



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

2012 Annual Data Summary



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 28 July 2012. Twenty-nine transient flycatchers of unknown subspecies were observed during Base-wide surveys. Transients occurred on 8 of the 16 drainages surveyed in 2012. No Willow Flycatchers were detected at Aliso Creek, Cristianitos Creek, De Luz Creek, Horno Canyon, Newton Canyon, Roblar Creek, San Onofre Creek, or Windmill Canyon. Transients occurred in a range of habitat types including mixed willow (*Salix* spp.) riparian, willow-sycamore (*Platanus racemosa*) dominated riparian, oak (*Quercus* sp.)-sycamore dominated riparian, and riparian scrub.

In 2012, the resident Southwestern Willow Flycatcher population on Base consisted of four males, eight females, and one non-territorial floater of unknown sex. Ten territories were established, consisting of eight pairs (two polygynous groups consisting of one male pairing with five different females and one male pairing with three different females), one single male, and one male of unknown status. In total, eight females formed pair bonds with two male Willow Flycatchers.

The majority of territories were located along the Santa Margarita River. One territory was established at Lake O'Neill on Fallbrook Creek and one territory at the Sierra percolation ponds near San Mateo Creek. All territories were located in mixed willow riparian habitat. Poison hemlock (*Conium maculatum*) was present in the majority of the territories.

Fifty percent (4/8) of Willow Flycatcher pairs successfully fledged at least one young during the 2012 breeding season. Nesting was initiated in late May and continued into late July. Fifteen nesting attempts were documented, of which 27% (4/15) were successful. Thirteen fledglings were produced, yielding a seasonal productivity of 1.6 young/pair (13 young/8 pairs). No instances of Brown-headed Cowbird (*Molothrus ater*) parasitism were observed. Pairs placed nests in five species of plants, including black willow (*S. gooddingii*), sandbar willow (*S. exigua*), blue elderberry (*Sambucus nigra*), stinging nettle (*Urtica dioica*), and poison hemlock. Ninety-three percent (14/15) of nests were placed in native plant species.

Twelve birds (four males and eight females) that were banded in previous years were present at Camp Pendleton in 2012. Of the banded adult flycatchers present during the 2011 breeding season, 40% (2/5) of males and 83% (5/6) of females returned to Camp Pendleton in 2012. One hundred percent (7/7) of those returned to the same breeding area. Twenty percent (3/15) of nestlings banded in 2011 returned to the Base as adults in 2012, one male and two females. Both females paired and nested in 2012; the male established a territory at Lake O'Neill but no evidence of pairing was seen. Twenty-four nestlings from seven nests were banded in 2012. 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, Brown-headed Cowbird (*Molothrus ater*) 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 10-fold since the mid-1980's in response to management alleviating these threats (USFWS 2006), 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 2007), the Upper San Luis Rey River, including a portion of the Cleveland National Forest in San Diego County (Howell and Kus 2010b), and Marine Corps Base Camp Pendleton in San Diego County (Howell and Kus 2010a). 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, Kus and Whitfield 2005).

Male Southwestern Willow Flycatchers typically arrive in southern California at the end of April while females arrive approximately one week later. Males sing repeatedly from exposed perches while on the breeding grounds. Once the pair bond is established, the female builds an open-cup nest usually placed in a branch fork of a willow (*Salix* spp.) or plant with a similar branching structure approximately 1-3 m above the ground. The typical clutch of 3-4 eggs is laid in May-June. Females incubate for approximately 12 days and nestlings fledge within 12-15 days in early July. Adults usually depart from their breeding territory in mid-August/early September to their wintering grounds in central Mexico and northern South America.

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 28 July (Fig. 1, Appendix A, Figs. 4-9). Field work was conducted by USGS personnel Lisa Allen, Patience Falatek, Aaron Gallagher, Scarlett Howell, Barbara Kus, Maia Lipshutz, Suellen Lynn, Sarah Nichols, Eric Nolte, Jason Pietrzak, Ryan Pottinger, and Anne Winters. The specific areas surveyed are as follows:

Santa Margarita River: between Stuart Mesa Road and the Base boundary, including Ysidora Basin and Stagecoach Canyon (Appendix A, Figs. 4, 5).

De Luz Creek: between the confluence with the Santa Margarita River and the Base boundary (Appendix A, Fig. 4).

Roblar Creek: from the confluence with De Luz Creek to a point approximately 1.5 km upstream (Appendix A, Fig. 4).

Fallbrook Creek: around Lake O'Neill as well as along the creek between the lake and the Base boundary (Appendix A, Fig. 4).

Newton Canyon: between the confluence with the Santa Margarita River and the upstream limit of riparian habitat (Appendix A, Fig. 5).

Cockleburr Canyon: between the Pacific Ocean and 0.25 km upstream of Interstate 5 (Appendix A, Fig. 5).

French Creek: between the Pacific Ocean and the Edson Range Impact Area (Appendix A, Fig. 5).

Aliso Creek: between the Pacific Ocean and 0.5 km upstream of the electrical transmission lines (Appendix A, Fig. 5).

Cristianitos Creek: between the confluence with San Mateo Creek and the Base boundary (Appendix A, Fig. 6).

San Mateo Creek: between the Pacific Ocean and the Base boundary, including habitat south of the creek and south of the agricultural fields (Appendix A, Figs. 6, 7).

San Onofre Creek: between the Pacific Ocean and the access road to Range 219 (Appendix A, Figs. 6, 8).

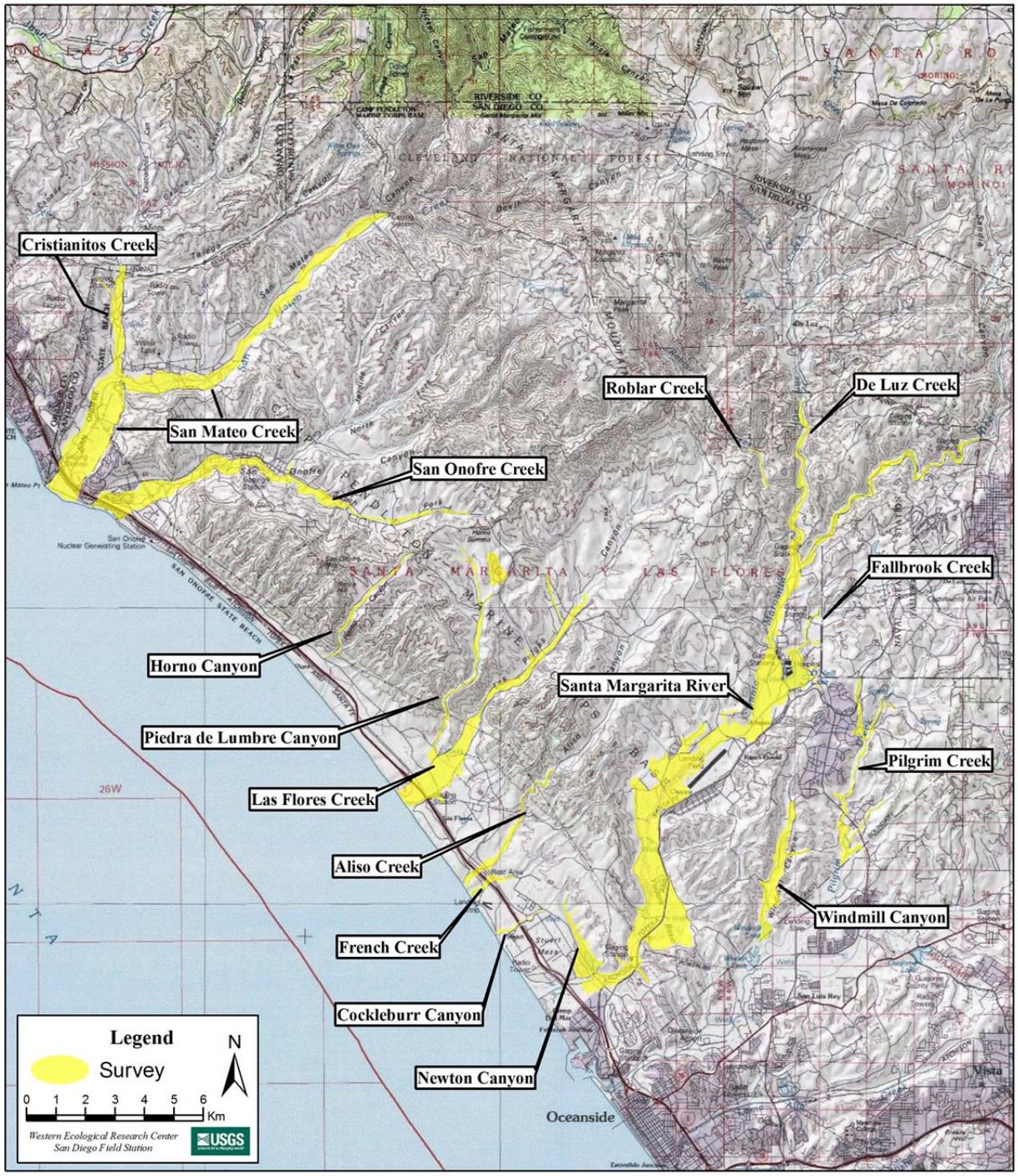


Fig. 1. Southwestern Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2012.

Las Flores Creek: between the Pacific Ocean and a point approximately 800 m upstream of Basilone Road (Appendix A, Fig. 8).

Piedra de Lumbre Canyon: between the confluence with Las Flores Creek and the upstream limit of riparian habitat, approximately 2.7 km upstream of Las Pulgas Lake (in 2012 only, includes Ammunition Supply Point compound) (Appendix A, Fig. 8).

Horno Canyon: between Old Highway 101 and the upstream limit of riparian habitat (Appendix A, Fig. 8).

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 (Appendix A, Fig. 9).

Windmill Canyon: from the Base boundary to the golf course entrance (Appendix A, Fig. 9).

Drainages were surveyed one to three times at least 7 days apart. The majority of drainages were surveyed three times. The upper portion of the Santa Margarita River and Roblar Creek were surveyed twice.

Investigators followed standard survey protocol (Sogge *et al.* 2010), moving slowly (approximately 2 km/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 60 Global Positioning System (GPS) or Trimble Juno SB GPS unit with 1-15 m positioning accuracy to determine geographic coordinates (WGS84). For all resident flycatchers, territory boundaries were approximated by mapping singing perches and the extent of the male's and female's use area on 1":12,000" aerial photographs. Habitat type was recorded for each location according to the following categories based on dominant vegetation:

Mixed willow riparian: Habitat dominated by one or more willow species including black willow (*S. gooddingii*), arroyo willow (*S. lasiolepis*), and red willow (*S. laevigata*), with mule fat (*Baccharis salicifolia*) as a frequent co-dominant.

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

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

Sycamore-oak: Woodlands in which sycamore and oak (*Quercus agrifolia*) occur as co-dominants.

Riparian scrub: Dry and/or sandy habitat dominated by sandbar willow (*S. exigua*) or mule fat, with few other woody species.

Upland scrub: Coastal sage scrub adjacent to riparian habitat.

Non-native: Sites vegetated exclusively with non-native species such as giant reed (*Arundo donax*) and salt-cedar (*Tamarix ramosissima*).

Percent cover of exotic vegetation at each location was estimated using cover categories of <5%, 5-50%, 51-95% and > 95%, and the dominant exotic species recorded.

Nest Monitoring

Pairs were observed for evidence of nesting and nests were 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 to nest sites; typically, there were 3-4 visits/nest. The first visit was timed to determine the number of eggs laid, the next to confirm hatching and age of young, and the last to band nestlings. After a nest became inactive, six possible nest fates were assigned based on the following parameters:

(SUC) Successful: Nest fledged at least one young. Fledging was confirmed by detection of young outside the nest.

(PRE) Nest failed as a result of predation: This includes (1) nests seen in the process of ant or other predation, (2) nests found with evidence such as eggshell fragments, feathers, or partially consumed nestlings in or below the nest, (3) nests with eggs or nestlings later found empty and torn from supporting branch, either partially or completely, typically indicative of mammal predation (Peterson *et al.* 2004), and (4) nests that had eggs or nestlings but were later found intact and empty before the expected fledge date with no evidence of eggs or nestlings on the ground, consistent with snake and bird predation which typically leave no sign (Peterson *et al.* 2004).

(PAR) Nest failed as a result of parasitism: This includes (1) nests that were abandoned with one or more cowbird eggs in the nest, and (2) nests that were tended by the host but contained only cowbird eggs.

(INC) Incomplete: Nests that were seen under construction, but were never completed.

(OTH) Nest failed for other reasons that are known: This includes nests that failed for reasons such as host plant failure, surrounding vegetation falling and crushing a nest, inviable eggs that did not hatch after more than 2 weeks, and human disturbance such as mowing or weed-whacking. This category also includes nests that appeared to have failed as a result of cowbird “predation” such as (1) abandoned nests containing punctured eggs in or below the nest, (2) nests

where nestlings were killed by a puncture wound to the skull, or (3) nests where nestlings were ejected from the nest and found on the ground.

(UNK) Nest failed for unknown reasons: This designation is used when no other reason could be confirmed. In many instances, the fate “UNK” was assigned to nests that were likely depredated, but because we could not confirm egg-laying did not fit the criteria of the “PRE” fate (above). These are explained more fully in results.

Nest site characteristics were recorded following the abandonment or fledging of nests. Measurements included nest height, host species, host height, distance from the nest to the edge of the host species, and distance from the nest to the edge of the clump of riparian vegetation. Distance to edge of clump was expressed as a negative number if the nest was not located in a clump of riparian vegetation. For example, if the nest was located in a field of poison hemlock (*Conium maculatum*) without any other non-hemlock vegetation present, the distance to the nearest clump of riparian vegetation was measured, and the value expressed as a negative number.

Banding

Nestlings were banded at 7-10 days of age. Each bird received a silver aluminum federal numbered band on the left leg. Unbanded adults were captured in mist nets within their territories and were banded with a numbered federal band on one leg and a solid or bi-colored metal band on the other. Returning second-year birds banded as nestlings in 2011, with a single silver aluminum federal numbered band on the right leg, were recaptured in their territories and banded with a colored metal band on the left leg to yield a full, unique combination.

RESULTS

Population Size and Distribution

Transients

Twenty-nine Willow Flycatchers of unknown sub-species were observed during Base-wide surveys (Appendix B, Figs. 10-16). The majority of transients were detected between 15 May and 15 June, with the exception of one detection on 5 July. Transients occurred on 8 of the 16 drainages surveyed in 2012. No Willow Flycatchers were detected at Aliso Creek, Cristianitos Creek, De Luz Creek, Horno Canyon, Newton Canyon, Roblar Creek, San Onofre Creek, or Windmill Canyon.

