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

2013 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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By Scarlett L. Howell and Barbara E. Kus

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

San Diego Field Station
USGS Western Ecological Research Center
4165 Spruance Road, Suite 200
San Diego, CA 92101

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U.S. DEPARTMENT OF THE INTERIOR
SALLY JEWELL, SECRETARY

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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 26 July 2013. Forty-five transient Willow Flycatchers of unknown subspecies were observed during Base-wide surveys. Transients occurred on 10 of the 16 drainages surveyed in 2013. No Willow Flycatchers were detected at De Luz Creek, Horno Canyon, Newton Canyon, Piedra de Lumbre Canyon, Roblar 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 2013, the resident Southwestern Willow Flycatcher population on Base consisted of three males, ten females, and four non-territorial floaters of unknown sex. Eleven territories were established, consisting of ten pairs (two polygynous groups consisting of two males each pairing with five different females), and one male of unknown status. In total, ten females formed pair bonds with two male Willow Flycatchers.

The majority of territories were located along the Santa Margarita River. One additional territory was established at Pilgrim Creek. All territories were located in mixed willow riparian habitat. Poison hemlock (*Conium maculatum*) was present in the majority of the territories.

Thirty percent (3/10) of Southwestern Willow Flycatcher pairs successfully fledged at least one young during the 2013 breeding season. Nesting was initiated in late May and continued into mid-July. Fifteen nesting attempts were documented, of which 20% (3/15) were successful. Nine fledglings were produced, yielding a seasonal productivity of 0.9 young/pair (9 young/10 pairs). No instances of Brown-headed Cowbird (*Molothrus ater*) parasitism were observed. Pairs placed nests in five species of plants, including sandbar willow (*S. exigua*), black willow *(S. gooddingii*), arroyo willow (*S. lasiolepis*), stinging nettle (*Urtica dioica*), and poison hemlock. Ninety-three percent (14/15) of nests were placed in native plant species.

Fourteen birds (two males, nine females, and three floaters of unknown sex) that were banded in previous years were present at Camp Pendleton in 2013. Of the banded adult flycatchers present during the 2012 breeding season, 25% (1/4) of males and 88% (7/8) of females returned to Camp Pendleton in 2013; all occupied the same breeding area as they did in 2012. Additionally, one banded adult female last seen in 2011, one natal male last seen in 2010, and three natal birds (one female, two floaters of unknown sex) that were not captured to confirm their origins were present on Camp Pendleton in 2013. Fifteen percent (2/13) of nestlings banded in 2012 were seen as adults in 2013, one female and one floater of unknown sex. The female paired and nested off Base on the San Luis Rey River in 2013 while the floater of unknown sex was detected on Base but did not establish a territory. Twenty-seven nestlings from nine nests were banded in 2013; of these, only 9 survived to fledging. 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 26 July (Fig. 1, Appendix A, Figs. 4-9). Field work was conducted by USGS personnel Katherine Allen, Lisa Allen, Patience Falatek, Aaron Gallagher, Jonathan Gunther, Alexandra Houston, Scarlett Howell, Barbara Kus, Suellen Lynn, Sarah Nichols, Melanie Madden, Eric Nolte, Jason Pietrzak, Ryan Pottinger, Devin Taylor, 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).

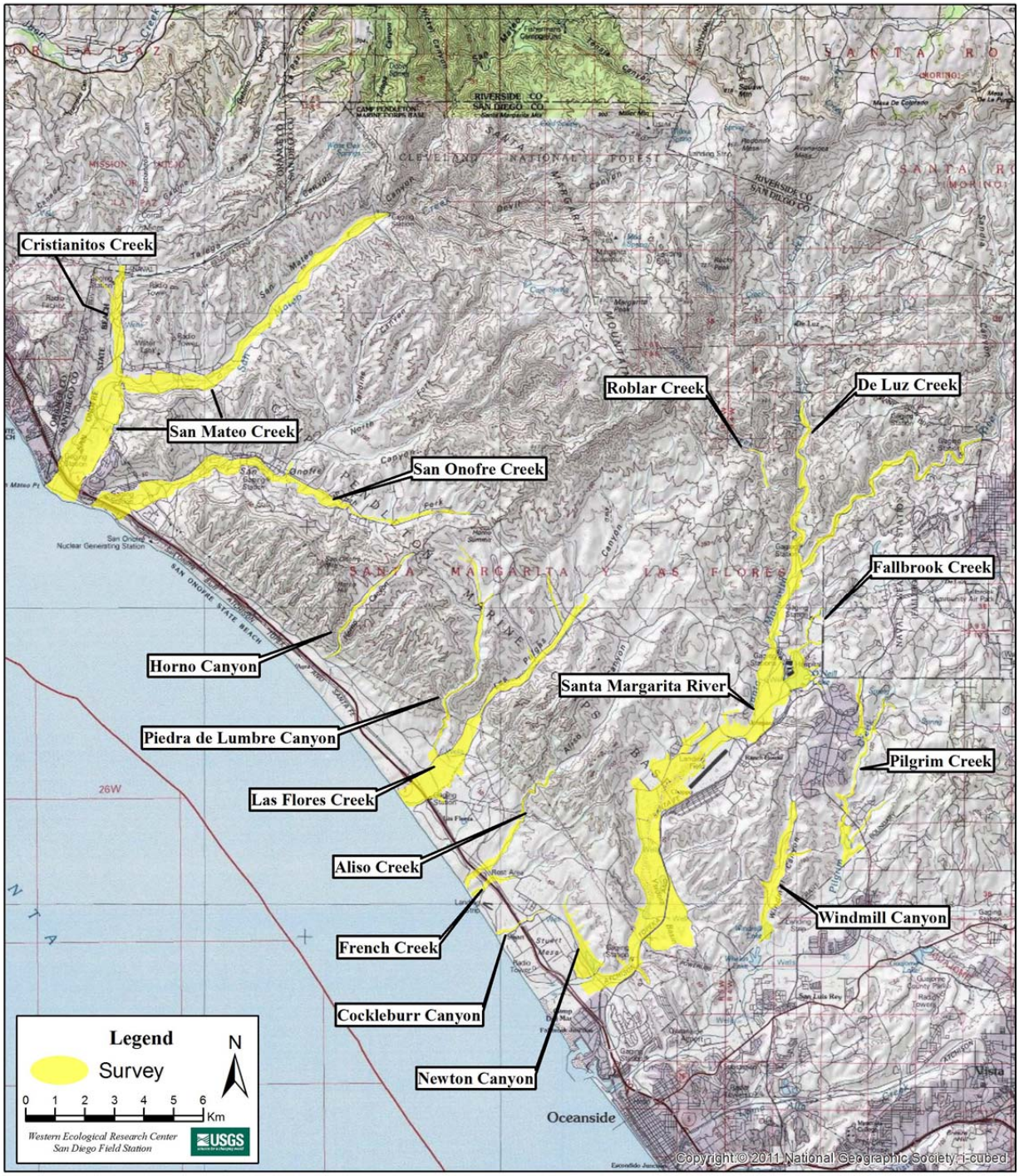

Fig. 1. Southwestern Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2013.

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 (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 four times at least 7 days apart. The majority of drainages were surveyed four times. The upper portion of the Santa Margarita River was surveyed twice and Roblar Creek was surveyed once.

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 (WSG84). 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 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 solid or bi-colored metal band on the other. Returning second-year birds banded as nestlings in 2012, with a single silver aluminum federal numbered band on the left leg, were recaptured in their territories and banded with a colored metal band on the right leg to yield a full, unique combination.

