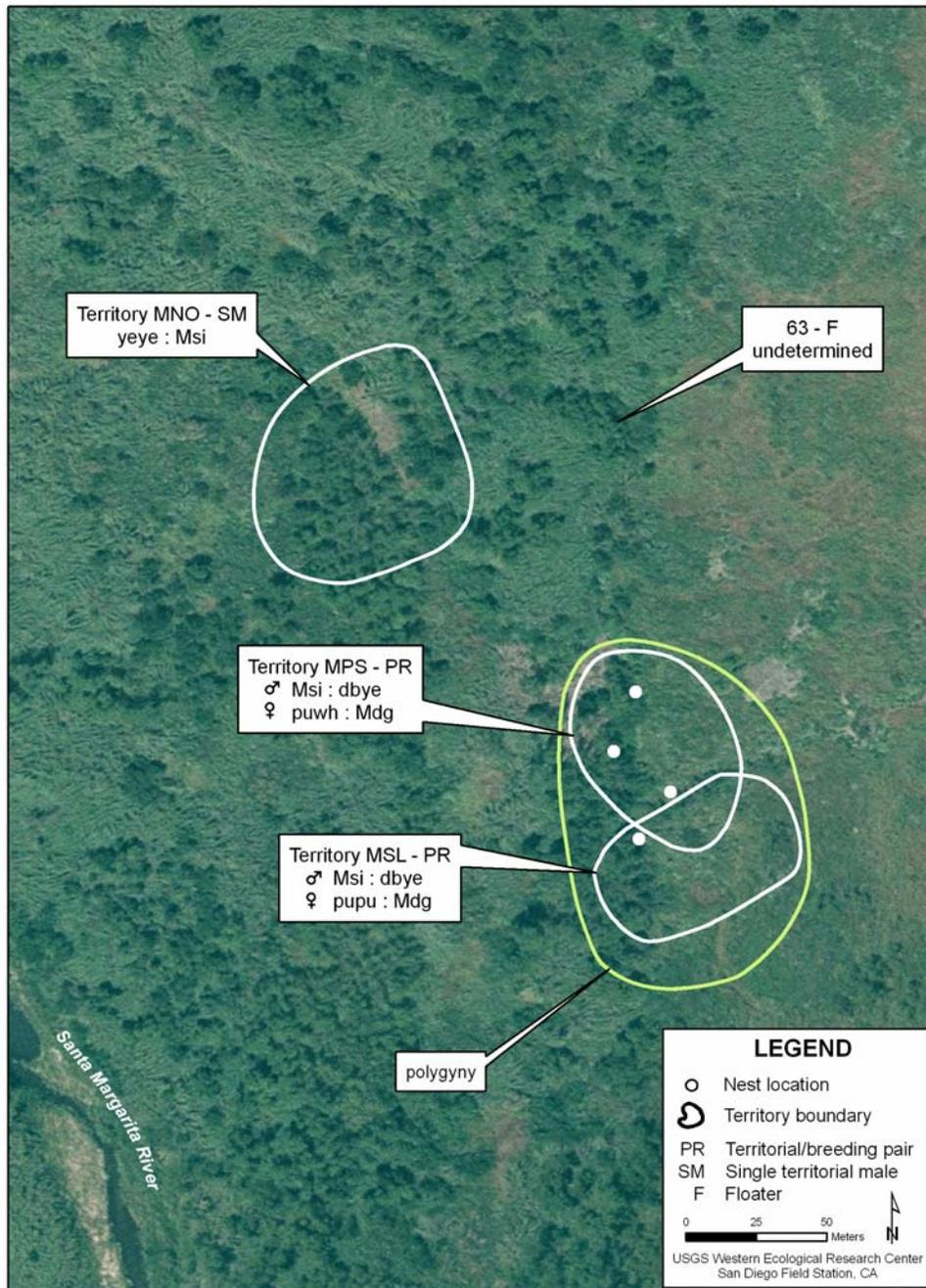


Figure 24. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2005: Ysidora Ponds (lower), Santa Margarita River