Residents

Thirteen Willow Flycatchers, including four males, eight females, and one unknown sex floater were detected throughout the 2012 breeding season (Appendix B, Figs. 10, 14-15; Appendix C, Figs. 17-21). Two of the males were paired, one remained single, and one male's breeding status was undetermined. Both of the paired males were polygynous; one with five females (Appendix C, Fig. 18), and one with three females (Appendix C, Figs. 19-20). The unknown breeding status male (Appendix C, Fig. 21) was detected on 6 July; however, the bird

may have been present as early as 9 June and not detected until July because of survey timing. The floater of unknown sex was detected in late July in the territory of a resident male (Appendix C, Fig. 18). Although the bird was only seen once, it was determined to be a floater rather than a transient because it was detected during a period when most new detections are considered to be either territorial birds or nonbreeding floaters (15 June to 20 July; Unitt 1987, Sogge *et al.* 2010), and the bird's song was slow and indicative of the *E. t. extimus* subspecies (Sedgwick 2001). In total, ten known territories (i.e., one unpaired male, one male of unknown status, and eight female nesting locations) were established in 2012, with eight females forming pair bonds with two male Willow Flycatchers. Overall, the resident flycatcher population on Base remained steady from 2011 to 2012 (Fig. 2).

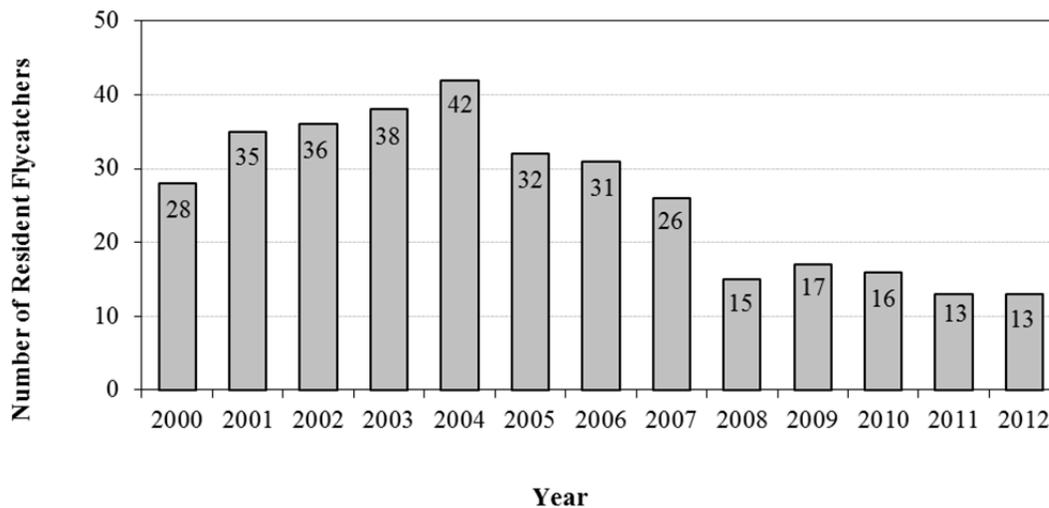


Fig. 2. Southwestern Willow Flycatcher population estimates for Marine Corps Base Camp Pendleton, 2000-2012.

Resident flycatchers were restricted to the Santa Margarita River (Appendix B, Fig. 14; Appendix C, Figs. 18-20), Lake O'Neill on Fallbrook Creek (Appendix B, Fig. 15; Appendix C, Fig. 21), and lower San Mateo Creek (Appendix B, Fig. 10; Appendix C, Fig. 17). Along the Santa Margarita River, three core flycatcher breeding areas (those annually supporting multiple flycatcher territories) were occupied in 2012: Air Station, Treatment Ponds, and Pump Road. The Air Station area supported the largest concentration of breeding flycatchers with five pairs, the Treatment Ponds area supported two breeding pairs, and the Pump Road area supported one pair. For the first time since monitoring began in 2000, no territorial birds were detected in the Pueblitos breeding area. Overall, flycatcher distribution on the Santa Margarita River remained contracted relative to previous years, with portions of the Santa Margarita River that historically supported resident flycatchers (Vine, Bell, Ysidora Ponds, and Pueblitos breeding areas; see Fig. 3) devoid of flycatcher territories in 2012 (Table 1). Flycatcher distribution away from the Santa Margarita River was limited to two birds. After a five year absence, Lake O'Neill once again supported a territorial male, and a single male occupied a territory at San Mateo Creek.

Table 1. Distribution of territorial Willow Flycatchers at Marine Corps Base Camp Pendleton, 2000-2012.

		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012	
Santa Margarita River		M ^a	F ^a	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
SWFL Breeding Areas	Above Hospital	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Below Hospital	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Air Station	3	3	2	3	1	1	-	-	1	1	-	-	-	-	2	2	2	2	1	4	2	4	2	3	1	5
	Rifle Range	-	-	-	-	-	-	1	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-
	Pump Road	1	1	3	3	3	3	2	3	5	6	3	6	2	4	3	5	2	1	2	1	1	2	1	1	- ^b	1
	Treatment Ponds	1	-	1	-	-	-	-	-	-	-	1	-	1	4	2	2	1	1	2	2	2	2	2	1	2	1
	Pueblitos	4	-	3	4	3	3	4	5	4	4	1	3	3	6	1	1	2	3	2	1	- ^b	1	1	-	-	-
	Ysidora Ponds	4	2	4	4	2	2	2	2	2	4	4	5	2	3	2	1	-	-	-	-	-	-	-	-	-	-
	Bell	2	1	2	2	3	3	1	2	4	6	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Vine	2	2	1	1	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stuart Mesa	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Lake O'Neill	1	1	1	1	1	1	2	1	1	1	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	
Las Flores Creek	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
San Mateo Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1	-	1	-	1	-	1	-	
Total	18	10	17	18	17	16	16	16	18	22	12	17	12	19	12	14	7	7	8	8	6	9	6	6	4	8	

^a Sex: M = male, F = female. ^b One male's territory spanned two breeding areas; included in Treatment Ponds total

Sources: Kus 2001; Kus and Ferree 2002; Kus and Kenwood 2003, 2005, 2006a, b; Kenwood and Kus 2007; Rourke *et al.* 2008; Howell and Kus 2009a, b, 2010a, 2011.

Habitat Characteristics

Eighty percent (32/40) of all flycatcher sightings occurred in habitat classified as mixed willow riparian, 50% (16/32) of which occurred along the Santa Margarita River (Table 2). Eight percent (3/40) of locations were in riparian scrub, dominated by mule fat and/or sandbar willow, and an additional 8% were found in willow habitat co-dominated by sycamore. The remaining 5% (2/40) of flycatcher detections were located in habitat dominated by a mix of sycamores and oaks. While transients used all habitat types, resident flycatchers were found exclusively in mixed willow riparian.

The most common exotic plant in habitat used by flycatchers in 2012 was poison hemlock. Sixty-eight percent (27/40) of flycatcher locations were composed of 5-50% exotic vegetation, primarily poison hemlock. Five percent (2/40) of sites were dominated by exotic vegetation (percent cover of exotics >50; Table 2), with poison hemlock again the dominant species.

Table 2. Habitat characteristics of Willow Flycatcher locations at Marine Corps Base Camp Pendleton in 2012.

Bird ID	Drainage	Status ^a	Habitat Type ^b	Exotic Cover Class ^c	Dominant Exotics ^d
CC01F	Cocklebur Canyon	T	Mixed Willow	1	-
CC02F	Cocklebur Canyon	T	Mixed Willow	1	-
OL01F	Fallbrook Creek	T	Riparian Scrub	2	CON
OL02F	Fallbrook Creek	T	Mixed Willow	2	TAM
OL03F	Fallbrook Creek	T	Mixed Willow	1	-
OL04F	Fallbrook Creek	T	Mixed Willow	2	BRA, CON

Table 2 (*continued*). Habitat characteristics of Willow Flycatcher locations at Marine Corps Base Camp Pendleton in 2012.

Bird ID	Drainage	Status ^a	Habitat Type ^b	Exotic Cover Class ^c	Dominant Exotics ^d
OL05F	Fallbrook Creek	U	Mixed Willow	1	-
FR01F	French Creek	T	Mixed Willow	1	-
FS201	Las Flores Creek	T	Mixed Willow	1	-
LL01F	Las Flores Creek	T	Mixed Willow	1	-
LL02F	Las Flores Creek	T	Mixed Willow	1	-
LN01F	Las Flores Creek	T	Willow/Sycamore	2	BRA, CON
LN02F	Las Flores Creek	T	Mixed Willow	2	BRA, CON
PD01F	Piedra de Lumbre Canyon	T	Mixed Willow	2	FOE
PS01F	Pilgrim Creek	T	Mixed Willow	2	PIC
MAT	San Mateo Creek	S	Mixed Willow	1	-
MB02F	San Mateo Creek	T	Willow/Sycamore	1	-
MB03F	San Mateo Creek	T	Mixed Willow	2	ARU, CON
MU01F	San Mateo Creek	T	Riparian Scrub	2	BRA
MU02F	San Mateo Creek	T	Riparian Scrub	2	BRA
MU03F	San Mateo Creek	T	Mixed Willow	2	BRA
MU04F	San Mateo Creek	T	Oak/Sycamore	2	BRA
AE51F	Santa Margarita River	T	Mixed Willow	2	CON
AE52F	Santa Margarita River	F	Mixed Willow	2	CON
AEO	Santa Margarita River	P	Mixed Willow	2	CON
AH01F	Santa Margarita River	T	Oak/Sycamore	2	CON
ANG	Santa Margarita River	P	Mixed Willow	2	CON
APL	Santa Margarita River	P	Mixed Willow	2	CON
APR	Santa Margarita River	P	Mixed Willow	2	CON
ARC	Santa Margarita River	P	Mixed Willow	2	CON
ESF81	Santa Margarita River	T	Mixed Willow	2	CON
ESF82	Santa Margarita River	T	Mixed Willow	2	CON
PNB	Santa Margarita River	P	Mixed Willow	2	CON
PR02F	Santa Margarita River	T	Mixed Willow	2	CON, PIC
PRS01F	Santa Margarita River	T	Mixed Willow	3	CON
PRS02F	Santa Margarita River	T	Willow/Sycamore	2	CON
SW01F	Santa Margarita River	T	Mixed Willow	1	-
TLM	Santa Margarita River	P	Mixed Willow	2	CON
TWI	Santa Margarita River	P	Mixed Willow	2	CON
YB01F	Santa Margarita River	T	Mixed Willow	3	CON

^a F = Floater, P = breeding pair, S = single resident male, T = transient, U = unknown status bird.

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

^c 1 = <5%, 2 = 5-50%, 3 = 51-95%.

^d ARU = giant reed, BRA = black mustard (*Brassica nigra*), CON = poison hemlock, FOE = fennel (*Foeniculum vulgare*), PIC = ox-tongue (*Picris echioides*), TAM = salt-cedar

Breeding Activities

Nesting was observed for all eight pairs (Table 3). Nesting was initiated in late May. The earliest confirmed lay date was 27 May and the latest was 5 July. Six pairs attempted more than one nest, all following an unsuccessful initial attempt. Of the re-nesting pairs, one attempted a third nest after two unsuccessful attempts. The TLM female built her first nest on top of her 2011 nest, a behavior not previously documented on Base. Nesting continued into July, with the last young fledging on 29 July. Of the eight breeding pairs, 50% (4/8) fledged young during the 2012 breeding season.

Fifteen nesting attempts by Willow Flycatchers were documented during the 2012 breeding season. Twenty-seven percent (4/15) of nests successfully fledged at least one flycatcher young. Although no predation events were witnessed, predation was believed to be the primary source of nest failure, accounting for 82% (9/11) of nest failures. Three predation events took place during the egg stage, five during the nestling stage, and one on or around hatch day so it is unclear during which stage the depredation occurred. Of the six pairs whose nests were depredated, two re-nested successfully, three were depredated again, and one female did not attempt a re-nest after a late season failure. Substrate failure was the cause of the other two failures.

Mean clutch size, estimated from 13 nests known to have full clutches, was 3.2 ± 0.5 eggs. Thirteen fledglings were produced, yielding a seasonal productivity of 1.6 young/pair (13 young/8 pairs).

Table 3. Nesting activity of Southwestern Willow Flycatcher pairs at Marine Corps Base Camp Pendleton in 2012.

Pair ID	Lay Date	# Eggs	# Nestlings	# Fledglings	Nest Fate ^a	Comments
AEO	03 Jun	3	3	0	PRE	Nest intact but empty.
	04 Jul	3	3	0	PRE	Nest intact but empty.
ANG	19 Jun	3	3	3	SUC	
APL	27 May	4	4	0	PRE	Nest torn from supporting branch.
	29 Jun	3	3	3	SUC	
APR	10 Jun	3	0	0	PRE	Eggshell fragments and yolk in nest.
	21 Jun	3	0	0	PRE	Nest intact but empty.
ARC	21 Jun	3	3	3	SUC	

Table 3 (*continued*). Nesting activity of Southwestern Willow Flycatcher pairs at Marine Corps Base Camp Pendleton in 2012.

Pair ID	Lay Date	# Eggs	# Nestlings	# Fledglings	Nest Fate ^a	Comments
PNB	29 May	4	4	0	PRE	Nest torn from supporting branch.
	05 Jul	3	0	0	PRE	One egg missing and two broken eggs in nest.
TLM	01 Jun	3	0	0	PRE	Lining of nest pulled up.
	20 Jun	4	4	4	SUC	
TWI	29 May	3	0	0	OTH	Host vegetation shifted, eggs fell out of nest.
	13 Jun	3	0	0	OTH	Support branch broken, one whole egg and one eggshell fragment on ground.
	01 Jul	3	1	0	PRE	Partial egg predation occurred with one egg missing 7/9 and 2nd egg missing 7/12. Remaining egg hatched, but nest later found intact but empty.

^a OTH = Nest failed for other reasons, PRE = Nest failed as a result of predation, SUC = Nest fledged at least one young.

Nest Site Characteristics

Flycatchers placed nests in five species of plants (Table 4), including black willow, sandbar willow, blue elderberry (*Sambucus nigra*), stinging nettle (*Urtica dioica*), and poison hemlock. Ninety-three percent (14/15) of nests were placed in native species: 73% (11/15) in willow, 13% (2/15) in stinging nettle, and 7% (1/15) in blue elderberry. The remaining nest was placed in the exotic species poison hemlock. Nest height averaged 1.9 ± 0.6 m, while host height averaged 3.4 ± 1.4 m.

Table 4. Nest site characteristics of Southwestern Willow Flycatchers at Marine Corps Base Camp Pendleton in 2012. All measurements are in meters.