RESULTS

Population Size and Distribution

Transients

Forty-five Willow Flycatchers of unknown sub-species were observed during Base-wide surveys (Appendix B, Figs. 10-18). All transients were detected between 15 May and 26 June. Transients occurred on 10 of the 16 drainages surveyed in 2013. One Willow Flycatcher was incidentally detected along Talega Canyon during a Least Bell's Vireo survey. No Willow Flycatchers were detected at De Luz Creek, Horno Canyon, Newton Canyon, Piedra de Lumbre Canyon, Roblar Creek, or Windmill Canyon.

Residents

Seventeen Southwestern Willow Flycatchers, including three males, ten females, and four floaters of unknown sex were detected throughout the 2013 breeding season (Appendix B, Figs. 16-18; Appendix C, Figs. 19-22). Two of the males were paired, and one male's breeding status was undetermined. Both of the paired males were polygynous with five females each (Appendix C, Figs. 19-21). The male of unknown breeding status (Appendix C, Fig. 22) was detected on 2 July at Pilgrim Creek; however, the bird may have been present as early as 22 June and not

detected until July because of survey timing. No evidence of pairing was seen. In total, 11 known territories (i.e., one male of unknown status, and ten female nesting locations) were established in 2013, with ten females forming pair bonds with two male Willow Flycatchers. The four floaters of unknown sex included one possible female based on behavior. The first floater of unknown sex (AE99F; Appendix C, Fig. 19) was detected in the Air Station breeding area on 21 June, whitting and interacting with the resident male, and was suspected to be a breeding female. However, no nesting behavior was observed and the bird was not detected after 25 June. The second and third floaters of unknown sex were seen only once, on 1 July at Fallbrook Creek near a historic breeding area (FC01F; Appendix B, Fig. 17), and on 8 July at the Treatment Ponds breeding area in the territory of a nesting female (ES99F; Appendix C, Fig. 21). The fourth floater of unknown sex was detected in the Treatment Ponds breeding area on 19 July in the territory of a nesting female (ES98F; Appendix C, Fig. 21), and was present until at least 24 July. The birds were determined to be a floaters rather than a transients because they were 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 first three were banded with a single band on the left leg, indicating that they were returning nestlings. Overall, the resident flycatcher population on Base increased by 31% from 2012 to 2013 (Fig. 2).

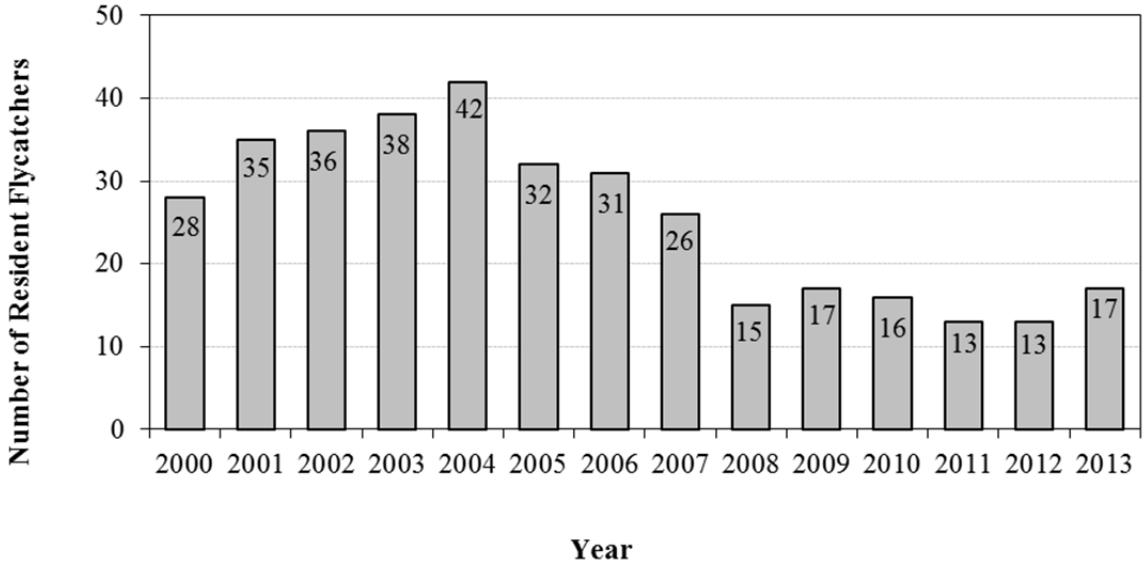

Fig. 2. Southwestern Willow Flycatcher population estimates for Marine Corps Base Camp Pendleton, 2000-2013.

Resident flycatchers were restricted to the Santa Margarita River (Appendix B, Fig. 16; Appendix C, Figs. 19-21), Fallbrook Creek (Appendix B, Fig. 17), and Pilgrim Creek (Appendix B, Fig. 18; Appendix C, Fig. 22). Along the Santa Margarita River, four core flycatcher breeding areas (those annually supporting multiple flycatcher territories) were occupied in 2013: Air Station, Treatment Ponds, Pump Road, and Northern Pueblitos. The Air Station area

supported the largest concentration of breeding flycatchers with four pairs; the Treatment Ponds area supported three pairs, the Pump Road area supported two pairs, and the northern portion of the Pueblitos breeding area supported one breeding pair. 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 the southern portion of Pueblitos breeding areas; see Fig. 3) devoid of flycatcher territories in 2013 (Table 1). Flycatcher distribution away from the Santa Margarita River was limited to one territorial male detected at Pilgrim Creek, and one floater of unknown sex at Fallbrook Creek.

Table 1. Distribution of territorial Willow Flycatchers at Marine Corps Base Camp Pendleton, 2000-2013.

		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
Santa Margarita River		M[a]	F	M	F	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	1	4
	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	-	2
	Treatment Ponds	1	-	1	-	-	-	-	-	-	-	1	-	1	4	2	2	1	1	2	2	2	2	1	2	1	2	1	3
	Pueblitos	4	-	3	4	3	3	4	5	4	4	1	3	3	6	1	1	2	3	2	1	-[b]	1	1	-	-	-	-[b]	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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pilgrim Creek		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	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**	**3**	**10**

[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, 2012.

Habitat Characteristics

Eighty percent (48/60) of all flycatcher sightings occurred in habitat classified as mixed willow riparian, 54% (26/48) of which occurred along the Santa Margarita River (Table 2). Ten percent (6/60) of locations were in willow habitat co-dominated by sycamore, and an additional 8% (5/60) were found in riparian scrub, dominated by mule fat and/or sandbar willow. The remaining 2% (1/60) 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 2013 was poison hemlock. Fifty-three percent (32/60) of flycatcher locations were composed of 5-50% exotic vegetation, primarily poison hemlock. Seven percent (4/60) 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 2013.