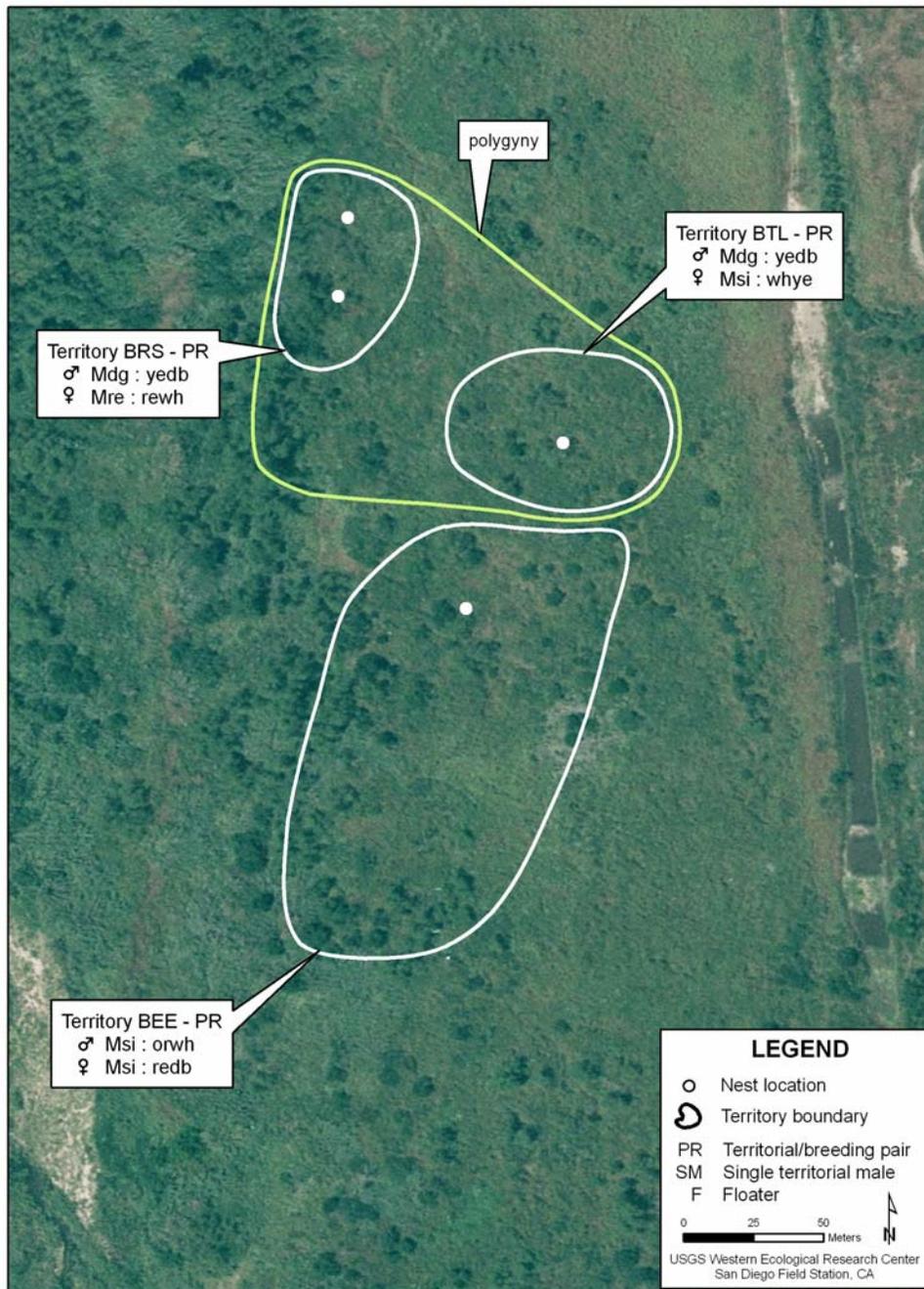


Figure 25. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2005: Bell (upper), Santa Margarita River



Figure 26. Southwestern Willow Flycatcher Territories at Marine Corps Base Camp Pendleton, 2005: Bell (lower), Santa Margarita River

Nest Site Characteristics

Flycatchers placed nests in seven species of plants (Table 3), including black willow (*S. gooddingii*), arroyo willow (*S. lasiolepis*), mule fat (*B. salicifolia*), stinging nettle, poison hemlock, blackberry, and mugwort (*Artemisia douglasiana*). Sixty-four percent of nests were placed in native species: 28% (7/25) in willow, 12% (3/25) in both stinging nettle and mulefat, 8% (2/25) in blackberry, and 4% (1/25) in mugwort. Thirty-six percent (9/25) of nests were placed in exotic species, all in poison hemlock. Nest height averaged 1.7 ± 0.4 m (N = 25), while host height averaged 4.4 ± 3.3 (N = 25).

Table 3. Nest site characteristics of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in 2005.