Pair ID	Nest ID	Host Species	Host Height	Nest Height	Distance to the edge of:	
					Host Plant	Clump
AEO	1	Sandbar Willow	3.7	3.3	0.4	1.0
AEO	2	Sandbar Willow	4.6	3.1	0.8	2.1
ANG	1	Stinging Nettle	2.6	1.5	0.3	0.4
APL	1	Sandbar Willow	3.6	1.5	0.8	2.5
APL	2	Sandbar Willow	4.1	2.1	0.4	1.2
APR	1	Blue Elderberry	3.4	1.5	0.9	2.1
APR	2	Sandbar Willow	2.1	1.9	0.3	1.7
ARC	1	Poison Hemlock	1.6	1.5	0.4	2.1
PNB	1	Sandbar Willow	3.4	1.6	0.4	0.6
PNB	2	Sandbar Willow	1.6	1.3	0.3	2.5
TLM	1	Black Willow	6.6	1.6	0.2	2.5
TLM	2	Sandbar Willow	4.2	1.9	2.2	2.3
TWI	1	Stinging Nettle	1.6	1.4	0.2	0.3
TWI	2	Sandbar Willow	4.3	1.5	0.3	0.5
TWI	3	Sandbar Willow	4.1	2.8	0.6	1.2

Cowbird Parasitism

All nests were checked for the presence of cowbird eggs. No nest parasitism of Southwestern Willow Flycatcher nests by Brown-headed Cowbirds was documented in 2012.

Banded Birds

All resident Willow Flycatchers were observed closely enough to determine with confidence whether they were banded (Table 5). All resident males and females were banded in previous years. Of these, one second-year male and two second-year females that were banded with a single federal band as nestlings in 2011 were recaptured and banded with a second band to provide a unique combination in 2012. All known banded birds were originally banded on Camp Pendleton. The floater of unknown sex was unbanded prior to 2012.

Twenty five flycatchers were banded for the first time in 2012. The floater of unknown sex was captured and banded with a unique combination. Twenty-four nestlings from seven nests were banded (Appendix D); all except four nestlings from APL, four nestlings from PNB, and three nestlings from AEO are believed to have fledged.

The male in the MAT territory was observed with a partially peeled color-band, complicating identification. The male was recaptured to confirm his identity and was found to be the same male that occupied the area in 2009. The band combination for the male in the PNB territory was not 100% confirmed, however genetic samples collected from two nests in the territory confirmed his identity as the same male that resided across the river in the Treatment Ponds area (USGS Western Ecological Research Center, San Diego Field Station; unpubl. data).

Table 5. Band status of Southwestern Willow Flycatchers at Marine Corps Base Camp Pendleton in 2012.

Territory / Bird ID	Status ^a	Male Banded? ^b	Female Banded? ^b	Nestlings Banded?	Comments ^c
AEO	P	Msi : puor	Msi : bkpu	3	Male banded in 2010 as an adult at Air Station. Female banded in 2010 as an adult at Air Station. Male polygynous with four other females (ANG/APL/APR/ARC).
ANG	P	Msi : puor	rebk : Msi	3	Female banded in 2011 as a nestling at Treatment Ponds and color-banded in 2012. Male polygynous with four other females (AEO/APL/APR/ARC).
APL	P	Msi : puor	Msi : yedb	7	Female banded in 2008 as a nestling at Treatment Ponds. Male polygynous with four other females (AEO/ANG/APR/ARC).
APR	P	Msi : puor	bkwh : Msi		Female banded in 2009 as a nestling at Pueblitos. Male polygynous with four other females (AEO/ANG/APL/ARC).
ARC	P	Msi : puor	bkye : Msi	3	Female banded in 2011 as a nestling at Treatment Ponds and color-banded in 2012. Male polygynous with four other females (AEO/ANG/APL/APR).
PNB	P	dbwh : Msi	Msi : orpu	3	Male banded in 2009 as a nestling at Air Station. Female banded in 2010 as an adult at Pump Road. Male polygynous with two other females (TLM/TWI).
TLM	P	dbwh : Msi	bkbk : Msi	3	Female banded in 2009 as an adult at Air Station. Male polygynous with two other females (PNB/TWI).
TWI	P	dbwh : Msi	yere : Msi	2	Female banded in 2011 as an adult at Treatment Ponds. Male polygynous with two other females (PNB/TLM).

^a F = nonbreeding floater, P = breeding pair, S = single resident male, U = unknown breeding status.

^b Band combinations: left leg : right leg; Msi = federal aluminum band. *Metal bands:* Metal bands: bkbk = black, bkpu = black-purple split, bkwh = black-white split, dbwh = dark blue-white split, dgdg = dark green, orpu = orange-purple split, puor = purple-orange split, rebk = red-black split, reor = red-orange split, sire = blank silver-red split, yebk = yellow-black split, yedb = yellow-dark blue split, yere = yellow-red split.

^c See Fig. 3, Appendix B, Figs. 10,14-15; Appendix C, Figs. 17-21 for breeding area and territory locations.

Table 5 (*continued*). Band status of Southwestern Willow Flycatchers at Marine Corps Base Camp Pendleton in 2012.

Territory / Bird ID	Status ^a	Male Banded? ^b	Female Banded? ^b	Nestlings Banded?	Comments ^c
MAT	S	Msi : sire	N/A		Male banded in 2008 as a nestling at Pueblitos.
OL05F	U	reor : Msi	N/A		Male banded in 2011 as a nestling at Treatment Ponds and color-banded in 2012.
AE52F	F	dgdg : Msi			Unknown sex bird banded as an adult in APR territory at Air Station.

^a F = Nonbreeding floater, P = breeding pair, S = single resident male, U = unknown breeding status.

^b Band combinations: left leg : right leg; Msi = federal aluminum band. *Metal bands*: bkbk = black, bkpu = black-purple split, bkwh = black-white split, dbwh = dark blue-white split, dgdg = dark green, orpu = orange-purple split, puor = purple-orange split, rebk = red-black split, reor = red-orange split, sire = blank silver-red split, yebk = yellow-black split, yedb = yellow-dark blue split, yere = yellow-red split.

^c See Fig. 3, Appendix B, Figs. 10, 14-15; Appendix C, Figs. 17-21 for breeding area and territory locations.

Survivorship, Site Fidelity, and Movement

The recapture and resighting of banded birds allowed us to determine the proportion of flycatchers previously documented on Base that returned to hold territories in 2012. Although this is the minimum number of flycatchers known to survive, and does not include birds that dispersed off Base or that we may have failed to detect/resight, it can be used as an inference to calculate minimum annual survivorship for the flycatcher population on Base. Of the uniquely banded adult flycatchers present during the 2011 breeding season, 40% (2/5) of males and 83% (5/6) of females returned to Camp Pendleton in 2012. Overall, adult survivorship from 2011 on Camp Pendleton was 64% (7/11). Return rates were calculated based on banded birds with confirmed, unique color-band combinations, and do not include a male in the MAT territory whose band combination could not be confirmed in 2011. Because adult flycatchers exhibit high site fidelity, it is likely that the 2012 MAT male was present during the 2011 breeding season. In addition, a female last seen as an adult in 2010 in the ASA territory reappeared in 2012 in the APR territory. The female was likely present in 2011, but because of the shortened season went undetected. If APR and MAT are incorporated into the survivorship calculations, the estimate of total adult survivorship from 2011 on Camp Pendleton increases to 69% (9/13), with a revised return rate for males (50%; 3/6) and females (86%; 6/7).

Three of the 15 nestlings banded in 2011 that survived to fledge were resighted and recaptured at Camp Pendleton in 2012, yielding a first-year survivorship estimate of 20% (3/15). The three birds returning to Camp Pendleton included two females and one male (Table 6). All returning second-year females paired and successfully nested in 2012 and the second-year male established a territory at Lake O'Neill but no evidence of breeding was observed.

Table 6. Between-year, between-area movement of Southwestern Willow Flycatchers at Marine Corps Base Camp Pendleton in 2012.

Year Last Detected	Breeding Area ^a (Territory Last Detected)	Breeding Area (Territory in 2012)	Dispersal Distance (km)	Band Combination ^b	Age in 2012	Sex ^c
2010	San Mateo Creek (MAT)	San Mateo Creek (MAT)	0.0	Msi :sire	4 yrs	M
2011	Air Station (AEO)	Air Station (AEO/ANG/APL/APR/ARC)	0.0	Msi : puor	≥ 3 yrs	M
2011	Treatment Ponds (TLM/TWI)	Treatment Ponds (TLM/TWI)	0.0	dbwh : Msi	3 yrs	M
2011	Treatment Ponds (TLM)	Treatment Ponds (TLM)	0.0	bkbk : Msi	≥ 4 yrs	F
2011	Air Station (APR)	Air Station (APL)	0.1	Msi : yedb	4 yrs	F
2011	Pump Road (PNB)	Pump Road (PNB)	0.1	Msi : orpu	≥ 3 yrs	F
2011	Air Station (AEO)	Air Station (AEO)	0.0	Msi : bkpu	≥ 3 yrs	F
2010	Air Station (ASA)	Air Station (APR)	0.2	bkwh : Msi	3 yrs	F
2011	Treatment Ponds (TWI)	Treatment Ponds (TWI)	0.0	yere : Msi	≥ 2 yrs	F
2011	Treatment Ponds (TLM)	Lake O'Neill (OL05F)	7.4	reor : Msi	1 yr	M
2011	Treatment Ponds (TWI)	Air Station (ANG)	1.5	rebk : Msi	1 yr	F
2011	Treatment Ponds (TLM)	Air Station (ARC)	1.4	yebk : Msi	1 yr	F

^a See Fig. 3, Appendix B, Figs. 10, 14-15; Appendix C, Figs. 17-21 for breeding area and territory locations.

^b Band combinations: left leg : right leg; Msi = federal aluminum band. *Metal bands*: bkbk = black, bkpu = black-purple split, bkwh = black-white split, dbwh = dark blue-white split, orpu = orange-purple split, puor = purple-orange split, rebk = red-black split, reor = red-orange split, sire = blank silver-red split, yebk = yellow-black split, yedb = yellow-dark blue split, yere = yellow-red split.

^c Sex: M = male, F = female.

Willow Flycatchers at Camp Pendleton generally settle into breeding concentrations or areas where groups of birds establish territories (Fig. 3). Resighting banded birds allowed us to identify individuals that returned to the same area they used the previous year. In 2012, all of the nine banded adults returned to the breeding area they last occupied (Table 6). Six of the nine birds, three males and three females, either returned to the same territories they previously occupied, or occupied a territory that encompassed a portion of the area they previously defended. The other three females moved a short distance within the same breeding area they last occupied. The average distance moved by adult flycatchers between the 2011 and 2012 breeding seasons was 0.05 ± 0.05 km (excluding MAT and APR that were not confirmed in 2011).

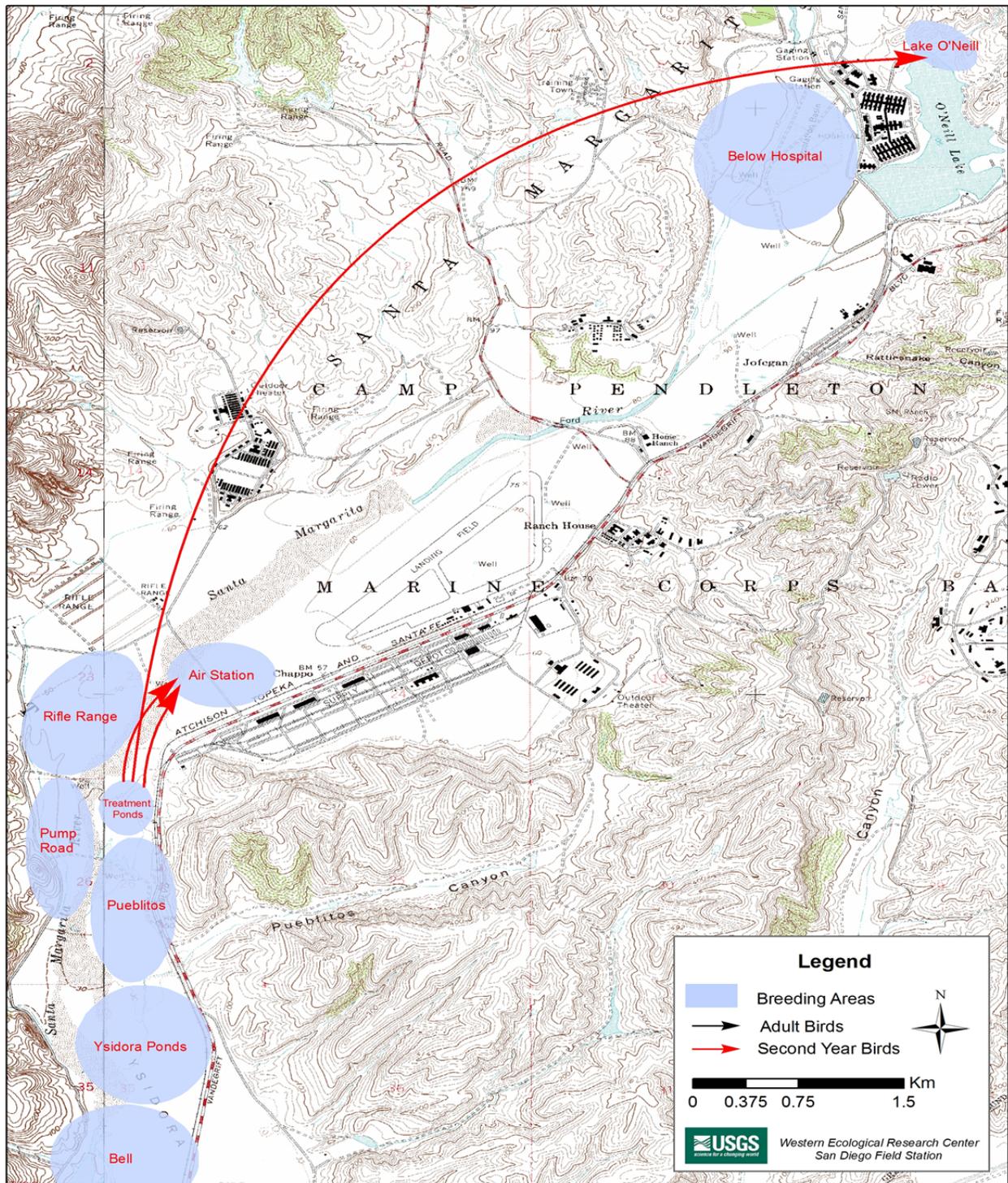


Fig. 3. Between-year, between-area movement by adult and second-year Southwestern Willow Flycatchers at Marine Corps Base Camp Pendleton, 2012.

In contrast to returning adults, none of the three returning second-year birds banded as nestlings in 2011 returned to their natal areas to breed. The two returning second-year females, banded as nestlings in the Treatment Ponds area, both dispersed to the Air Station area, approximately 1.4 and 1.5 km away (Table 6, Fig. 3). The returning second-year male, banded as a nestling in the Treatment Ponds area, dispersed to Lake O'Neill, approximately 7.4 km away (Table 6, Fig. 3). The average distance that second-year birds dispersed from their natal areas was 3.4 ± 3.4 km.