Bird ID	Drainage	Status[a]	Habitat Type[b]	Exotic Cover Class[c]	Dominant Exotics[d]
AL01Fa	Aliso Creek	T	Willow/Sycamore	2	BRA
AL01Fb	Aliso Creek	T	Willow/Sycamore	2	BRA
CC01F	Cocklebur Canyon	T	Mixed Willow	2	EUC
CS01F	Cristianitos Creek	T	Riparian Scrub	1	-
CS02F	Cristianitos Creek	T	Riparian Scrub	2	ARU
CS03F	Cristianitos Creek	T	Oak/Sycamore	2	CON
CS04F	Cristianitos Creek	T	Willow/Sycamore	1	-
CS05F	Cristianitos Creek	T	Mixed Willow	1	-
FC01F	Fallbrook Creek	F	Mixed Willow	2	CON
OL01F	Fallbrook Creek	T	Riparian Scrub	2	BRA
OL02F	Fallbrook Creek	T	Mixed Willow	2	ARU
OL03F	Fallbrook Creek	T	Mixed Willow	1	-
FR01Fa	French Creek	T	Mixed Willow	1	-
FR01Fb	French Creek	T	Mixed Willow	1	-
LL01F	Las Flores Creek	T	Riparian Scrub	2	BRA
PS01F	Pilgrim Creek	T	Mixed Willow	2	BRA, SIL
PS02F	Pilgrim Creek	U	Mixed Willow	1	-
MB01F	San Mateo Creek	T	Mixed Willow	1	-
MB02Fa	San Mateo Creek	T	Mixed Willow	1	-
MB02Fb	San Mateo Creek	T	Mixed Willow	1	-
MB03F	San Mateo Creek	T	Mixed Willow	1	-
MB04F	San Mateo Creek	T	Mixed Willow	1	-
MB05F	San Mateo Creek	T	Mixed Willow	1	-
MB06F	San Mateo Creek	T	Mixed Willow	1	-
MB07F	San Mateo Creek	T	Mixed Willow	1	-
MB08F	San Mateo Creek	T	Mixed Willow	1	-
MB09F	San Mateo Creek	T	Mixed Willow	1	-
MB10F	San Mateo Creek	T	Mixed Willow	1	-
MB11F	San Mateo Creek	T	Mixed Willow	2	BRA
MT01F	San Mateo Creek	T	Riparian Scrub	3	ARU
MU01F	San Mateo Creek	T	Willow/Sycamore	1	-
MU02F	San Mateo Creek	T	Willow/Sycamore	1	-
OE01F	San Onofre Creek	T	Mixed Willow	2	FOE
OE02F	San Onofre Creek	T	Mixed Willow	2	FOE
AE99F	Santa Margarita River	F	Mixed Willow	2	CON
AH01F	Santa Margarita River	T	Mixed Willow	1	-
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
ASA	Santa Margarita River	P	Mixed Willow	2	CON

Table 2 (*continued*). Habitat characteristics of Willow Flycatcher locations at Marine Corps Base Camp Pendleton in 2013.

Bird ID	Drainage	Status[a]	Habitat Type[b]	Exotic Cover Class[c]	Dominant Exotics[d]
BN01Fa	Santa Margarita River	T	Mixed Willow	3	CON
BN01Fb	Santa Margarita River	T	Mixed Willow	3	CON
BN01Fc	Santa Margarita River	T	Mixed Willow	3	CON
BN02F	Santa Margarita River	T	Mixed Willow	1	-
BN03F	Santa Margarita River	T	Mixed Willow	2	CON
ES20F	Santa Margarita River	T	Mixed Willow	2	CON
ES98F	Santa Margarita River	F	Mixed Willow	2	CON
ES99F	Santa Margarita River	F	Mixed Willow	2	CON
ETC	Santa Margarita River	P	Mixed Willow	2	CON
PLM	Santa Margarita River	P	Mixed Willow	2	CON
PNB	Santa Margarita River	P	Mixed Willow	2	BRA, CON
PR04F	Santa Margarita River	T	Mixed Willow	1	-
PR51F	Santa Margarita River	T	Mixed Willow	2	CON
PR52F	Santa Margarita River	T	Mixed Willow	2	CON
PR53F	Santa Margarita River	T	Mixed Willow	2	CON
SE01F	Santa Margarita River	T	Mixed Willow	2	CON
TLM	Santa Margarita River	P	Mixed Willow	2	CON
TOR	Santa Margarita River	P	Mixed Willow	2	CON
TWI	Santa Margarita River	P	Mixed Willow	2	CON
TA01F	Talega Canyon	T	Willow/Sycamore	1	-

[a] F = Floater, P = breeding pair, 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, EUC = Eucalyptus (*Eucalyptus sp.*), FOE = fennel (*Foeniculum vulgare*), SIL = milk thistle (*Silybum sp.*), TAM = salt cedar

Breeding Activities

Nesting was observed for all ten pairs (Table 3). Nesting was initiated in late May. The earliest confirmed lay date was 30 May and the latest was 13 July. Five pairs attempted more than one nest, all following an unsuccessful initial attempt. Nesting continued into July, with the last young fledging on 10 July. Of the ten breeding pairs, 30% (3/10) fledged young during the 2013 breeding season.

Fifteen nesting attempts by Willow Flycatchers were documented during the 2013 breeding season. Twenty percent (3/15) 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 75% (9/12) of nest failures. The majority (7/9) of predation events took place during the nestling stage, while the remainder took place during the egg stage. The initial nest for the ASA female was found after failure, and the cause of failure could not be

Table 3. Nesting activity of Southwestern Willow Flycatcher pairs at Marine Corps Base Camp Pendleton in 2013.

Pair ID	Lay Date	# Eggs	# Nestlings	# Fledglings	Nest Fate[a]	Comments
ANG	04-Jun-13	3	3	0	PRE	Two nestlings seen perched on top of tilted nest on earliest fledge date, but not present the following day.
	13-Jul-13	2	2	0	PRE	Nest intact but empty.
APL	31-May-13	4	3	3	SUC	One nestling missing on banding day.
APR	30-May-13	3	3	0	PRE	Nest mite infestation.
	04-Jul-13	3	0	0	PRE	Two eggs missing and one damaged egg in nest.
ASA	N/A	0	0	0	UNK	Nest found after failure; female dismantled nest.
	N/A	2[b]	0	0	PRE	Nest found with 2 eggs. Eggs began to look damaged and discolored by day 9, removed on day 12 to promote re-nesting.
ETC	16-Jun-13	3	2	0	PRE	Nest intact but empty. 3rd nestling may have hatched before nest failed.
PLM	01-Jun-13	4	4	0	PRE	Nest torn down, 2 nestlings alive under nest. Installed substitute nest near original nest, but substitute nest was empty next day.
	06-Jul-13	3	0	0	OTH	Eggs infertile; did not hatch after 19 days.
PNB	09-Jun-13	4	4	3	SUC	Nest substrate shifted; found nest tilted on banding day, one nestling missing. Tied up nest and added support for failing substrate.
TLM	02-Jun-13	3	3	0	PRE	Nest torn down.
	06-Jul-13	3	0	0	OTH	Eggs infertile; did not hatch after 19 days.
TOR	09-Jun-13	3	3	0	PRE	Nest intact but empty on fledge day. Feces on rim, but no birds heard in territory on subsequent visits.
TWI	12-Jun-13	3	3	3	SUC	

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

[b] Minimum number; nest not seen during laying.

determined as the female dismantled the nest. None of the seven pairs whose initial nests failed re-nested successfully: three were depredated, two laid clutches that were infertile, and two females disappeared after the initial failure.

Mean clutch size, estimated from 13 nests known to have full clutches, was 3.2 ± 0.6 eggs. Nine fledglings were produced, yielding a seasonal productivity of 0.9 young/pair (nine young/ten pairs).

Nest Site Characteristics

Flycatchers placed nests in five species of plants (Table 4), including sandbar willow, black willow, red or arroyo willow, stinging nettle (*Urtica dioica*), and poison hemlock. Ninety-three percent (14/15) of nests were placed in native species: 79% (11/14) in willow and 21% (3/14) in stinging nettle. The remaining nest was placed in the exotic species poison hemlock. Nest height averaged 1.8 ± 0.6 m, while host height averaged 4.9 ± 3.3 m.

Table 4. Nest site characteristics of Southwestern Willow Flycatchers at Marine Corps Base Camp Pendleton in 2013. All measurements are in meters.