Pair ID	Host Species	Host Height (m)	Nest Height (m)
BEE	<i>Baccharis salicifolia</i>	3.2	1.9
BRS	<i>Urtica dioica</i>	3.0	2.1
BRS	<i>Artemisia douglasiana</i>	2.1	1.6
BTL	<i>Urtica dioica</i>	3.4	1.8
EDY	<i>Conium maculatum</i>	2.6	1.8
ETC	<i>Conium maculatum</i>	2.7	1.6
ETC	<i>Salix lasiolepis</i>	8.5	1.7
EWN	<i>Baccharis salicifolia</i>	3.0	1.8
MPL	<i>Salix gooddingii</i>	17.0	2.1
MPS	<i>Rubus ursinus</i>	2.1	1.4
MPS	<i>Rubus ursinus</i>	2.0	1.9
MPS	<i>Conium maculatum</i>	2.6	1.2
MSL	<i>Conium maculatum</i>	3.1	1.6
MUT	<i>Salix gooddingii</i>	10.5	2.5
MYS	<i>Conium maculatum</i>	3.4	1.9
PIC	<i>Salix lasiolepis</i>	5.0	0.9
PIC	<i>Salix lasiolepis</i>	6.7	1.9
PIT	<i>Baccharis salicifolia</i>	3.1	2.5
PLM	<i>Conium maculatum</i>	2.5	1.4
PLM	<i>Conium maculatum</i>	3.7	2.0
PLM	<i>Urtica dioica</i>	4.1	2.0
POC	<i>Conium maculatum</i>	3.2	1.8
PRM	<i>Salix lasiolepis</i>	5.6	1.4
PRM	<i>Conium maculatum</i>	2.9	1.6
PRN	<i>Salix lasiolepis</i>	4.7	1.0

Cowbird Parasitism

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

Banded Birds

All of the resident flycatchers, except for one female and the three floater birds, were observed closely enough to determine with confidence whether they were banded (Table 4). Fifty-eight percent of the males (7/12) and 88% (14/16, excluding the undetermined female) of the females were birds banded in previous years.

No banded transients were detected during surveys.

Four adult males and one adult female were captured and banded in 2005 (Table 4). In addition, five second year birds that were banded with one band as nestlings in 2004 were recaptured and banded with a second band to provide unique combinations. Twenty-six nestlings in 13 nests were banded; all are believed to have fledged.

Table 4. Band status of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in 2005.

Territory/ Bird ID	Status ^a	Male Banded? ^b	Female Banded? ^b	Nestling s Banded?	Comments ^c
63	F	Undetermined	NA		
64	F	Undetermined	NA		
ARC	S	Msi : rewh	NA		Banded in 2005. Moved to PHL early in season.
BEE	P	Msi : orwh	Msi : redb		Male banded in 2005. Female banded as nestling at Pueblitos in 2004.
BRS	P	Mdg : yedb	Mre : rewh	1	Male polygynous. Male banded in 2004. Female banded as nestling at Bell in 2003.
BTL	P	Mdg : yedb	Msi : whye	1	Male polygynous. Male banded in 2004. Female banded as nestling at Pump Road in 2004.
EDY	P	Msi : yere	Mdg : pupu	1	Male polygynous. Male banded as nestling at MAPS in 2004. Female banded in 2002.
ETC	P	Msi : yere	whdg : Msi	1	Male polygynous. Male banded as nestling at MAPS in 2004. Female banded in 2005.
EWN	P	Msi : yere	Msi : none	3	Male polygynous. Male banded as nestling at MAPS in 2004. Female banded as nestling in 2004.
FBG	S	LBBK : Mdg	NA		Male banded in 2001.
MNO	S	yeye : Msi	NA		Male banded in 2005.
MPL	P	Mdg : dbwh	ordg : Mbr		Male polygynous. Male banded in 2003. Female banded as nestling at Pump Road in 2001.
MPS	P	Msi : dbye	puwh : Mdg	2	Male polygynous. Male banded in 2005. Female banded in 2001.
MSL	P	Msi : dbye	pupu : Mdg	2	Male polygynous. Male banded in 2005. Female banded in 2003.

Table 4 (continued). Band status of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in 2005.

Territory/ Bird ID	Status ^a	Male Banded? ^b	Female Banded? ^b	Nestling s Banded?	Comments ^c
MUT	P	Mdg : dbwh	none : Mbr	1	Male polygynous. Male banded in 2003. Female band number not confirmed.
MYS	P	Unbanded	Msi : none		Female banded as nestling in 2004.
PHL	S	Msi : rewh	NA		Male banded in 2005 and moved from ARC early in season.
PIC	P	Mre : yeye	Msi : dgdg	1	Male polygynous. Male banded as nestling at Pueblitos in 2003. Female banded as nestling at Bell in 2004.
PIT	P	Mre : yeye	whre : Msi	4	Male polygynous. Male banded as nestling at Pueblitos in 2003. Female banded in 2004.
PLM	P	yedb : Mbr	Mre : none	2	Male polygynous. Male banded as nestling at Pueblitos in 2002. Female banded as nestling in Pueblitos in 2003.
POC	P	yedb : Mbr	Undetermined		Male polygynous. Male banded as nestling in Pueblitos in 2002.
PRG	F	Undetermined	NA		
PRM	P	yedb : Mbr	Unbanded	4	Male polygynous. Male banded as nestling at Pueblitos in 2002.
PRN	P	Mre : yeye	Msi : dgre	3	Male polygynous. Male banded as nestling at Pueblitos in 2003. Female banded as nestling at Bell in 2004.
THN	S	Mdg : yebk	NA		Male banded at Couser Canyon on the San Luis Rey River in 2002.