No instances of movement by adult Willow Flycatchers within the 2012 season were observed.

No emigration or immigration of banded birds was documented in 2012. However, one unbanded floater of unknown sex was detected. This bird may have been an immigrant from a nearby population.

Human Activities in Riparian Habitat

No evidence of human activities in riparian habitat occupied by Willow Flycatchers was witnessed during the 2012 breeding season.

DISCUSSION

Camp Pendleton continues to provide important habitat for both migrating and breeding Willow Flycatchers. The number of transient flycatchers detected in 2012 (29) was comparable to the number seen in 2010 (25; Howell and Kus 2010a). The number of transients detected annually since 2002 has varied greatly, despite consistent survey scope and effort, from a high of 102 in 2002 (Kus and Kenwood 2003), to a low of 25 in 2010.

The resident population of Southwestern Willow Flycatchers on Camp Pendleton in 2012 (13 individuals) remained steady compared to 2011 (13 individuals, Howell and Kus 2011). In 2012, the sex ratio was once again skewed towards females, following an equal sex ratio in 2011. The fraction of paired males with multiple females increased to a record high of 100%, exceeding the previous record of 80% in 2010 (Howell and Kus 2010a). The rate of polygyny among males has ranged from 0-80% since monitoring began in 2000 and fluctuates in association with the sex ratio in the breeding population (Kus 2001; Kus and Ferree 2002; Kus and Kenwood 2003, 2005, 2006a, b; Kenwood and Kus 2007; Rourke *et al.* 2008; Howell and Kus 2009a, b, 2010a, 2011). In the occupied breeding areas (Air Station, Pump Road, and Treatment Ponds), females outnumbered males 2:1, and the high degree of polygyny in the population reflects this. Only two males were present on the Santa Margarita River, of which one paired with five females and the other paired with three. The number of females sharing males increased to a record high of 100%, surpassing the previous record of 89% (2010; Howell and Kus 2010a). In years when the sex ratio was closer to 1:1 (i.e., 2003, 2004, 2007, 2008, 2009) the proportion of females that were polygynous fluctuated between 50-57%, and increased (74-89%) in years when females outnumbered males (2005, 2006, 2010). As in previous years, single males were present during the breeding season, but females opted to share males, rather than move to an area where a single male held a territory. Continued monitoring at Camp Pendleton, combined with information from other polygynous populations of Willow Flycatchers (Davidson and Allison 2003; Pearson *et al.* 2006), should enhance our understanding of the basis for polygyny in this species, and its implications for genetic viability of the population.

The number of breeding flycatcher territories on the Santa Margarita River in 2012 increased (eight) relative to 2011 (six; Howell and Kus 2011), which corresponded directly to the increase in the number of females present in the breeding population. As in previous years, resident flycatchers were largely distributed among historic breeding areas, although the number of territories in some areas differed compared to previous years. Three of the four core flycatcher breeding areas on the Santa Margarita River (Air Station, Pump Road, Treatment Ponds, and Pueblitos) were occupied in 2012, with Pueblitos unoccupied for the first time since monitoring began in 2000. Among the three occupied areas, one area had an increase, one remained the same, and one area had a decrease in flycatcher territories. The Air Station breeding area has become increasingly important in recent years, hosting 63% (5/8) of the breeding pairs in 2012 (one male, five females) and one nonbreeding floater, compared to three pairs (two males, three females) in 2011 (Howell and Kus 2011). The Treatment Ponds breeding area supported two breeding pairs (one male, two females) in both years. The Pump Road breeding area hosted the same number of breeding pairs in both years (one pair), but in 2012 there was no dedicated male detected at Pump Road; rather the female shared the male at the Treatment Ponds area. This may suggest that female flycatchers are selecting the habitat rather

than the mate. The Pump Road female chose to stay in her preferred location even though her mate spent the majority of his time 400 m away in the Treatment Ponds area. Factors influencing territory selection from year-to-year are poorly understood and continued research may contribute to a better understanding of habitat selection in flycatchers. The distribution of resident flycatchers away from the Santa Margarita River was limited to a territorial male that recolonized Lake O'Neill on Fallbrook Creek for the first time since 2006, and a returning single male near San Mateo Creek. Lake O'Neill previously supported one breeding pair from 2000-2004, a single male in 2005, two single males in 2006, and was unoccupied from 2007-2011 (Kus 2001; Kus and Ferree 2002; Kus and Kenwood 2003, 2005, 2006a, b, Kenwood and Kus 2007, Rourke *et al.* 2008; Howell and Kus 2009a, b, 2010a, 2011). San Mateo Creek was initially colonized by a nesting pair in 2007, was devoid of resident flycatchers in 2008, and hosted a territorial male in 2009, 2010, and 2011 (Rourke *et al.* 2008, Howell and Kus 2009a, b, 2010a, 2011).

The proximity of the breeding areas on the Santa Margarita River facilitates movement between areas annually, and often within breeding seasons. In 2012, 100% of adult flycatchers returned to the breeding area they last occupied. The APR female was not seen in 2011, therefore it is possible she occupied a different area in 2011; however it is more likely that she was overlooked in 2011 because surveys did not begin until late June. We suspected that there was another female in the Air Station area in 2011, but it was never confirmed. In 2012, the APR female occupied the same area as in 2010. Between-year site fidelity has been highly variable, ranging from a low of 40% in 2008 (Howell and Kus 2009a) to a record high of 100% in 2012. Habitat condition and suitability are likely important factors in annual flycatcher movement between breeding areas. It is possible that flycatchers may be evaluating the habitat within the matrix of breeding areas on the Santa Margarita River each year in an attempt to maximize their fitness (i.e., ability to survive and reproduce successfully). High site fidelity in 2009 (88%; Howell and Kus 2009b), 2010 (83%; Howell and Kus 2010a), 2011 (83%; Howell and Kus 2011) and 2012 suggests that the areas being occupied represent the most suitable habitat currently available on Base.

Nest success reached a record low during the 2012 breeding season, with only 27% of located nests fledging at least one flycatcher young, less than half the 2001-2010 annual mean (60%; Kus 2001; Kus and Ferree 2002; Kus and Kenwood 2003, 2005, 2006a, b; Kenwood and Kus 2007; Rourke *et al.* 2008; Howell and Kus 2009a, b, 2010a). Seasonal productivity was down to 1.6 young/pair, compared to 2.8 young/pair in 2011. Average clutch size (3.2 eggs/nest) was comparable to the 2001-2010 annual mean (3.1 eggs/nest). Thirteen young were fledged in 2012, compared to 17 in 2011 (Howell and Kus 2011).

The return rate of banded adults between 2011 and 2012 (64%) was up from 2011 (40%, Howell and Kus 2011), and higher than the average return rate between 2001 and 2011 (45%; Kus 2001; Kus and Ferree 2002; Kus and Kenwood 2003, 2005, 2006a, b; Kenwood and Kus 2007; Rourke *et al.* 2008; Howell and Kus 2009a, b, 2010a, 2011). The return rate has fluctuated from a low of 25% in 2001 to a high of 70% in 2002. In 2012, the return rate of second-year birds increased to 20%, compared to 6% in 2011 (Howell and Kus 2011). The total percentage of adults within the breeding population that were banded as nestlings has generally increased annually. In 2012, 54% (7/13) of the adult flycatchers on Base were originally banded as

nestlings, compared to 46% (6/13; including the MAT male) in 2011, 67% (10/15) in 2010, 53% (9/17) in 2009, 40% (6/15) in 2008, and 31% (8/26) in 2007 (Rourke *et al.* 2008, Howell and Kus 2009a, b, 2010a, 2011). The presence of such a large percentage of natal banded birds creates the opportunity to collect life-time reproductive data for a growing segment of the population, which will facilitate identification of age- and sex-specific patterns in life history characteristics that influence population size, productivity, and genetic structure.

As the flycatcher population on Camp Pendleton decreases, the risk of inbreeding will likely increase (Meffe and Carroll 1997). However, the potential for inbreeding is reduced through immigration and emigration. Each year unbanded flycatchers are detected on Base. These unbanded flycatchers are likely immigrants from other nearby populations, such as the population on the upper San Luis Rey River. In 2012, one unbanded flycatcher, a floater of unknown sex, was detected on Base. While this bird did not breed in 2012, there is a possibility this bird may return and enter the breeding population in 2013, as some floaters in past years have returned the following year to breed (2002, 2004; Kus and Kenwood 2003, 2006a). 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.

CONCLUSIONS

The Southwestern Willow Flycatcher population in California appears to be experiencing a statewide decline, rather than one isolated to Camp Pendleton. Populations on the Kern River (Schuetz *et al.* 2008) and the lower San Luis Rey River (Ferree and Kus 2008) have experienced steep declines or have been eradicated in recent years. The exception appears to be the upper San Luis Rey population, where the number of territories declined only slightly between 1999 (18; Kus *et al.* 1999) and 2009 (15; Howell and Kus 2010b). It is encouraging that one unbanded flycatcher was detected on Base in 2012, suggesting that there are still viable breeding populations in the region from which emigration can occur. This event also suggests that the habitat on Camp Pendleton is still suitable for flycatchers. This may be in part a result of management actions on Base, specifically the restoration of riparian habitat, including the removal and treatment of invasive exotics such as giant reed. The flycatcher population on Base has contracted to the midstream portions of the Santa Margarita River, bypassing areas further south that were historically occupied. The removal of invasive exotics from the Santa Margarita River in recent years provides an opportunity for recolonization. As the native vegetation recovers, there is hope that Southwestern Willow Flycatchers will recolonize these areas, leading to an increase in the population and enhancing recovery of flycatchers on Base and in the region. Until that time, careful consideration should be given to any projects that alter the habitat in currently occupied areas.

With the continued decline of Southwestern Willow Flycatchers on Base, communication between the Assistant Chief of Staff (AC/S), Environmental Security and other military departments will become increasingly important. Coordination of maintenance activities such as vegetation clearing through AC/S, Environmental Security will minimize impacts in active territories. Coordination and cooperation among the various departments will help maintain a balance between the sometimes competing land uses on Base including military activities, recreation, habitat protection, and endangered species management.

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APPENDIX A

**SOUTHWESTERN WILLOW FLYCATCHER SURVEY AREAS AT MARINE CORPS
BASE CAMP PENDLETON, 2012**

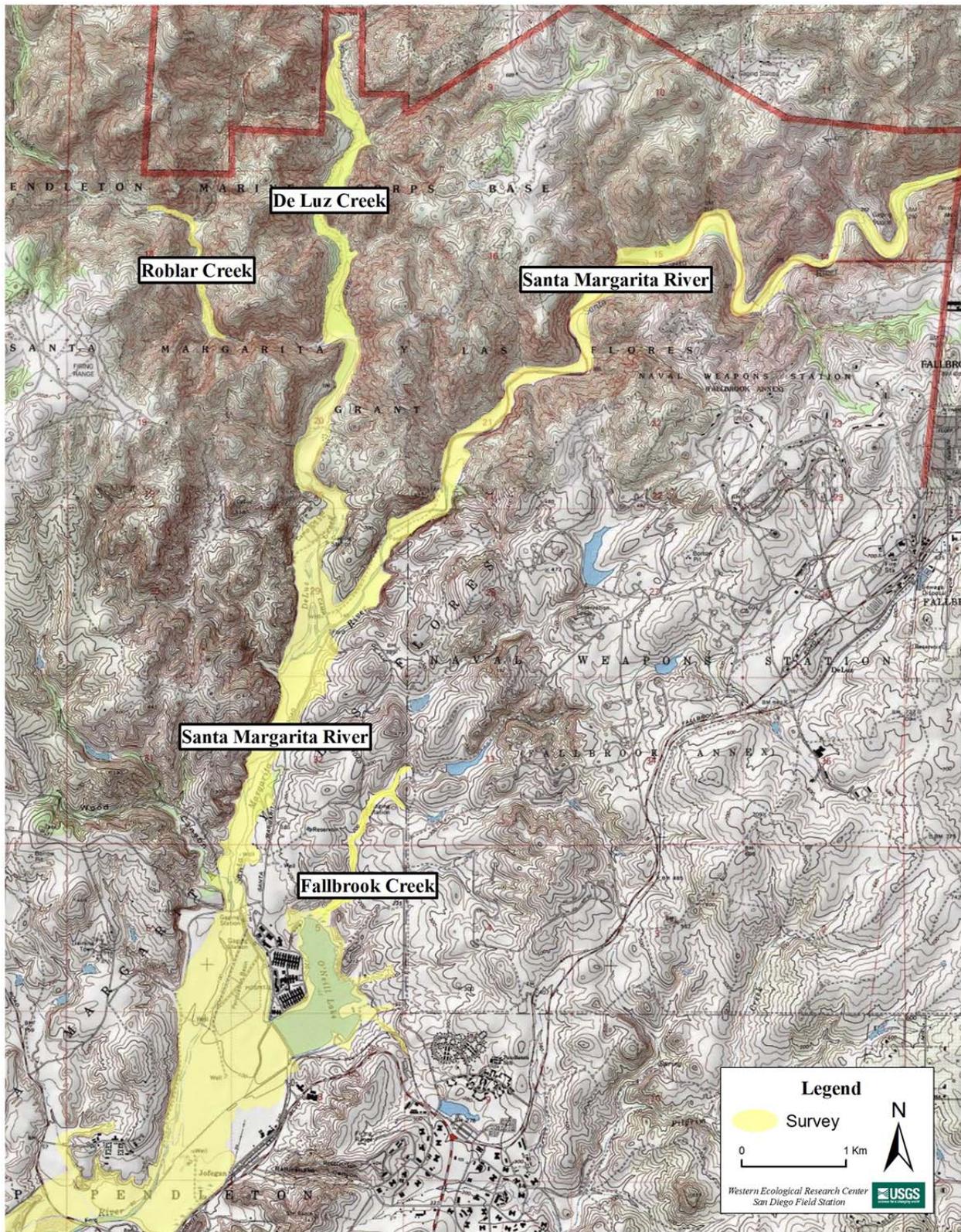


Fig. 4. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2012: Santa Margarita River, Fallbrook Creek, De Luz Creek and Roblar Creek.