					Distance to the edge of:	
Pair ID	**Nest ID**	**Host Species**	**Host Height**	**Nest Height**	**Host Plant**	**Clump**
ANG	1	Sandbar Willow	4.1	2.5	0.2	2.5
ANG	2	Sandbar Willow	3.2	2.0	1.0	1.5
APL	1	Sandbar Willow	4.3	2.8	0.3	1.1
APR	1	Sandbar Willow	4.0	1.9	0.4	3.2
APR	2	Sandbar Willow	3.3	2.7	1.1	2.3
ASA	1	Stinging Nettle	-	-	-	-
ASA	2	Stinging Nettle	2.9	1.6	0.0	3.1
ETC	1	Black Willow	9.5	2.2	0.3	0.3
PLM	1	Sandbar Willow	4.0	2.0	0.2	3.0
PLM	2	Red/Arroyo Willow	7.7	1.3	0.9	0.8
PNB	1	Poison Hemlock	1.8	1.2	0.0	2.9
TLM	1	Red/Arroyo Willow	7.8	1.3	0.7	4.0
TLM	2	Black Willow	13.0	1.7	0.4	2.5
TOR	1	Stinging Nettle	1.9	1.4	0.0	0.5
TWI	1	Sandbar Willow	1.7	1.0	0.6	0.6

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 2013.

Banded Birds

All resident Willow Flycatchers were observed closely enough to determine with confidence whether they were banded (Table 5). Sixty-seven percent (2/3) of resident males, 90% (9/10) of females, and three of the floaters of unknown sex were banded in previous years.

Of these, one resident male that was banded with a single federal band as a nestling in 2010, and one floater of unknown sex that was banded with a single federal band as a nestling in 2012, were recaptured and banded with a second band to provide a unique combination in 2013. All known and confirmed banded birds were originally banded on Camp Pendleton. One female and two floaters of unknown sex were most likely banded on Camp Pendleton as nestlings in 2011 and 2012; however, they were not recaptured to confirm their natal origins.

Thirty flycatchers were banded for the first time in 2013. Three adults (one male, one female, and one floater of unknown sex) were captured and banded with unique combinations. Twenty-seven nestlings from nine nests were banded (Appendix D); only three nestlings from APL, three nestlings from PNB, and three nestlings from TWI are believed to have fledged.

No male flycatchers were detected in the Pump Road breeding area; however genetic samples collected from the PLM and PNB nests confirmed that the PLM nestlings were fathered by the same male that resided across the river in the Treatment Ponds breeding area and the PNB nestlings were fathered by the same male that resided upstream at the Air Station breeding 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 2013.

Territory / Bird ID	Status[a]	Male Banded?[b]	Female Banded?[b]	Nestlings Banded?	Comments[c]
ANG	P	Msi : puor	rebk : Msi	5	Male banded in 2010 as an adult at Air Station. Female banded in 2011 as a nestling at Treatment Ponds. Male polygynous with four other females (APL/APR/ASA/PNB).
APL	P	Msi : puor	Msi : yedb	3	Female banded in 2008 as a nestling at Treatment Ponds. Male polygynous with four other females (ANG/APR/ASA/PNB).
APR	P	Msi : puor	Msi : bkpu	3	Female banded in 2010 as an adult at Air Station. Male polygynous with four other females (ANG/APL/ASA/PNB).
ASA	P	Msi : puor	bkwh : Msi	0	Female banded in 2009 as a nestling at Pueblitos. Male polygynous with four other females (ANG/APL/APR/PNB).
ETC	P	Msi : yebk	- : Msi	0	Male banded in 2010 as a nestling at Air Station and color-banded in 2013. Female likely banded as a nestling in 2011, but could not be recaptured to confirm identity. Male polygynous with four other females (PLM/TLM/TOR/TWI).
PLM	P	Msi : yebk	Msi : orpu	4	Female banded in 2010 as an adult at Pump Road. Male polygynous with four other females (ETC/TLM/TOR/TWI).

Table 5 (*continued*). Band status of Southwestern Willow Flycatchers at Marine Corps Base Camp Pendleton in 2013.

Territory / Bird ID	Status[a]	Male Banded?[b]	Female Banded?[b]	Nestlings Banded?	Comments[c]
PNB	P	Msi : puor	rewh : Msi	3	Female banded in 2009 as a nestling at Pueblitos. Male polygynous with four other females (ANG/APL/APR/ASA).
PS02F	U	yeor : Msi	N/A		Male banded in 2013.
TLM	P	Msi : yebk	bkbk : Msi	3	Female banded in 2009 as an adult at Air Station. Male polygynous with four other females (ETC/PLM/TOR/TWI).
TOR	P	Msi : yebk	yepu : Msi	3	Female banded in 2013. Male polygynous with four other females (ETC/PLM/TLM/TWI).
TWI	P	Msi : yebk	yere : Msi	3	Female banded in 2011 as an adult in Treatment Ponds. Male polygynous with four other females (ETC/PLM/TLM/TOR).
AE99F	F	Msi : -			Unknown sex likely banded as a nestling in 2012, but could not be recaptured to confirm identity.
ES98F	F	dbye : Msi			Unknown sex banded as an adult in 2013 in the TLM territory at Treatment Ponds.
ES99F	F	Msi : dbor			Unknown sex banded in 2012 as a nestling at Air Station and color banded in 2013 in TWI territory at Treatment Ponds.
FC01F	F	Msi : -			Unknown sex likely banded as a nestling in 2012, but could not be recaptured to confirm identity.

[a] F = nonbreeding floater, P = breeding pair, 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, dbor = dark blue-orange split, dbye = dark blue-yellow split, orpu = orange-purple split, puor = purple-orange split, rebk = red-black split, rewh = red-white split, yebk = yellow-black split, yedb = yellow-dark blue split, yeor = yellow-orange split, yepu = yellow-purple split, yere = yellow-red split.

[c] See Fig. 3, Appendix B, Figs. 16-18; Appendix C, Figs. 19-22 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 2013. 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 2012 breeding season, 25% (1/4) of males, 88% (7/8) of females, and 0% (0/1) of the floaters of unknown sex returned to Camp Pendleton in 2013. Overall, adult survivorship from 2012 on Camp Pendleton was 62% (8/13). In addition, a female last seen as an adult in 2011 in the APL territory reappeared in 2013 in the PNB territory. It is possible that the female was present during the 2012 breeding season; therefore if APL 2011 is incorporated into the survivorship calculations, the estimate of total adult survivorship from 2012 on Camp Pendleton increases to 64% (9/14), with a revised return rate for females (89%; 8/9). This also updates the previous estimate of total adult survivorship from 2011 to 2012 on Camp Pendleton from 64% (7/11; Howell and Kus 2012) to 73% (8/11), with a revised female return of 100% (6/6), up from 83% (5/6; Howell and Kus 2012).

One of the 13 nestlings banded in 2012 that survived to fledge was resighted and recaptured at Camp Pendleton in 2013, and one additional 2012 nestling was captured off Base, yielding a first-year survivorship estimate of 15% (2/13). The one bird returning to Camp Pendleton was a floater of unknown sex that was seen one time (ES99F; Table 5), and the bird captured off Base was a female that established a breeding territory at Bonsall along the San Luis Rey River (Houston and Kus 2013). Two additional birds (AE99F and FC01F, Table 5) were resighted in 2013 with a single federal band on the left leg, suggesting that they were 2012 nestlings; however, we were unable to capture them to confirm their origins. If these birds are incorporated into the return rate, the estimate of first-year survivorship from 2012 increases to 31% (4/13). Two male birds last seen as nestlings in 2010 and 2011 reappeared in 2013, increasing the first-year survivorship estimate of the 2010 cohort to 11% (2/18; Howell and Kus 2010a) and the 2011 cohort to 27% (4/15; Howell and Kus 2011). The 2010 bird established a breeding territory in northern Pueblitos/Treatment Ponds (Table 6), and the 2011 bird established a breeding territory off Base at Bonsall along the San Luis Rey River (Houston and Kus 2013).

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. All of the eight banded adults seen in both 2012 and 2013 returned to the breeding area they last occupied (Table 6). Four of the eight birds, one male 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 four females moved a short distance within the same breeding area they last occupied. The average distance moved by adult flycatchers between the 2012 and 2013 breeding seasons was 0.03 ± 0.03 km (excluding PNB female not seen in 2012). The PNB female who was last seen in 2011 in the Air Station breeding area returned to the exact territory she occupied in 2010 (Howell and Kus 2010a).