^a Pair = pair, S = single male, F = floater.

^b Band combinations: left leg:right leg; Msi = federal aluminum band, Mdg = anodized green federal band, Mbr = anodized bronze federal band, Mre = anodized red federal band. *Celluloid band*: LBBK = light blue-black split. *Metal bands*: pupu = purple, yeye = yellow, dgdg = dark green, rewh = red-white split, orwh = orange-white split, dbwh = dark blue-white split, puwh = purple-white split, whdg = white-dark green split, whye = white-yellow split, whre = white-red split, yedb = yellow-dark blue split, yere = yellow-red split, dbye = dark blue-yellow split, yebk = yellow-black split, dgre = dark green-red split, redb = red-dark blue split, ordg = orange-dark green split

^c see Figures 27 and 28 for Camp Pendleton locations mentioned in the comments.

Survivorship, Site Fidelity, and Movement

The recapture and resighting of banded birds allowed us to estimate survivorship, or the proportion of individuals known to survive from one year to the next. Of the banded adult flycatchers present during the 2004 breeding season, 33% (5/15) of males and 30% (6/20) of females returned to Camp Pendleton in 2005. Overall, adult survivorship from 2004 on Camp Pendleton was 31% (11/35). Survivorship was calculated based on the banded population seen at Camp Pendleton only, and does not include an additional male detected on Base in 2005 who

was banded at Couser Canyon on the San Luis Rey River in 2002. In addition, an adult female last seen in 2003 reappeared in 2005, increasing the survivorship estimate of the 2003 population.

Seven of the 42 nestlings banded in 2004 that survived to fledge were resighted at Camp Pendleton in 2005, yielding an estimate of first year survivorship of 17%. These birds included six females and one male. All returning second year birds paired and nested in 2005.

Willow flycatchers at Camp Pendleton generally settle into breeding concentrations or areas where groups of birds establish territories (Figures 27 and 28). Resighting banded birds allowed us to identify individuals that returned to the same area they used the previous year. In 2005, six of the 11 banded returning adults (55%, excluding female MUT (Table 4), whose previous territory location could not be determined) returned to the breeding area that they occupied in 2004 (Table 5). Adding one bird last seen in 2003 who returned to Camp Pendleton but not to the same area in 2005 decreases area fidelity to 50% (6/12; Table 5). Eighty-three percent (5/6) of the adult flycatchers returning to the same areas also returned to the same territories occupied in 2004, while 17% shifted territory locations within the area (Table 5).

In contrast to returning adults, none of five second year birds banded as nestlings in 2004 and of known origin returned to their natal areas to breed (see below).

Table 5. Area fidelity and between-year, within-area movement of southwestern willow flycatcher adults at Marine Corps Base Camp Pendleton in 2005.

Drainage	Area^a	# Banded Birds in Area, 2004	# Birds Returning to Area	Area Fidelity (%)	# (%) Birds Moved Within Area	Distance Moved (m)
Fallbrook Creek	O'Neill Lake	1	1	100%	0 (0)	N/A
Santa Margarita	Air Station	0	0	0%	N/A	N/A
	Pump Road	4	3	75%	0 (0)	N/A
	Pueblitos	3 ^b	1	33%	1 (100)	345
	Ysidora Ponds	3	1	33%	0 (0)	N/A
	Bell	0	0	0%	N/A	N/A
Las Flores Creek	Above Basilone	1	0	0%	N/A	N/A
Overall Totals		12	6	50%	1 (17)	345

^a Figures 27 and 28 show flycatcher concentration areas.

^b Includes one flycatcher not detected in 2004, but last seen in 2003 at Pueblitos.