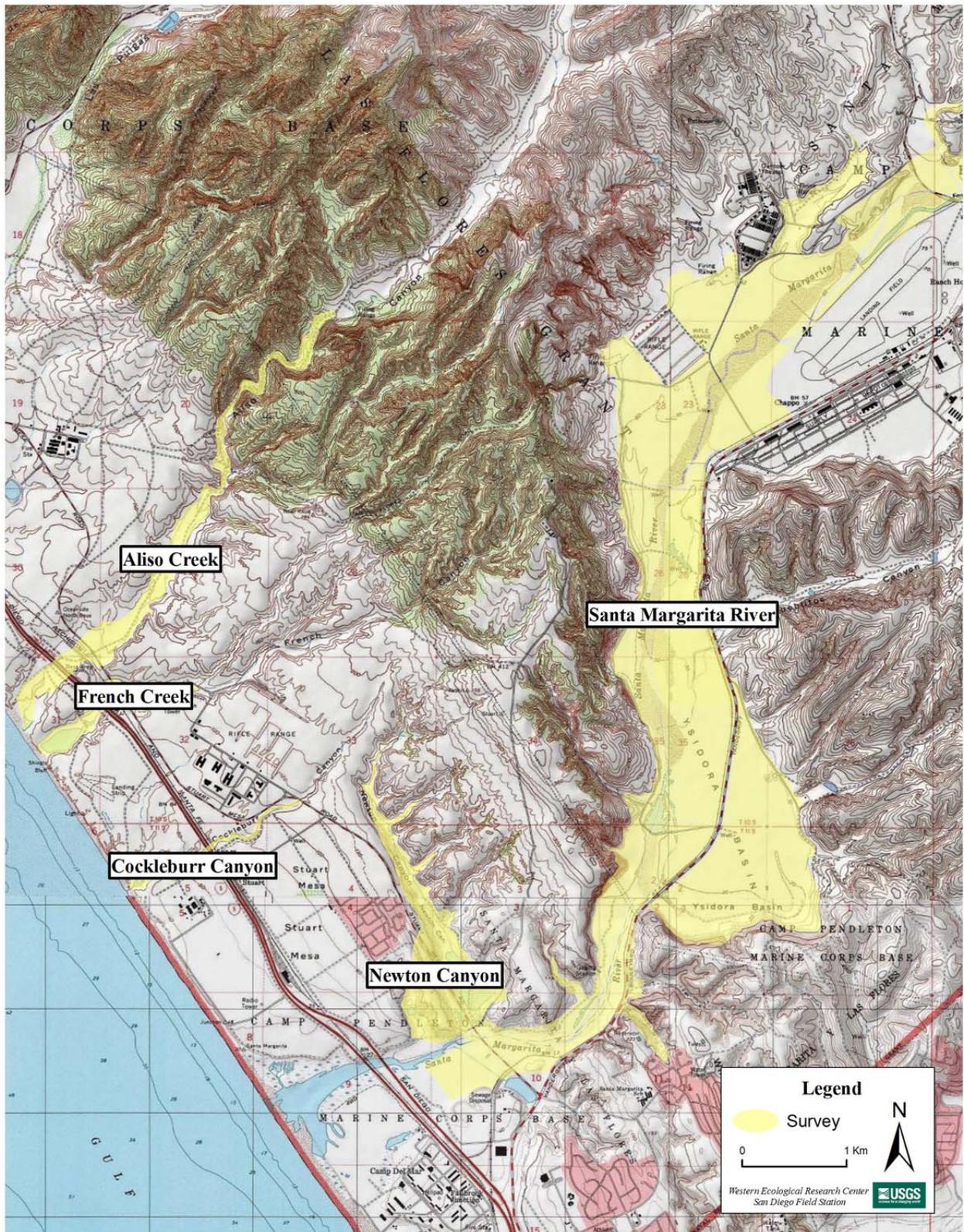


Fig. 5. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2012: Santa Margarita River, Newton Canyon, Cocklebur Canyon, French Creek, and Aliso Creek.

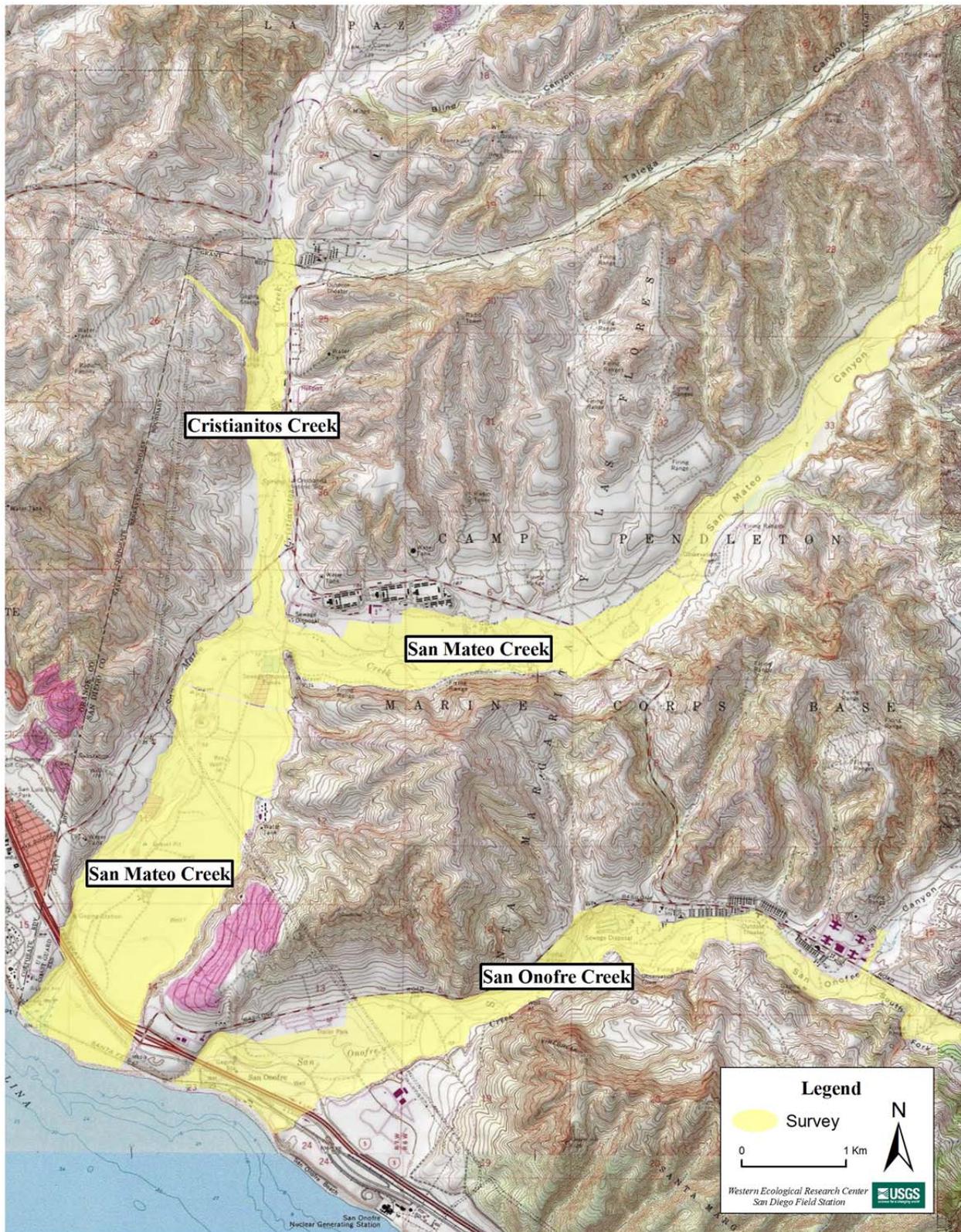


Fig. 6. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2012: Cristianitos Creek, San Mateo Creek and San Onofre Creek.

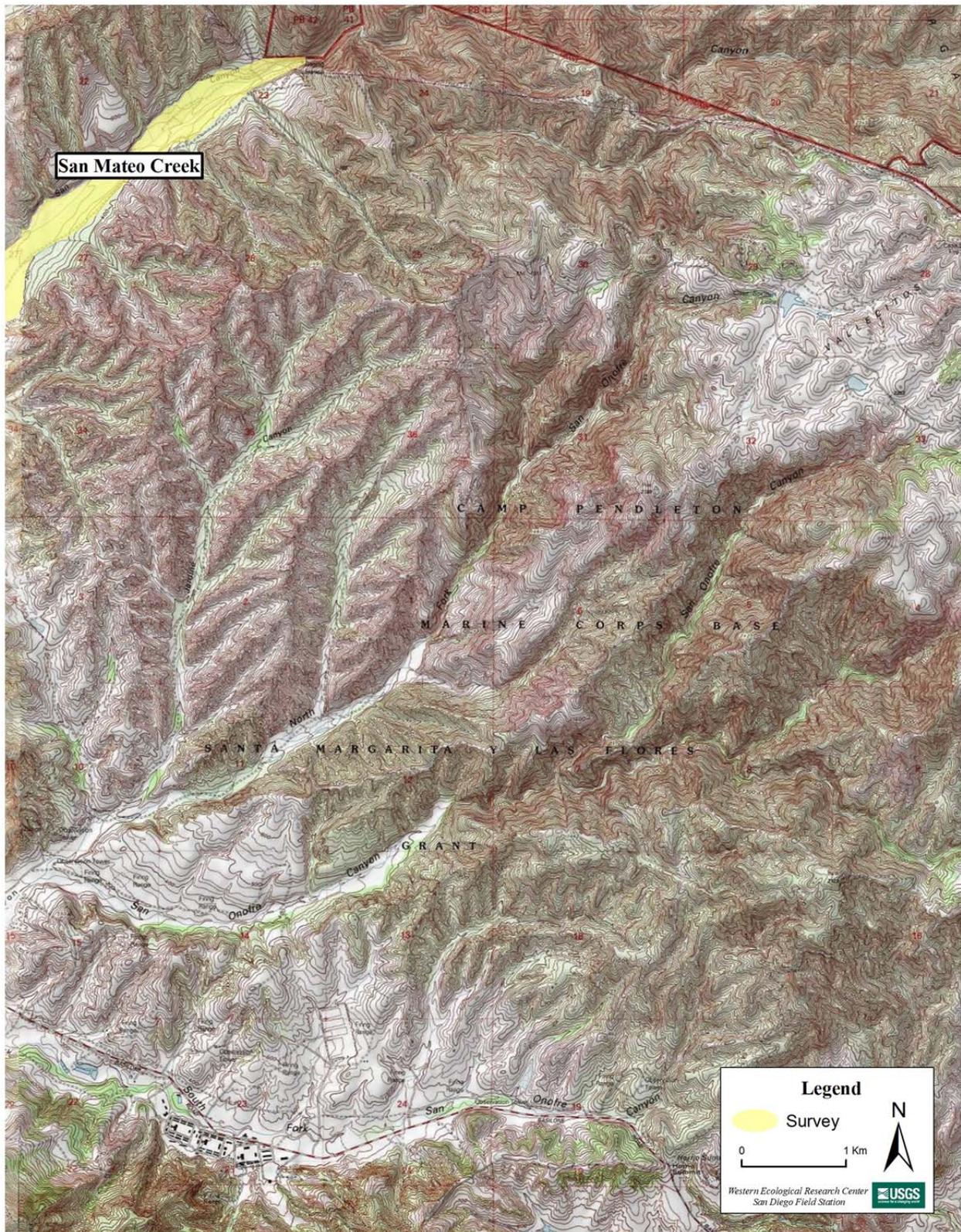


Fig. 7. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2012: San Mateo Creek.

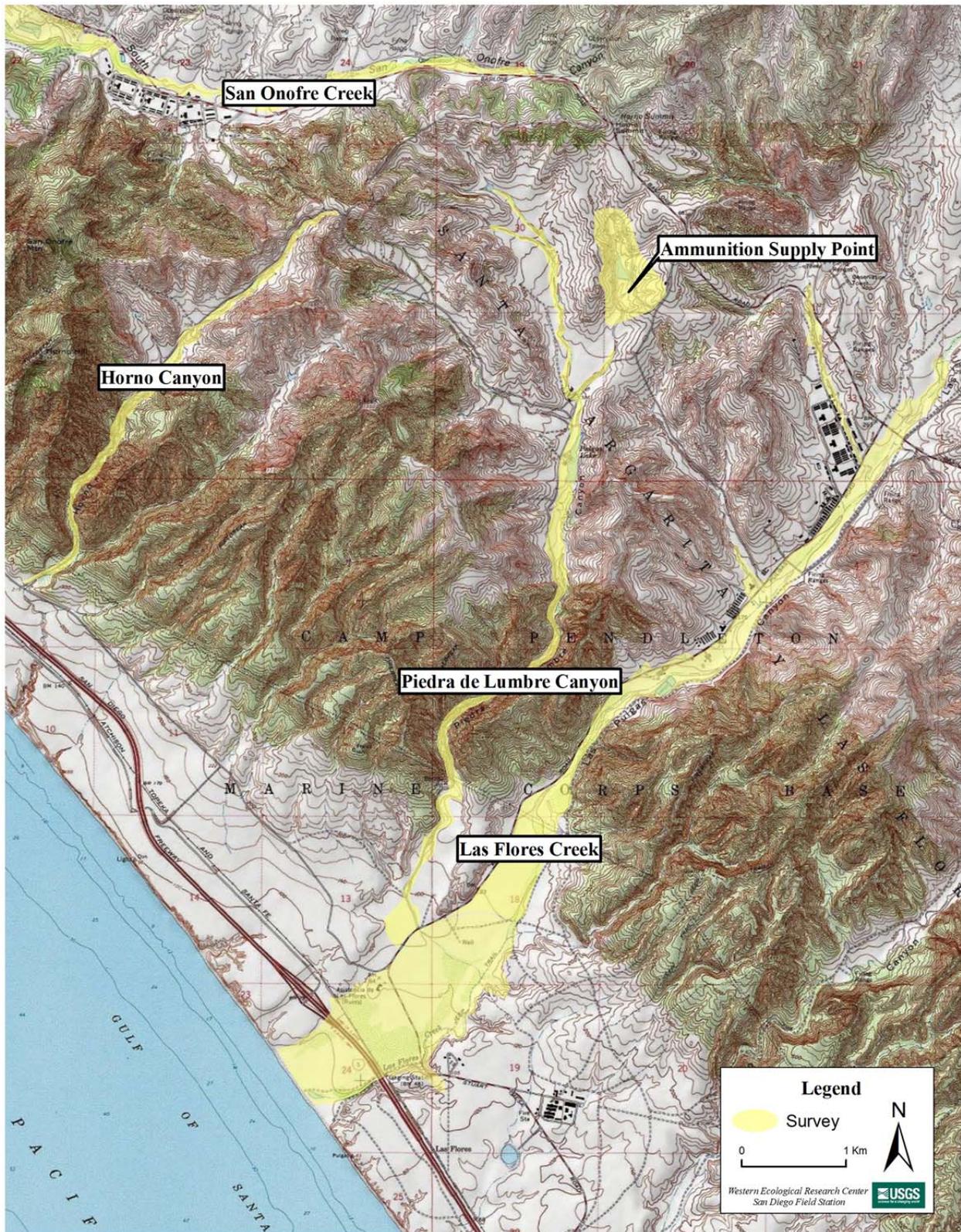


Fig. 8. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2012: Las Flores Creek, Piedra de Lumbre Canyon, Horno Canyon, and San Onofre Creek.