In contrast to returning adults, neither the returning second-year bird banded as a nestling in 2012, nor the returning nestling from 2010 returned to their natal areas to breed. The two birds returning for the first time in 2013, one male and one of unknown sex, were originally banded as nestlings in the Air Station area, and both dispersed to the Treatment Ponds area, approximately 1.4 and 1.6 km away (Table 6, Fig. 3). The average distance that second-year birds and first-time breeders dispersed from their natal areas was 1.5 ± 0.1 km.

Table 6. Between-year, between-area movement of Southwestern Willow Flycatchers at Marine Corps Base Camp Pendleton in 2013.

Year Last Detected	Breeding Area[a] (Territory Last Detected)	Breeding Area (Territory in 2013)	Dispersal Distance (km)	Band Combination[b]	Age in 2013	Sex[c]
2012	Air Station (AEO/ANG/APL/APR/ARC)	Air Station (ANG/APL/APR/ASA)	0.00	Msi : puor	≥ 4 yrs	M
2010	Air Station (ARC)	Treatment Ponds (ETC/TLM/TOR/TWI)	1.40	Msi : yebk	2 yrs	M
2012	Treatment Ponds (TLM)	Treatment Ponds (TWI)	0.05	bkbk : Msi	≥ 5 yrs	F
2012	Air Station (APL)	Air Station (APL)	0.00	Msi : yedb	5 yrs	F
2012	Air Station (AEO)	Air Station (APR)	0.04	Msi : bkpu	≥ 4 yrs	F
2012	Pump Road (PNB)	Pump Road (PLM)	0.00	Msi : orpu	≥ 4 yrs	F
2011	Air Station (APL)	Pump Road (PNB)	1.50	rewh : Msi	≥ 4 yrs	F
2012	Air Station (APR)	Air Station (ASA)	0.07	bkwh : Msi	4 yrs	F
2012	Treatment Ponds (TWI)	Treatment Ponds (TLM)	0.04	yere : Msi	≥ 3 yrs	F
2012	Air Station (ANG)	Air Station (ANG)	0.00	rebk : Msi	2 yrs	F
2012	Air Station (ANG)	Treatment Ponds (None)	1.60	Msi : dbor	1 yr	U

[a] See Fig. 3, Appendix B, Fig. 16; Appendix C, Figs. 19-21 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, dbor = dark blue-orange split, orpu = orange-purple split, puor = purple-orange split, rebk = red-black split, rewh = red-white split, yebk = yellow-black split, yedb = yellow-dark blue split, yere = yellow-red split.
[c] Sex: M = male, F = female, U = unknown.

No instances of movement by adult Willow Flycatchers within the 2013 season were observed.

Two instances of emigration were seen in 2013. A male originally banded as a nestling in 2011 in the Air Station area and a female originally banded as a nestling in 2012 in the Treatment Ponds area paired and established a breeding territory on the San Luis Rey River near Bonsall, approximately 13.3 and 14.1 km away (Houston and Kus 2013).

Human Activities in Riparian Habitat

No evidence of human activities in riparian habitat occupied by Willow Flycatchers was witnessed during the 2013 breeding season.

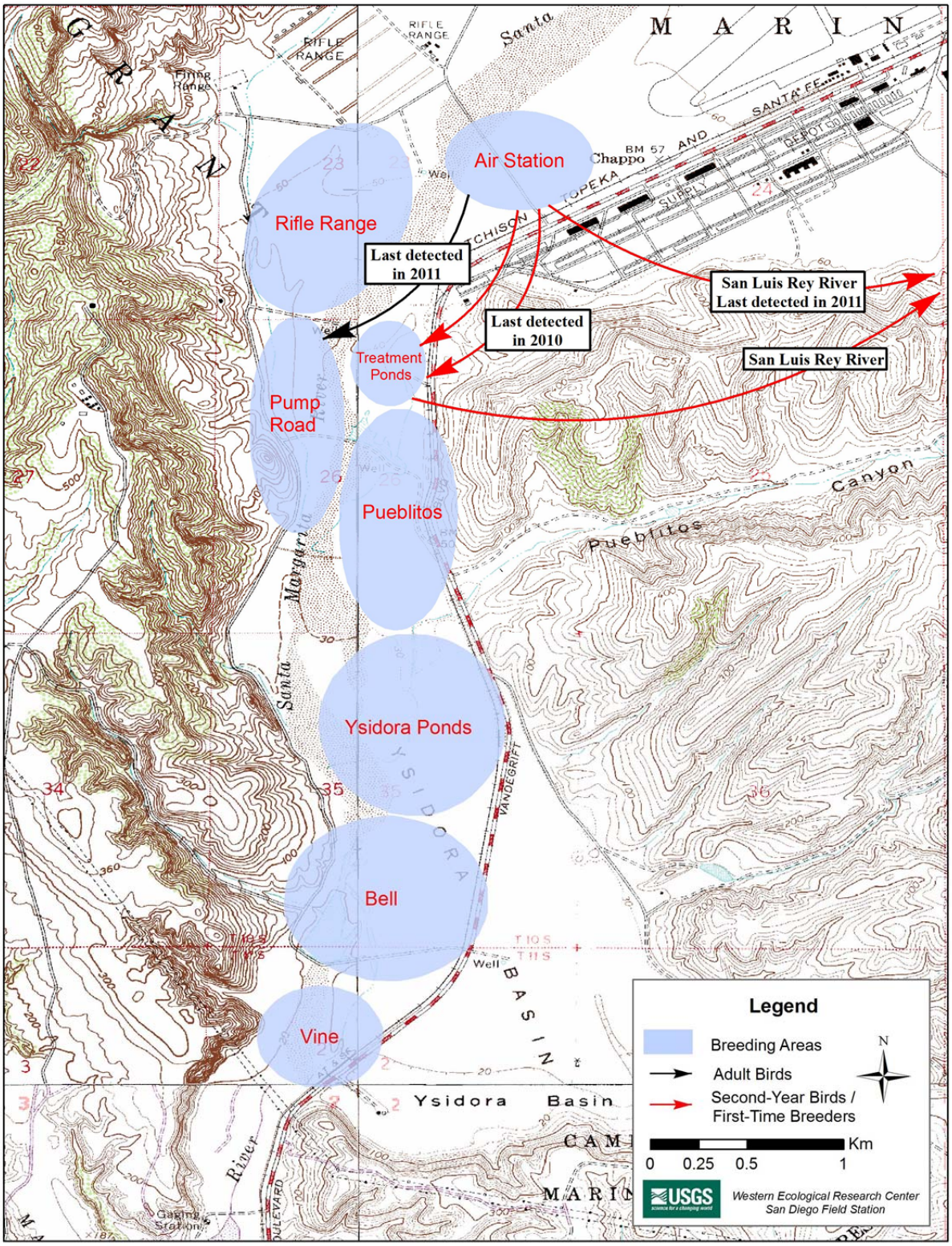

Fig. 3. Between-year, between-area movement by adult and second-year/first-time breeder Southwestern Willow Flycatchers at Marine Corps Base Camp Pendleton, 2013.

DISCUSSION

Camp Pendleton continues to provide important habitat for both migrating and breeding Willow Flycatchers. The number of transient flycatchers detected in 2013 (45) was higher than in 2012 (29; Howell and Kus 2012), and comparable to numbers seen in previous years. 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 (Howell and Kus 2010a).