We were also able to detect willow flycatchers that returned to different areas than they had occupied in 2004. Of the 11 banded adults detected at Camp Pendleton in 2004 that returned to the Base, five (45%) returned to different breeding areas in 2005, all within the Santa Margarita River (Table 6, Figure 27). Of these five, two were males and three were females, all

paired. Two birds, one from Pueblitos and one from Ysidora Ponds, moved into Bell, two other birds, one from Ysidora Ponds and one from Las Flores Creek, moved into Pump Road, and one bird moved from Pump Road into Ysidora Ponds (Table 6, Figure 27). One additional banded flycatcher detected as a female in the Pueblitos area in 2003 was not detected in 2004, but was seen in 2005 in the Ysidora Ponds area (Table 6, Figure 27), raising the proportion of birds moving between years to 50%. On average, adults move 3.4 ± 3.7 km between years.

Second year birds banded as nestlings in 2004 also exhibited between-year movement from 2004 to 2005 with all five (excluding two birds not recaptured and therefore with origins not confirmed; Table 4) returning birds moving to areas other than their natal areas. Two second year birds banded as nestlings at Bell in 2004 returned to Pump Road, one from Ysidora Ponds returned to Pueblitos, one from Pueblitos moved to Bell, and one from Pump Road moved to the Bell area (Table 6, Figure 27). The average distance that second year birds dispersed from their natal areas was 2.2 ± 0.8 km.

One bird, a male banded in 2002 as an adult at Couser Canyon on the San Luis Rey River 23.5 km away, immigrated onto the Base in 2005 and established a territory in the Treatment Ponds area (Table 6, Figure 27).

Table 6. Between-year, between-area movement of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in 2005.

Year Last Detected	Location Last Detected / Territory	Location Detected / Territory in 2005	Distance Moved (km)	Band Combination ^a	Age in 2005 ^b	Sex
2004	Bell / BEE	Pump Road / PIC	2.7	Msi : dgdg	SY	F
2004	Bell / BTY	Pump Road / PRN	2.8	Msi : dgre	SY	F
2004	Pueblitos / EDY	Bell / BEE	2.1	Msi : redb	SY	F
2004	Pump Road / POM	Bell / BTL	2.7	Msi : whye	SY	F
2004	Ysidora Ponds / MPS	Pueblitos / EDY&ETC&EWN	1.9	Msi : yere	SY	M
2004	Pueblitos / EDY	Bell / BRS & BTL	2.0	Mdg : yedb	ASY	M
2004	Ysidora Ponds / MGW	Pump Road / PIT	2.1	whre : Msi	TY	F
2004	Ysidora Ponds / MLY	Bell / BRS	0.6	Mre : rewh	TY	F
2004	Las Flores Creek / LUL	Pump Road / MUT & MPL	10.0	Mdg : dbwh	ATY	M
2004	Pump Road / PHL	Ysidora Ponds / MSL	2.4	pupu : Mdg	ATY	F
2003	Pueblitos / 102	Ysidora Ponds / MPL	0.7	ordg : Mbr	5Y	F
2002	Couser Canyon, San Luis Rey	Treatment Ponds / THN	23.5	Mdg : yebk	A4Y	M

^a Band combinations: left leg:right leg; Msi = federal aluminum band, Mdg = anodized green federal band, Mbr = anodized bronze federal band, Mre = anodized red federal band. Metal bands: dgdg = dark green, pupu = purple, dgre = dark green-red split, yere = yellow-red split, whre = white-red split, rewh = red-white split, redb = red-dark blue split, yedb = yellow-dark blue split, ordg = orange-dark green split, whye = white-yellow split, dbwh = dark blue-white split, yebk = yellow-black split.

^b Age codes: SY = second year - fledged 2004, TY = third year - fledged 2003, 5Y = fifth year - fledged 2001, ASY = after second year - bird is known to be at least three years old, ATY = after third year - bird is known to be at least four years old, A4Y = after fourth year - bird is known to be at least five years old.