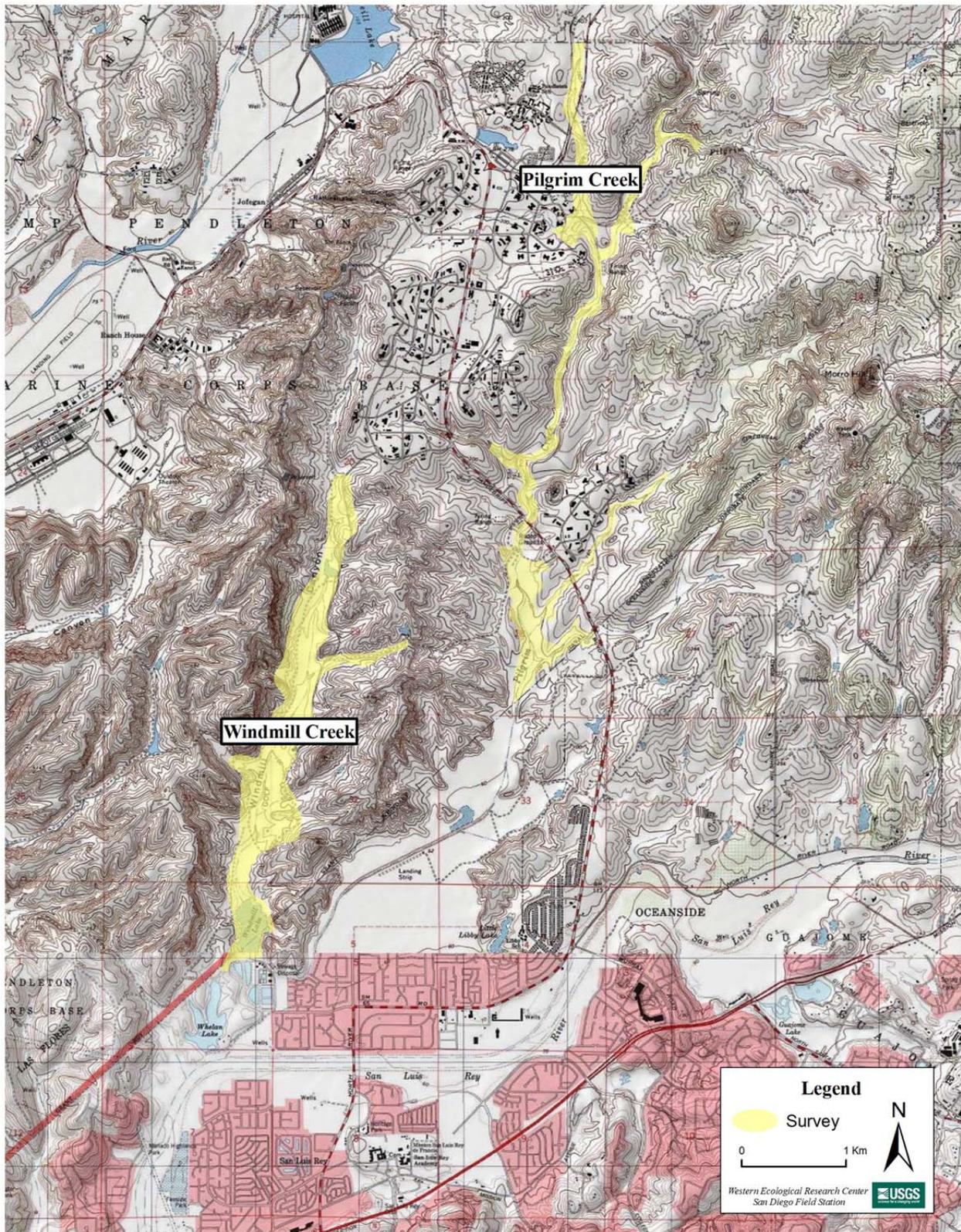


Fig. 9. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2012: Windmill Canyon and Pilgrim Creek.

APPENDIX B

**LOCATIONS OF SOUTHWESTERN WILLOW FLYCATCHERS AT MARINE CORPS
BASE CAMP PENDLETON, 2012**

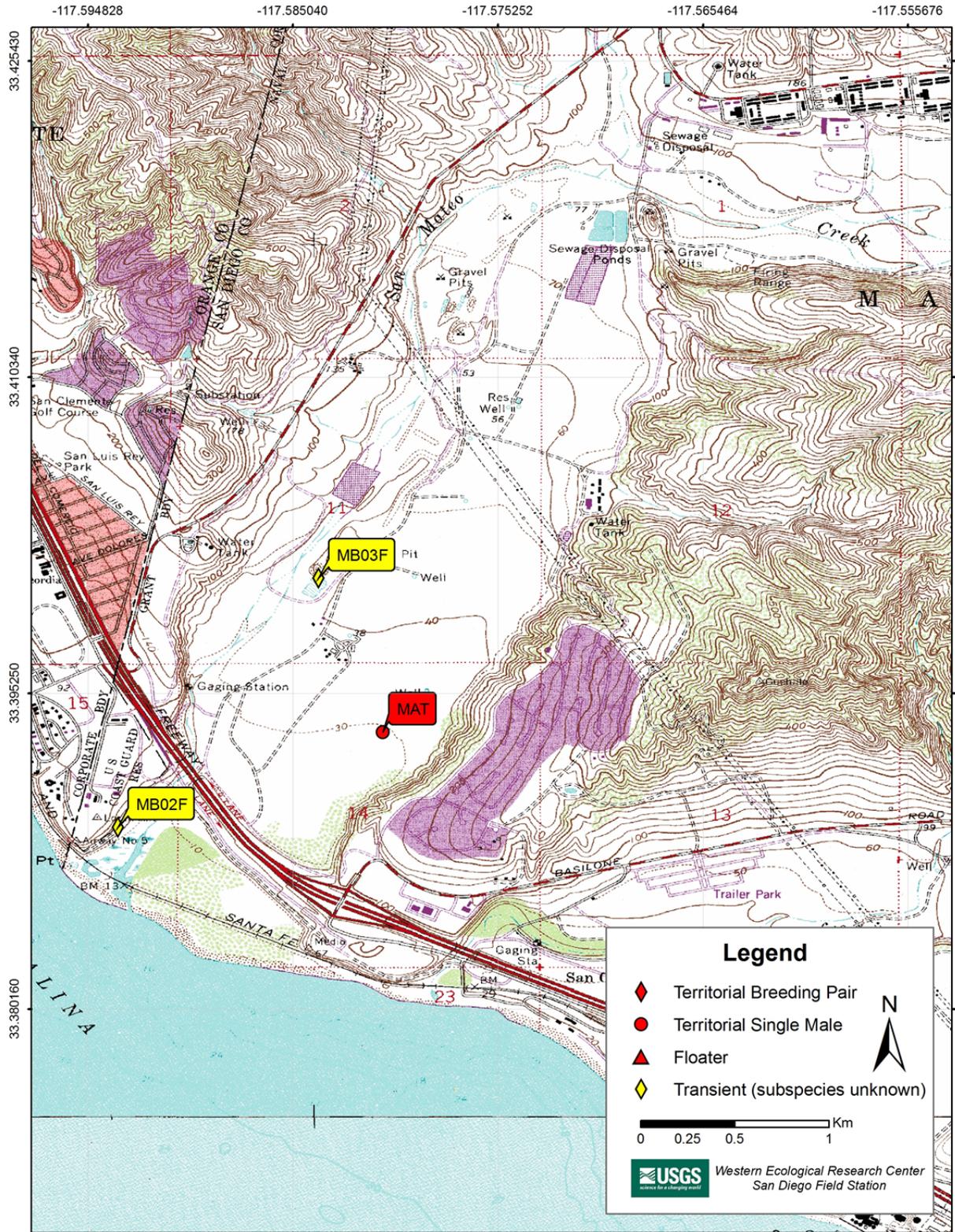


Fig. 10. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2012: San Mateo Creek (downstream).

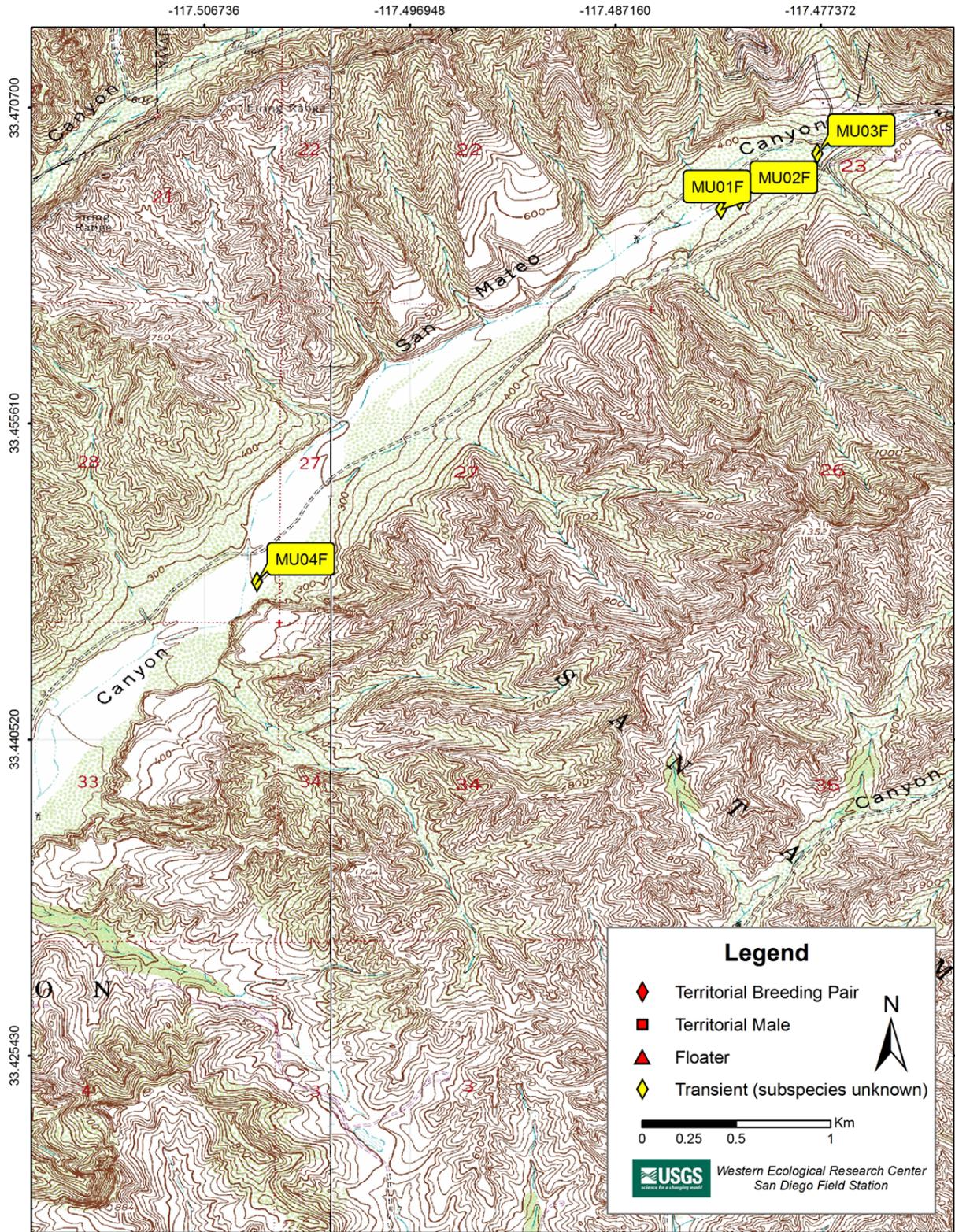


Fig. 11. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2012: San Mateo Creek (upstream).

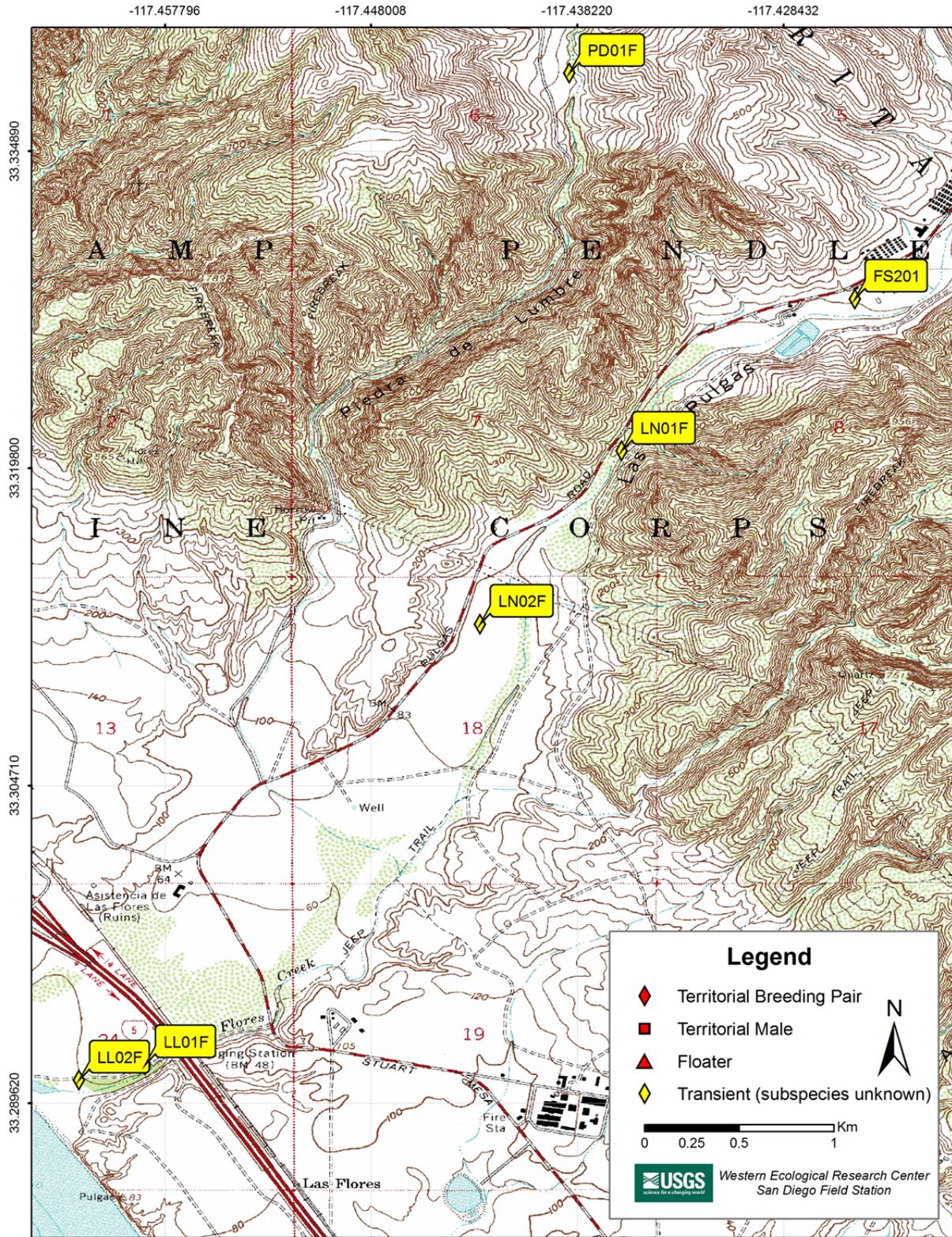


Fig. 12. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2012: Las Flores Creek and Piedra de Lumbre Canyon.