The resident population of Southwestern Willow Flycatchers on Camp Pendleton in 2013 (17 individuals) increased 31% compared to 2011 and 2012 (13 individuals, Howell and Kus 2011, 2012). This increase in individuals can be mostly attributed to the high number of floaters of unknown sex seen in 2013 (four); however, there was also an increase among female flycatchers from 2012 (eight; Howell and Kus 2012) to 2013 (ten). As in 2012, the sex ratio in 2013 was once again skewed towards females, following an equal sex ratio in 2011 (Howell and Kus 2011), and once again 100% of paired males were polygynous with multiple females. The rate of polygyny among males has ranged from 0-80% between 2000 and 2010 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). In the occupied breeding areas (Air Station, Treatment Ponds, Pump Road, and Northern Pueblitos), females outnumbered males 5:1, and the high degree of polygyny in the population reflects this. Only two males were present on the Santa Margarita River, and both paired with five females each. The record high number of females sharing males (100%) seen in 2012 (Howell and Kus 2012) continued into 2013, 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, unpaired territorial males were present during the breeding season, but females shared males rather than pairing with males in other areas. 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 2013 (ten) increased relative to 2012 (eight; Howell and Kus 2012), 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. Among the occupied areas, one area had a decrease in flycatcher territories, and three areas had an increase. The Air Station breeding area once again supported the majority of flycatcher breeding pairs (4/10) on Base in 2013 (one male, four females) and one nonbreeding floater, down from five pairs (one male, five females) in 2012 (Howell and Kus 2012). The Treatment Ponds breeding area increased relative to 2012, hosting three breeding pairs (one male, three females) and two nonbreeding floaters, compared to two breeding pairs (one male, two females) in 2012. One additional female paired with the Treatment Ponds male and nested in the northern portion of Pueblitos breeding area, which was unoccupied in 2012. The number of territories in the Pump Road breeding area

increased to two pairs (two female nesting locations), up from one pair (one female nesting location) in 2012. In 2012 there was no dedicated male detected at Pump Road; rather the female shared the male at the Treatment Ponds area. The same situation occurred in 2013, with no male detections at Pump Road in either female territory. The PLM female stayed in the Pump Road location even though her mate spent the majority of his time 0.4 km away in the Treatment Ponds area, and the PNB female mated with the Air Station male located 1.4 km upstream from Pump Road. The mechanism by which this pairing occurred is unknown; the male may have traveled downstream to mate with the female, or the female may have visited the male at Air Station. In previous years, the PNB female has nested either in Air Station (2011; Howell and Kus 2011) or Pump Road (2010; Howell and Kus 2010a). It is possible that she arrived on Base, visited the Air Station where she encountered the male and mated with him, but then found the Air Station to be unsuitable in some way (i.e., all suitable habitat occupied) and moved to Pump Road. This may suggest that female flycatchers are selecting the best available habitat rather than the mate. 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 non-territorial floater of unknown sex that was detected on Fallbrook Creek, and a territorial male that recolonized Pilgrim Creek for the first time since 1997. Pilgrim Creek historically supported two to six breeding pairs between 1986 and 1997, but no breeding birds have been detected there since 1997 (Griffith Wildlife Biology 1999; 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, 2012). No birds were detected at San Mateo Creek in 2013, which previously hosted a breeding pair in 2007 (Rourke *et al.* 2008), and a territorial male at the Sierra holding ponds from 2009-2012 (Howell and Kus 2009b, 2010a, 2011, 2012).

The proximity of the breeding areas on the Santa Margarita River facilitates movement between areas annually, and often within breeding seasons. One hundred percent of adult flycatchers that returned in 2013 occupied the same breeding area that they used in 2012. The PNB female was not seen in 2012, but she occupied Pump Road in 2010 (Howell and Kus 2010a) and this year returned to Pump Road. It is possible that she quietly nested at Pump Road in 2012 and went undetected. 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 (Howell and Kus 2012) and 2013. 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%), 2010 (83%), 2011 (83%), 2012 (100%) and 2013 suggests that the areas being occupied represent the most suitable habitat currently available on Base (Howell and Kus 2009b, 2010a, 2011, 2012).

Nest success reached a new record low of 20% during the 2013 breeding season, following the previous record low set in 2012 (27%; Howell and Kus 2012). In addition to low nest success, seasonal productivity hit a record low of 0.9 young/pair, compared to 1.6 young/pair in 2012 (Howell and Kus 2012). Average clutch size (3.2 eggs/nest) was comparable

to the 2001-2010 annual mean (3.1 eggs/nest). Only nine young were confirmed fledged in 2013, compared to 13 in 2012 and 17 in 2011 (Howell and Kus 2011, 2012). Several factors combined to create this overall reduction in productivity. Higher than average predation impacts were seen in 2013, with 60% (9/15) of all flycatcher nests depredated, more than double the mean predation rate of 29 ± 13% from 2001 to 2012 (excluding the partial 2011 season; 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, 2012). In addition, the majority of predation events took place late in the nestling stage, with 67% (6/9) of all depredated nests failing within 2 days of fledging. These late stage failures were especially detrimental in the Treatment Ponds/northern Pueblitos/Pump Road breeding areas, as the male was not seen after 20 June. Four nest failures occurred after 20 June: two of the females opted to re-nest, but the eggs in the second clutch were infertile and did not hatch. The remaining two females were not seen again after their first nests failed. The lack of male presence at the nests after 20 June may have made the nests more susceptible to predators as the male may have provided support in nest defense. On one hand, the high degree of polygyny in this population allows females to breed that otherwise would not if they required a monogamous partner. On the other hand, fewer males means that losing the only male in an area will have potentially catastrophic consequences, and highlights the need for additional males. In order for the flycatcher population on Base to recover, more males need to colonize to reduce the risk of catastrophic season failures.

The return rate of banded adults between 2012 and 2013 (62%) was comparable to the return rate in 2012 (64%; Howell and Kus 2012), 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 2013, the return rate of second-year birds (20%) was just below the 2012 rate (27%; Howell and Kus 2012), and this number will likely adjust upward in future years. Two probable second-year birds were seen on Base, but were not captured to confirm their age or origin; it is possible that they will return to breed in subsequent years when they can be captured and identified. The total percentage of adults within the breeding population that were banded as nestlings has generally increased annually. In 2013, 53% (9/17) of the adult flycatchers on Base were originally banded as nestlings, compared to 54% (7/13) in 2012, 46% (6/13) 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, 2012). 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 may be immigrants from other nearby populations, such as the population on the upper San Luis Rey River. In 2013, two unbanded flycatchers were detected on Base, one male and one floater of unknown sex. While neither bird was known to breed in 2013, there is a possibility these birds may return and enter the breeding population in 2014.

Two instances of emigration off Base were observed in 2013. Two natal birds, a female hatched in the Treatment Ponds area in 2012 (Howell and Kus 2012), and a male hatched in the Air Station area in 2011 (Howell and Kus 2011) dispersed to Bonsall on the San Luis Rey River. Emigration of birds off Base to the Bonsall area on the San Luis Rey River has been documented twice since 2010. One adult female bred on Base in the Air Station area in 2009, moved to Bonsall in 2010, and returned to the Treatment Ponds area on Base in 2011, 2012, and 2013, and one natal male dispersed to Bonsall in 2011 (Howell and Kus 2009b, 2010a, 2011, 2012). 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 *et al.* 2012) 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 two unbanded flycatchers were detected on Base in 2013, 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. However, the high number of nonbreeding floaters detected in 2013 and the emigration of two flycatchers off Base may indicate that all currently suitable habitat on Base is being occupied, and the population on Base may not increase until additional habitat becomes available. Until that time, careful consideration should be given to any projects that alter the habitat in currently occupied areas. Additionally, restoration activities such as planting and watering of cleared habitats in historically occupied areas may be warranted to speed up recovery and increase the chances of recolonization by Southwestern Willow Flycatchers.