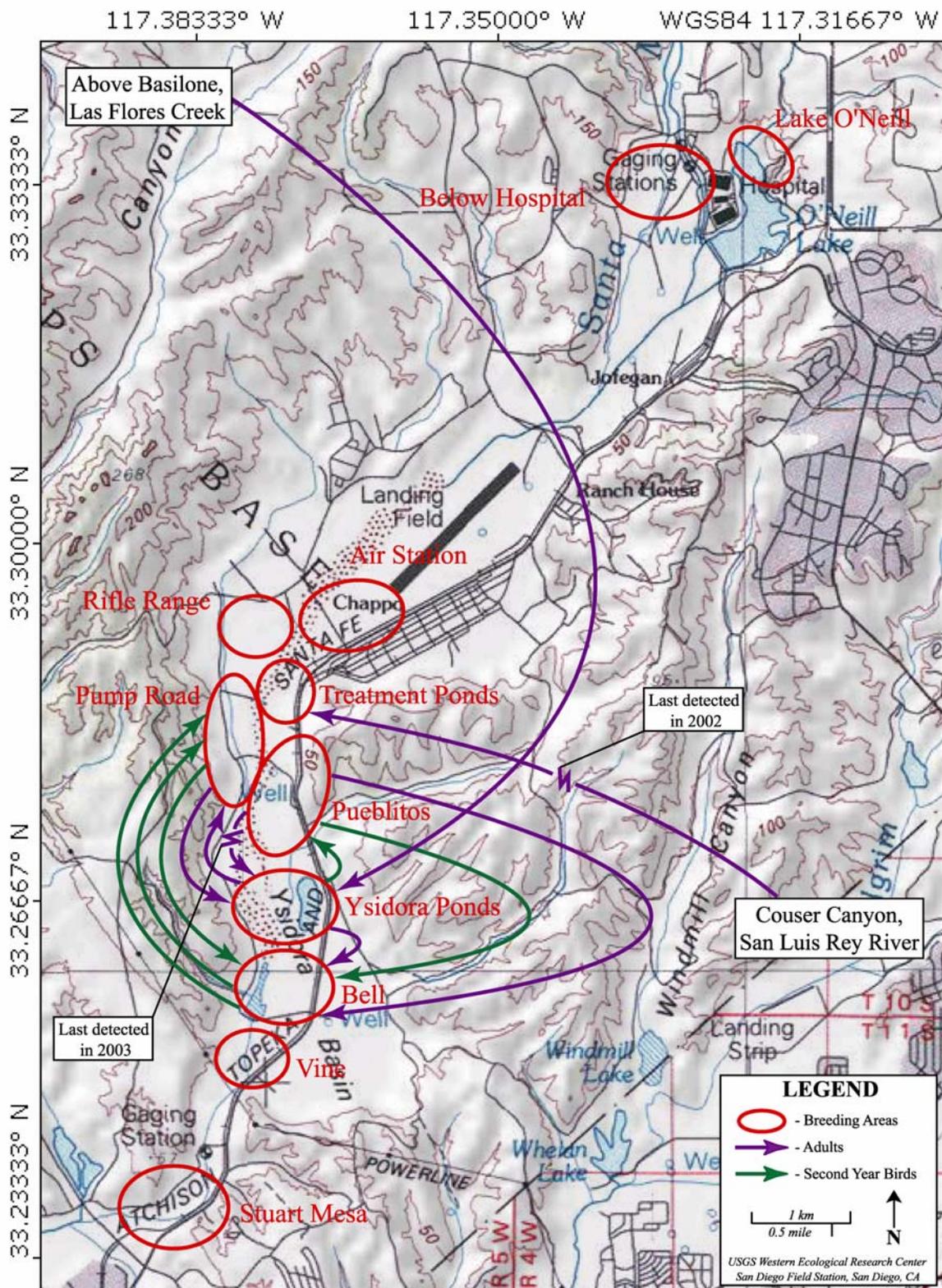


Figure 27. Between-year, between-area movement by adult and second year southwestern willow flycatchers at Marine Corps Base Camp Pendleton, 2005.

Two incidents of movement by adult willow flycatchers within the 2005 season were observed (Table 7, Figure 28). One male documented as single and banded in territory ARC in the Air Station area (Figure 18) at the beginning of the season later moved to Pump Road (territory PHL, Figure 19) where he remained single. A second male, who spent the beginning of the season at Treatment Ponds (territory THN, Figure 21) moved out of the area and was not detected again after late May.

Table 7. Within-year, between-area movement of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in 2005.

Area First Detected	Area Later Detected	Distance Moved (km)	Band Combination ^a	Age ^b	Status	Comments
Air Station	Pump Road	1.6	Msi : rewh	AHY	Single	Movement occurred near beginning of season. Remained single at new location.
Treatment Ponds	not seen again	N/A	Mdg : yebk	A4Y	Single	Movement occurred near beginning of season. Bird not detected after left area.

^a Band combinations: left leg:right leg; Msi = federal aluminum band, Mdg = anodized green federal band. Metal bands: rewh = red-white split, yebk = yellow-black split.

^b Age codes: AHY = after hatch year - bird is known to be at least in it's second year, A4Y = after fourth year - bird is known to be at least four years old.