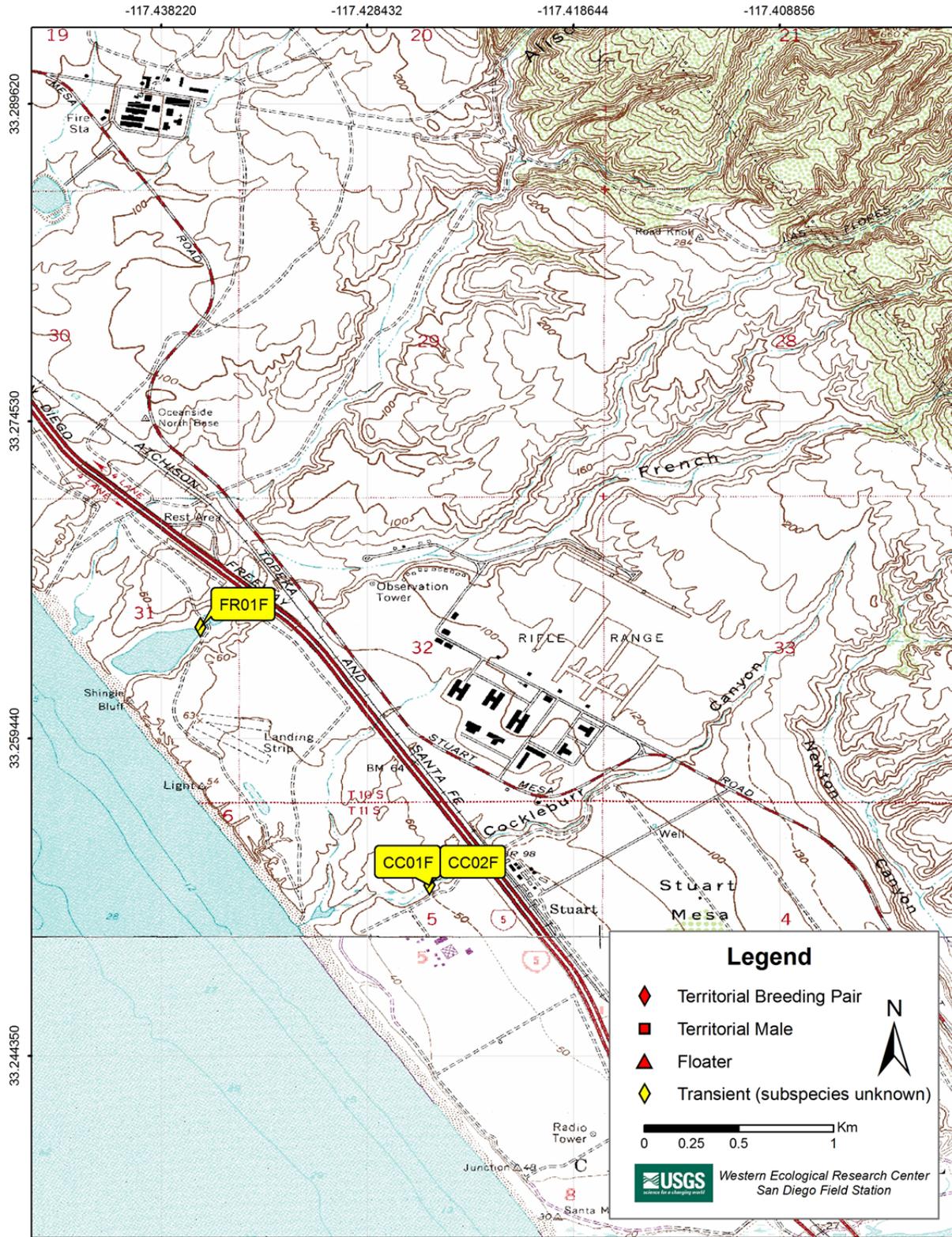


Fig. 13. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2012: French Creek and Cocklebur Canyon.

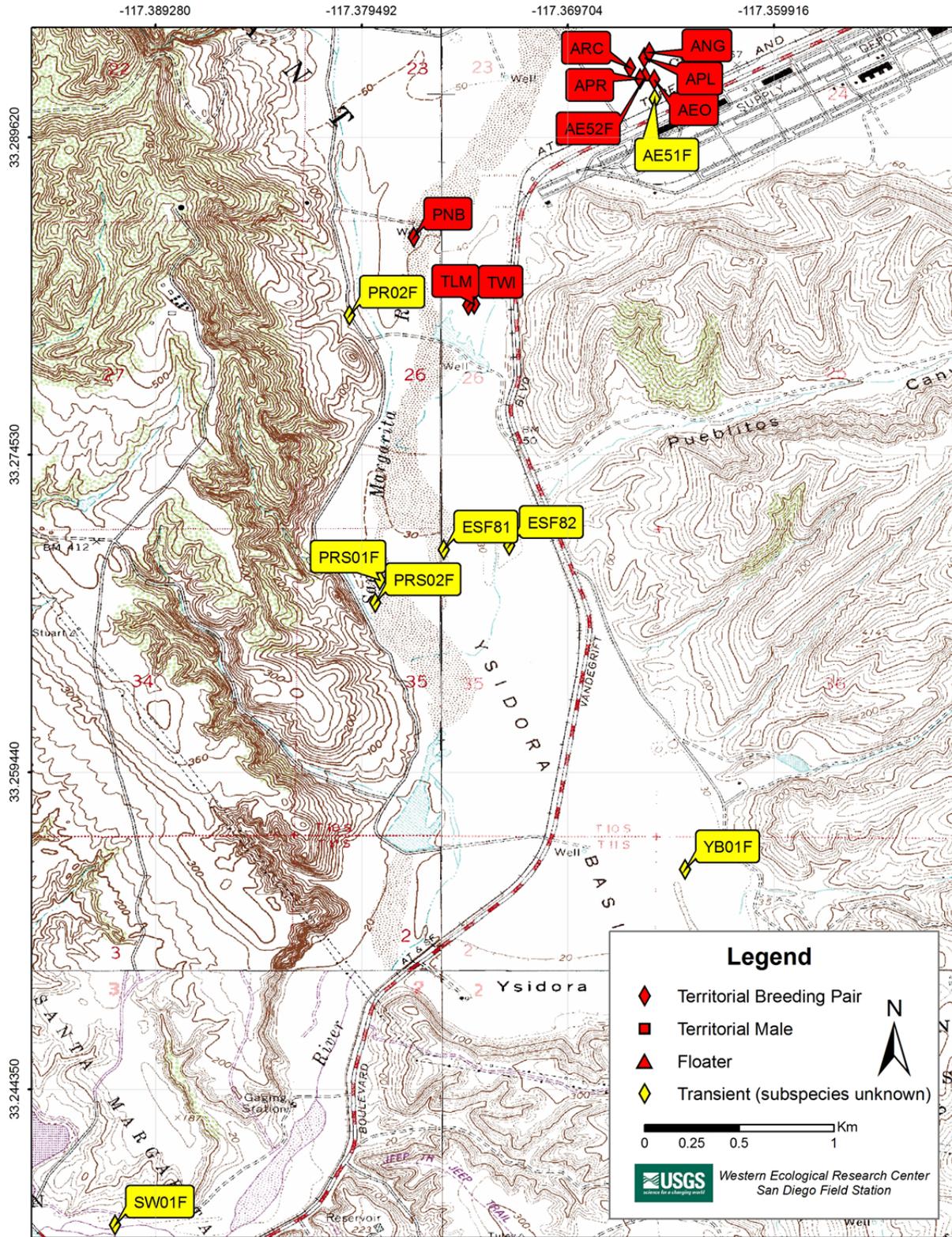


Fig. 14. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2012: Santa Margarita River.

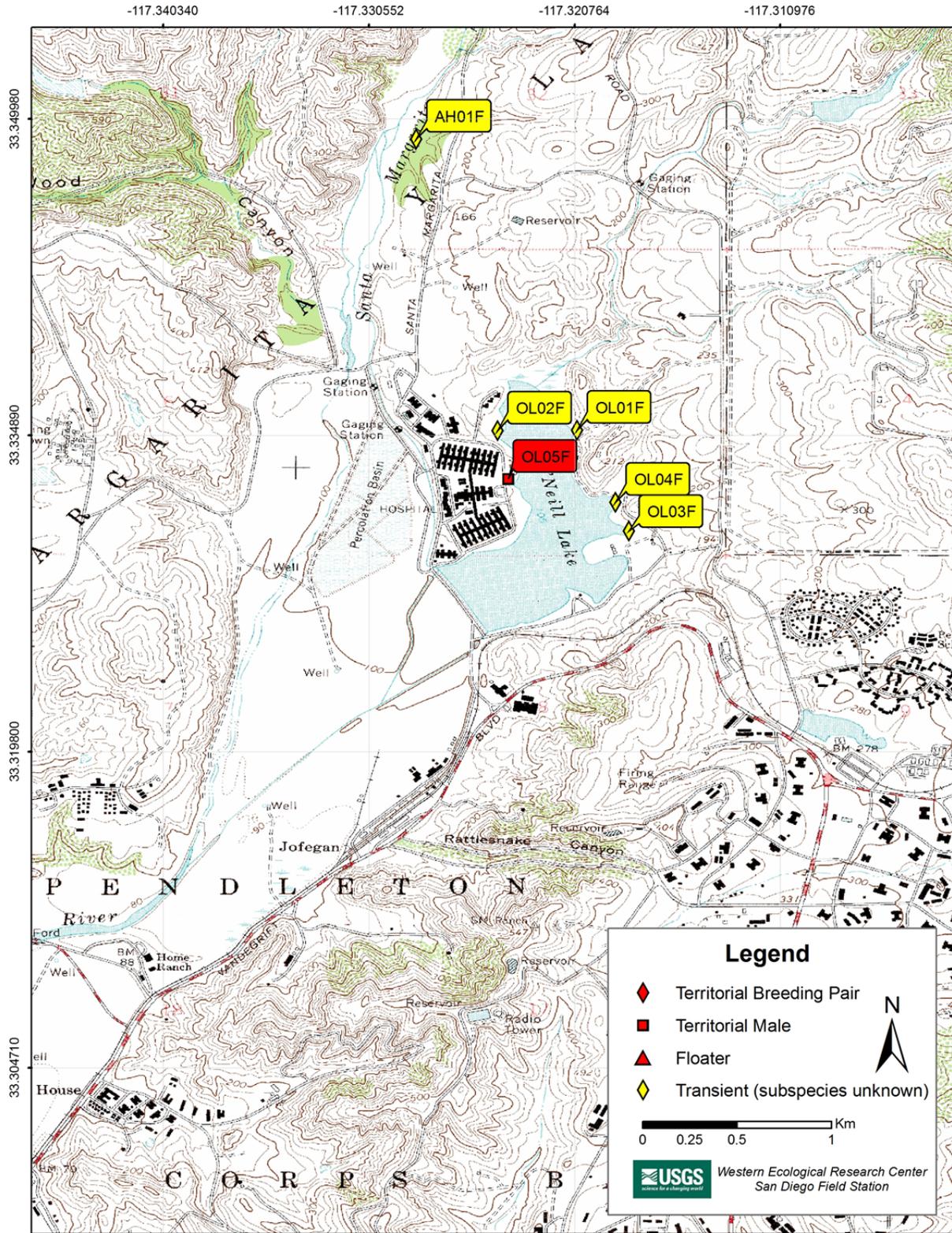


Fig. 15. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2012: Santa Margarita River and Fallbrook Creek.

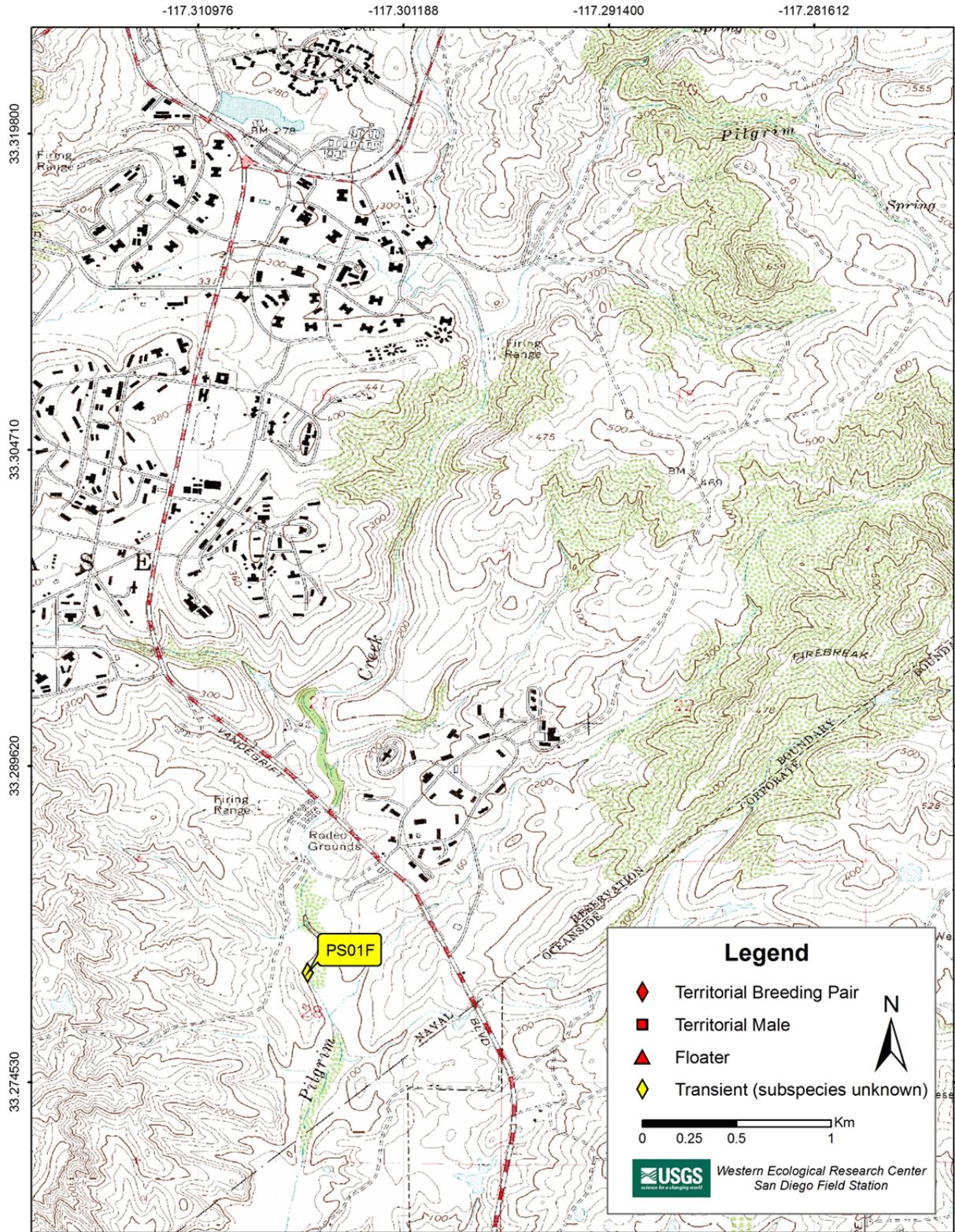


Fig. 16. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2012: Pilgrim Creek.