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, 2013

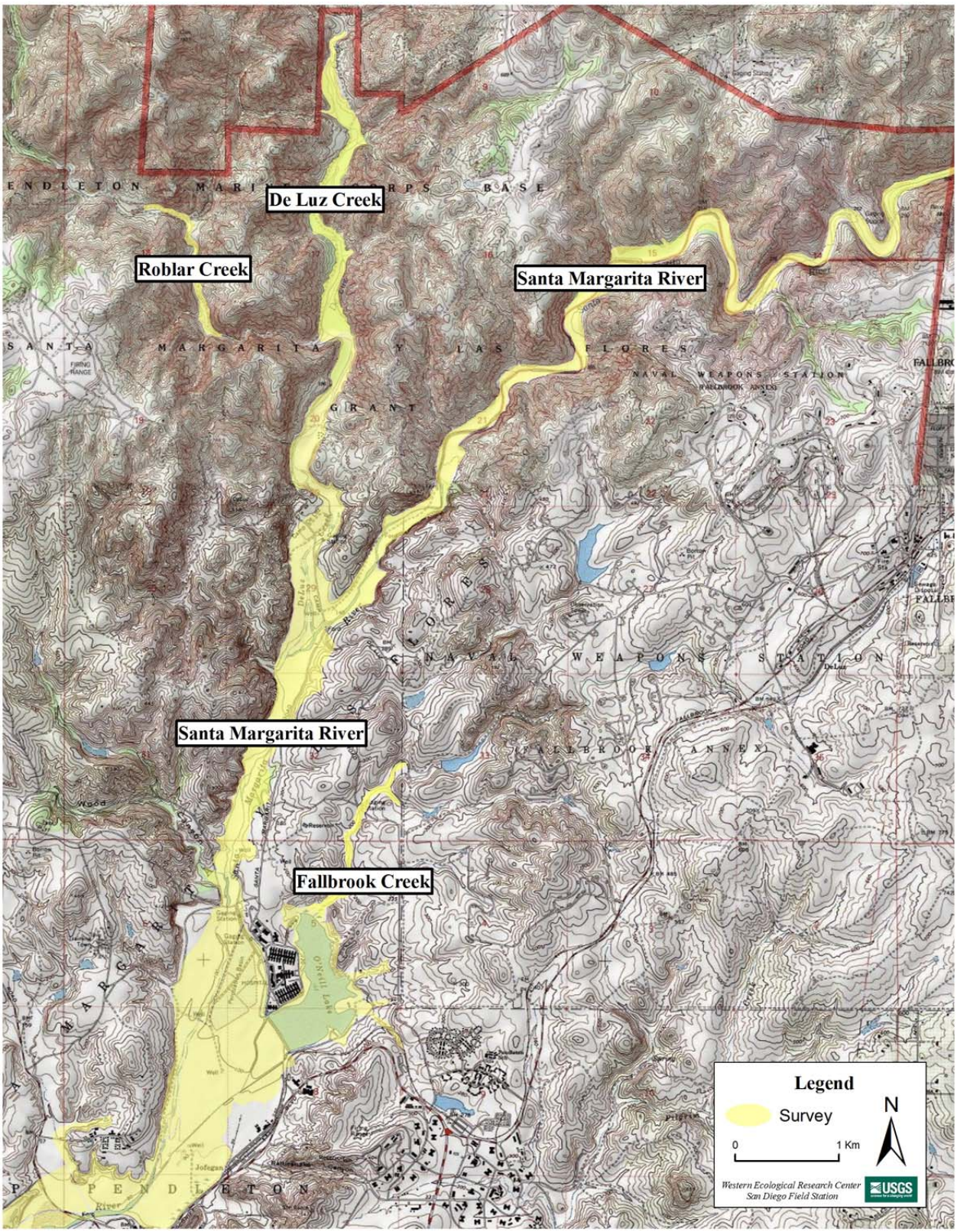

Fig. 4. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2013: Santa Margarita River, Fallbrook Creek, De Luz Creek and Roblar Creek.

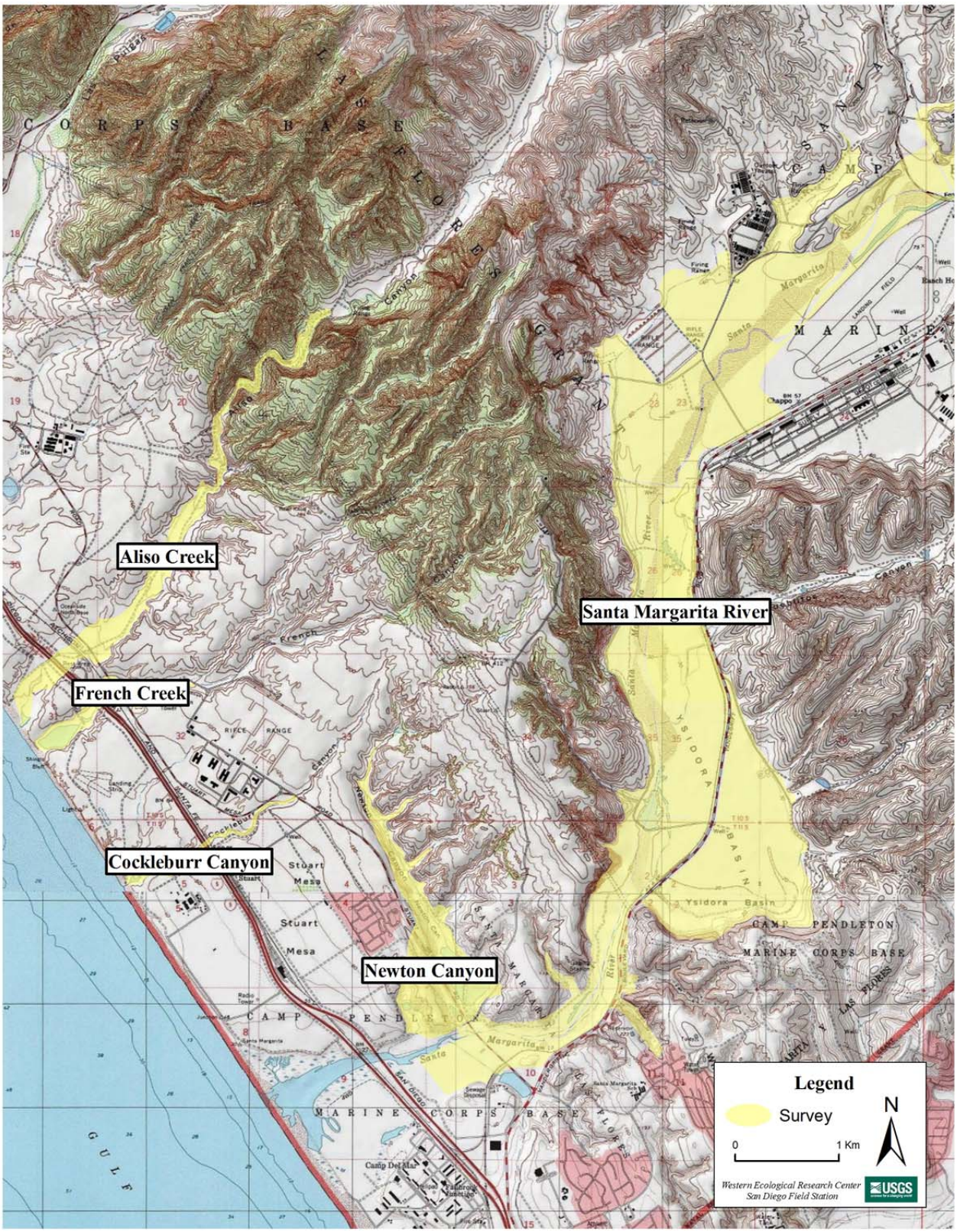

Fig. 5. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2013: Santa Margarita River, Newton Canyon, Cockleburr Canyon, French Creek, and Aliso Creek.