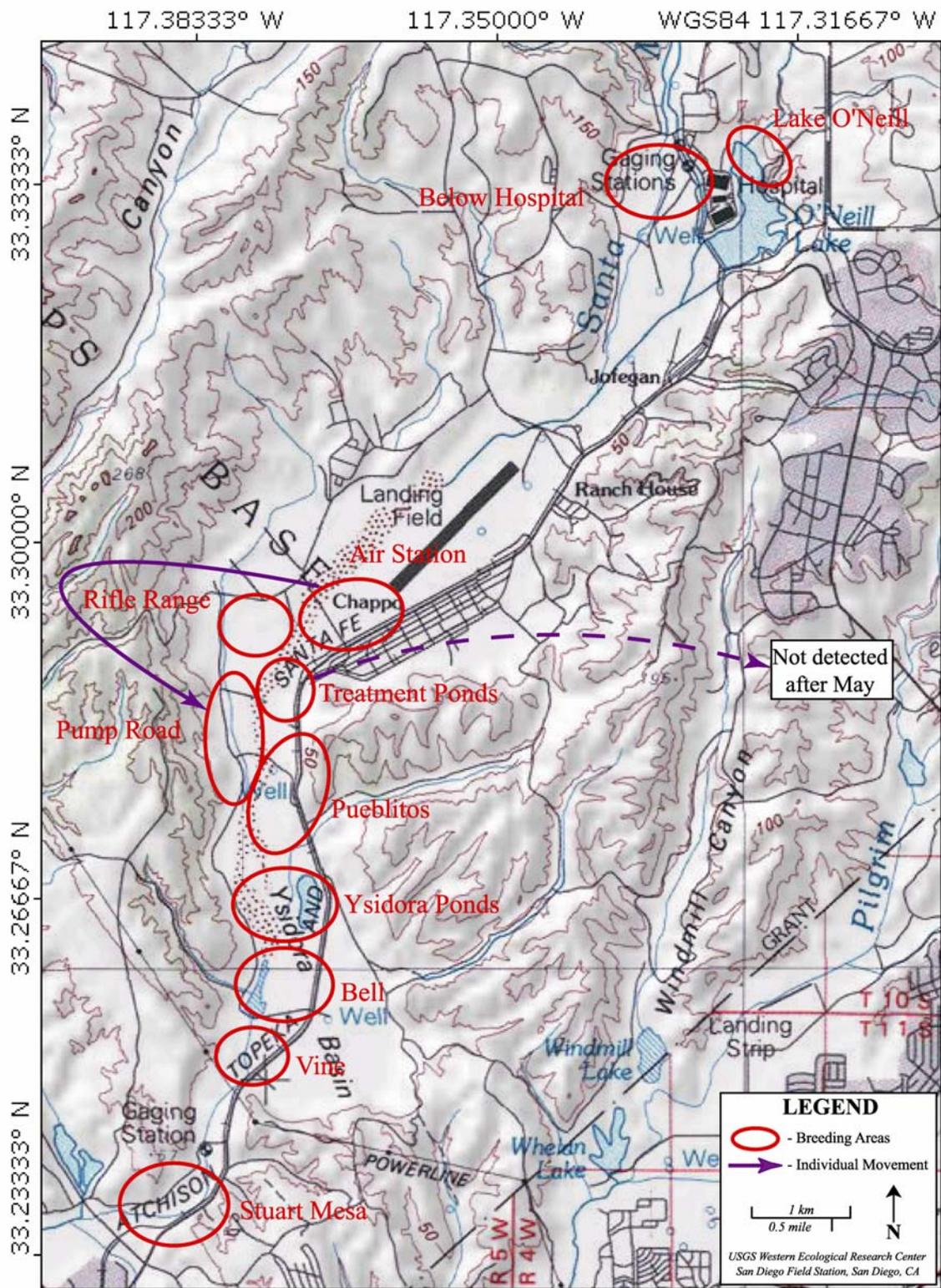


Figure 28. Same-year, between-area movement by southwestern willow flycatchers at Marine Corps Base Camp Pendleton, 2005.

DISCUSSION

The 2005 breeding season followed a winter of record-breaking precipitation and flooding in San Diego County which resulted in dramatic changes to the habitat used by willow flycatchers at Camp Pendleton. Scouring of the floodplains widened channels and removed or disturbed riparian vegetation throughout the Base. Standing water and saturated soils persisted well into the summer, and promoted lush growth of herbaceous vegetation as flood waters receded. Flood-related changes to habitat appeared to be responsible for shifts in habitat use by flycatchers, and may have affected flycatcher abundance as well.

The number of transient willow flycatchers detected in 2005 (35) was less than half the number counted in 2004 (82; Kus and Kenwood 2006), although comparable to the total of 39 detected in 2003 (Kus and Kenwood 2005). While it is likely that the decline in 2005 is in part a response to changed habitat conditions, the number of transients observed annually is highly variable despite consistent survey scope and effort, making it difficult to explain differences between years in the transient population. Transients in 2005 were on average within 108 m of standing water, much closer than in the past three years when distance to water averaged between 200-489 m (Kus and Kenwood 2003, 2005, 2006). This probably reflects a change in the distribution of surface water rather than a change in habitat used by transient flycatchers.