APPENDIX C

**SOUTHWESTERN WILLOW FLYCATCHER TERRITORY LOCATIONS AT
MARINE CORPS BASE CAMP PENDLETON, 2012**



Fig. 17. Southwestern Willow Flycatcher territories at Marine Corps Base Camp Pendleton, 2012: San Mateo Creek.

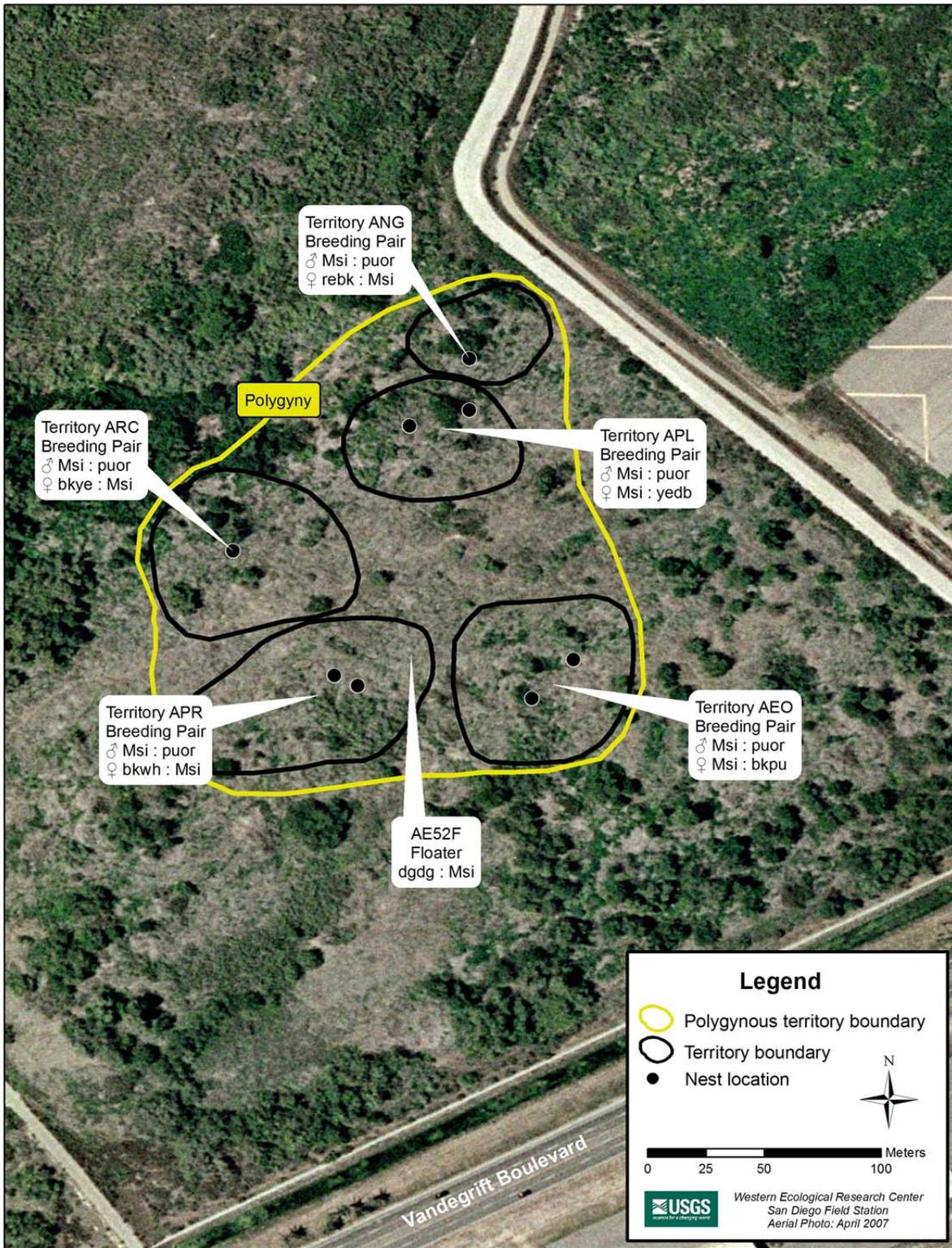


Fig. 18. Southwestern Willow Flycatcher territories at Marine Corps Base Camp Pendleton, 2012: Air Station Breeding Area, Santa Margarita River.

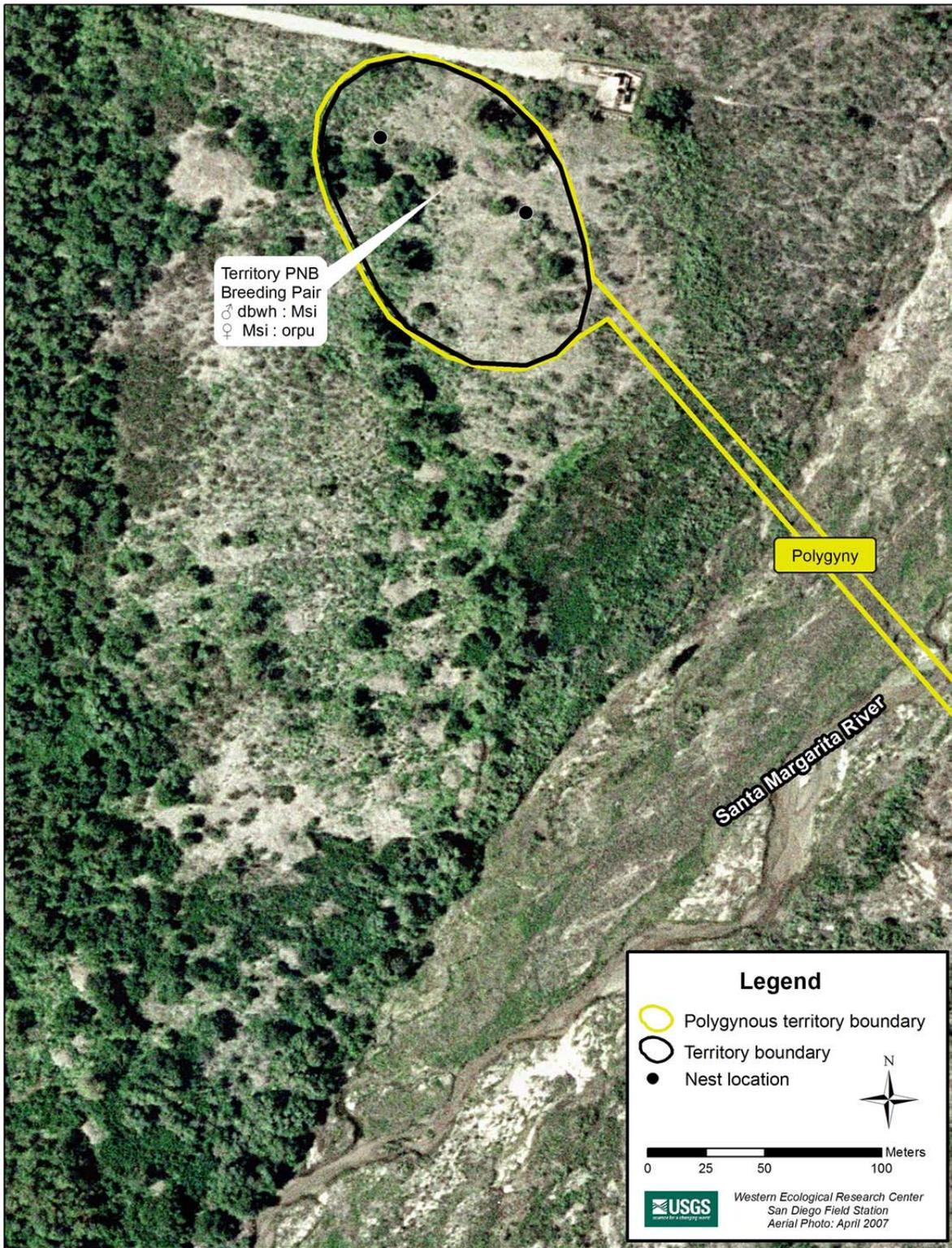


Fig. 19. Southwestern Willow Flycatcher territories at Marine Corps Base Camp Pendleton, 2012: Pump Road Breeding Area, Santa Margarita River.

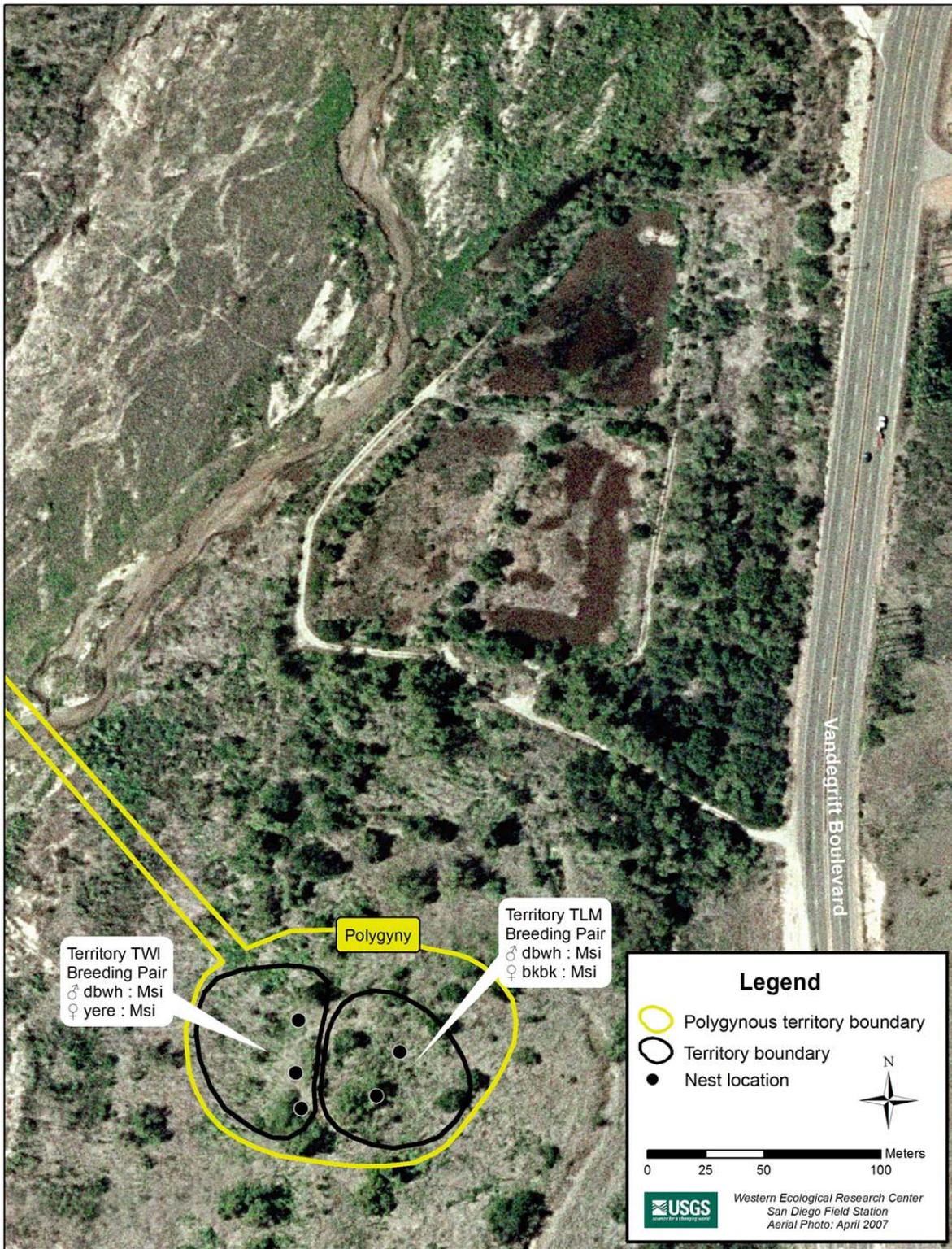


Fig. 20. Southwestern Willow Flycatcher territories at Marine Corps Base Camp Pendleton, 2012: Treatment Ponds Breeding Area, Santa Margarita River.



Fig. 21. Southwestern Willow Flycatcher territories at Marine Corps Base Camp Pendleton, 2012: Lake O'Neill, Fallbrook Creek.

APPENDIX D

**BAND COMBINATIONS AND IDENTIFICATION OF SOUTHWESTERN WILLOW
FLYCATCHER NESTLINGS BANDED ON MARINE CORPS BASE CAMP
PENDLETON, 2012**

Band combinations and identification of Southwestern Willow Flycatcher nestlings banded on Marine Corps Base Camp Pendleton in 2012.

Territory ID	Nest ID	Nestling Band Combination^a	Federal Band Number
APL	1	Msi : none	245087074
APL	1	Msi : none	245087075
APL	1	Msi : none	245087076
APL	1	Msi : none	245087077
PNB	1	Msi : none	245087078
PNB	1	Msi : none	245087079
PNB	1	Msi : none	245087080
PNB	1	Msi : none	245087081
ANG	1	Msi : none	245087083
ANG	1	Msi : none	245087084
ANG	1	Msi : none	245087085
TLM	2	Msi : none	245087086
TLM	2	Msi : none	245087087
TLM	2	Msi : none	245087088
TLM	2	Msi : none	245087089
ARC	1	Msi : none	245087090
ARC	1	Msi : none	245087091
ARC	1	Msi : none	245087092
APL	2	Msi : none	245087094
APL	2	Msi : none	245087095
APL	2	Msi : none	245087096
AEO	2	Msi : none	245087097
AEO	2	Msi : none	245087098
AEO	2	Msi : none	245087099

^a Band combinations: left leg : right leg, Msi = federal aluminum band, none = no bands present