Resident flycatchers exhibited changes in distribution as well. The southern portion of the Bell area on the lower Santa Margarita River, which supported four pairs and one floater in 2004 (Kus and Kenwood 2006), was occupied by only one floater in 2005. The eastern section of Ysidora Ponds, and the southern section of the Pueblitos area did not support birds in 2005, and the Air Station, re-colonized in 2004, was occupied for only part of the season in 2005 by a single male. In contrast, the density of birds in traditional use areas (e.g., Pump Road, Bell) along the middle Santa Margarita River increased, and several new areas were colonized or re-colonized, including northern Ysidora Ponds and the Treatment Pond, the latter last occupied in 2001 (Kus and Ferree 2002). Movement of individuals between years, detected through resighting of banded birds, increased considerably from 28% of returning adults between 2003-2004 to 45% of returning adults between 2004-2005.

The number of resident flycatcher pairs in 2005 (17) declined from the 22 pairs observed in 2004 (Kus and Kenwood 2006), the largest number of pairs documented at the Base since 1999. However, it falls within the range of breeding pairs present in previous years (16-18; Kus and Ferree 2002, Kus and Kenwood 2003, 2005). The degree of polygyny in the population continued to increase, with 75% (6/8) of paired males polygynous, and 88% (15/17) of females sharing males. As in 2004, single males, and (probable) male floaters were present during the breeding season, but the majority of females paired instead with polygynous males. Despite the availability of unpaired males, however, the number of females (17) exceeded the number of males (12-15, depending on the actual sex of three floaters considered probable males) for the first time in 2005, creating conditions where polygyny benefits females as well as males if the alternative for females is failure to mate. Continued monitoring at Camp Pendleton, combined with information from other polygynous populations of willow flycatchers (Davidson and Allison 2003), should enhance our understanding of the basis for polygyny in this species, and

its implications for genetic viability of the population.

Nest success was higher in 2005 than in 2004 (60% versus 52%, respectively). Predation and host plant collapse accounted for the majority of nest failures, each responsible for 40% of failed nests (4/10). Host plant collapse has been associated with the placement of nests in poison hemlock, which has been the most commonly used nest substrate in recent years (Kus and Kenwood 2005, 2006). The use of poison hemlock declined slightly from 42% of nests in 2004 to 36% of nests in 2005, and proportionately fewer of the nests placed in this host failed as a result of collapse (31% and 22%, respectively), probably because of subsequent efforts by nest monitors to secure the host plants against collapse by tying them to reinforcements. However, host plant collapse was also documented for the first time in a native host, stinging nettle, indicating that this source of nest failure is not limited to the exotic poison hemlock.

Although nest success increased in 2005 relative to 2004, seasonal productivity declined slightly from 1.8 fledglings per pair to 1.7 fledglings per pair in 2004 and 2005, respectively. This did not result from a reduction in clutch size, as average clutch size was constant over the two years, at 3.2 eggs per nest. Rather, it resulted from the failure of eggs to hatch (N=5) or the disappearance of eggs or nestlings (N=10) from nests that otherwise fledged young. Of the 45 eggs laid in successful nests, these 15 losses represent a 33% reduction in the potential number of young that could have been produced had they hatched/survived. The disappearance of individual eggs and nestlings from nests, suggestive of partial predation, has not been as extensive in previous years (e.g., reduction of 24% (12/51) in 2004 (Kus and Kenwood 2006), 16% (9/57) in 2003 (Kus and Kenwood 2005).

The return of banded adults between 2004 and 2005 (31%) was nearly half that observed between 2003-2004 (56%), but return of second year birds was comparable between the two years (17% in 2005, 15% in 2004). Although the rate of return of second year birds seems low, the fraction of the breeding population made up of second year birds was the highest ever documented at the Base, at 33%. It appears that the Pendleton population has reached a stage of turnover where older birds are being replaced in substantial numbers by first-time breeders. This creates the opportunity to collect life-time reproductive data for a growing segment of the population, which will facilitate identification of age-and sex-related patterns in life history characteristics that influence population size, productivity, and genetic structure.

2005 marks the third year in which immigration onto the Base has been documented, bringing to four the number of birds entering the Pendleton flycatcher population. The immigration of a male from Couser Canyon on the San Luis Rey River represents the longest distance traveled by an immigrating bird (24 km) moving to Camp Pendleton, and is an encouraging sign that regional flycatcher populations are connected through dispersal over a large area. Further banding and resighting of flycatchers throughout their range will allow a better determination of the extent of movement between populations and the role such movement plays in maintaining genetic diversity and persistence in these populations.

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