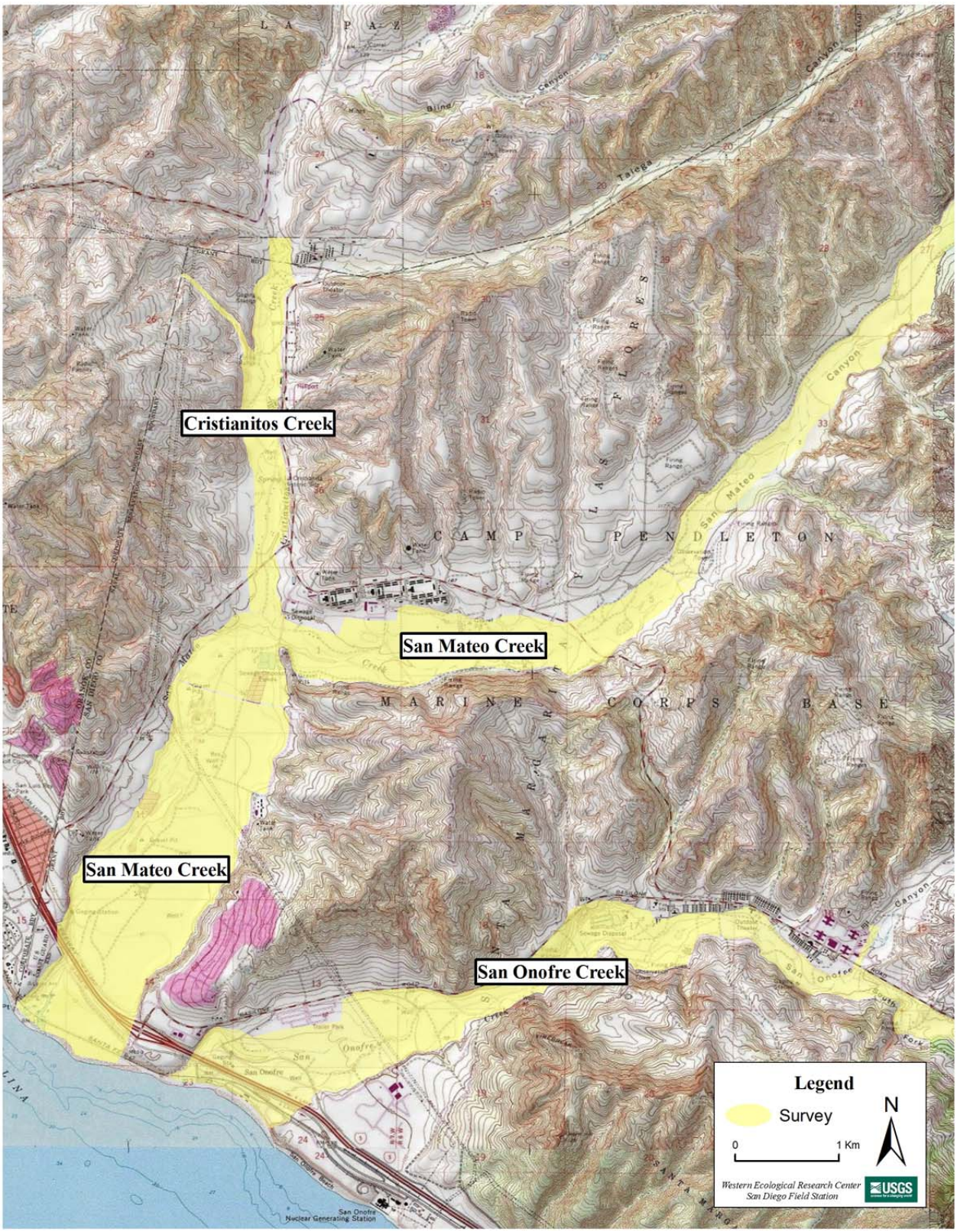

Fig. 6. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2013: Cristianitos Creek, San Mateo Creek and San Onofre Creek.

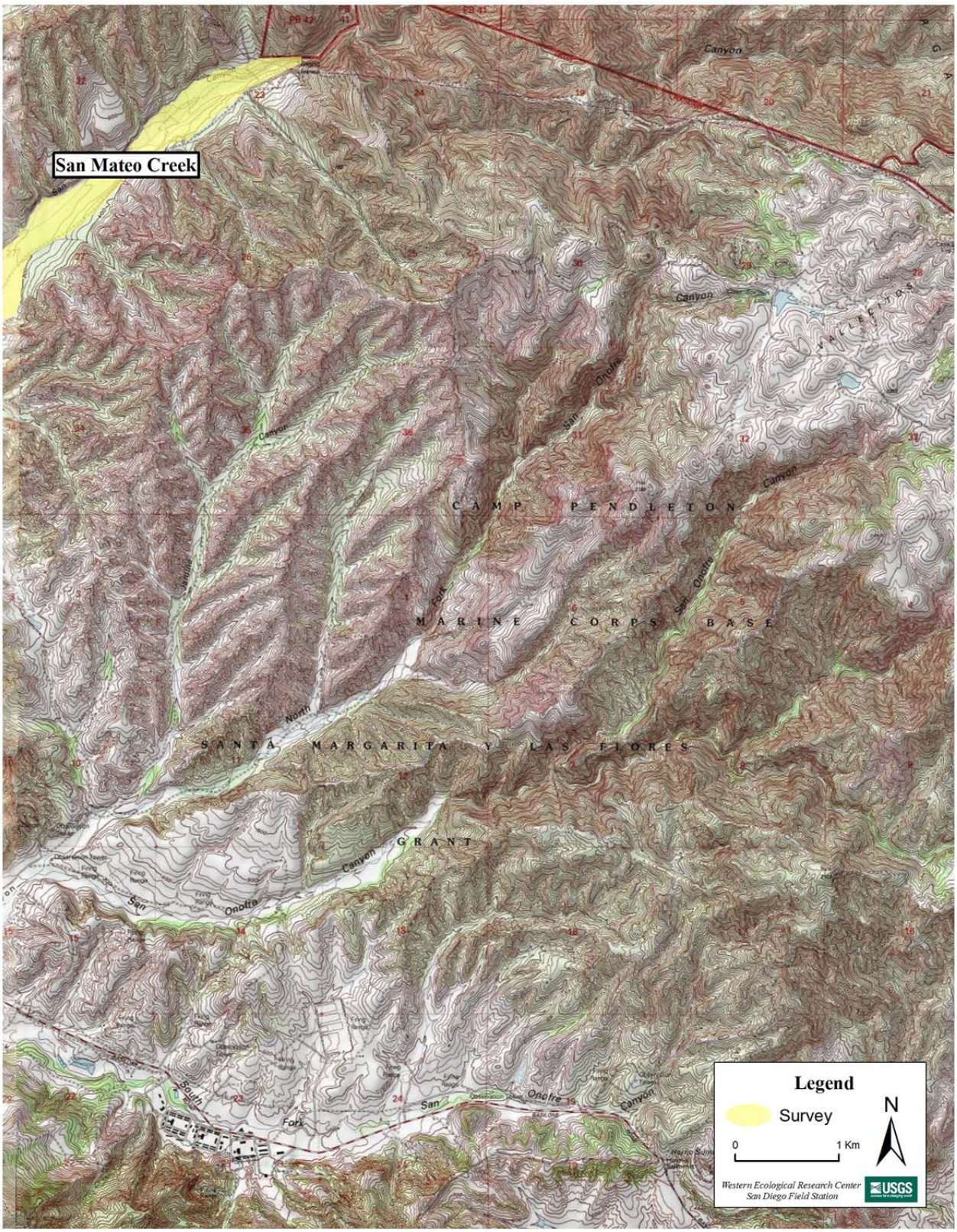

Fig. 7. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2013: San Mateo Creek.

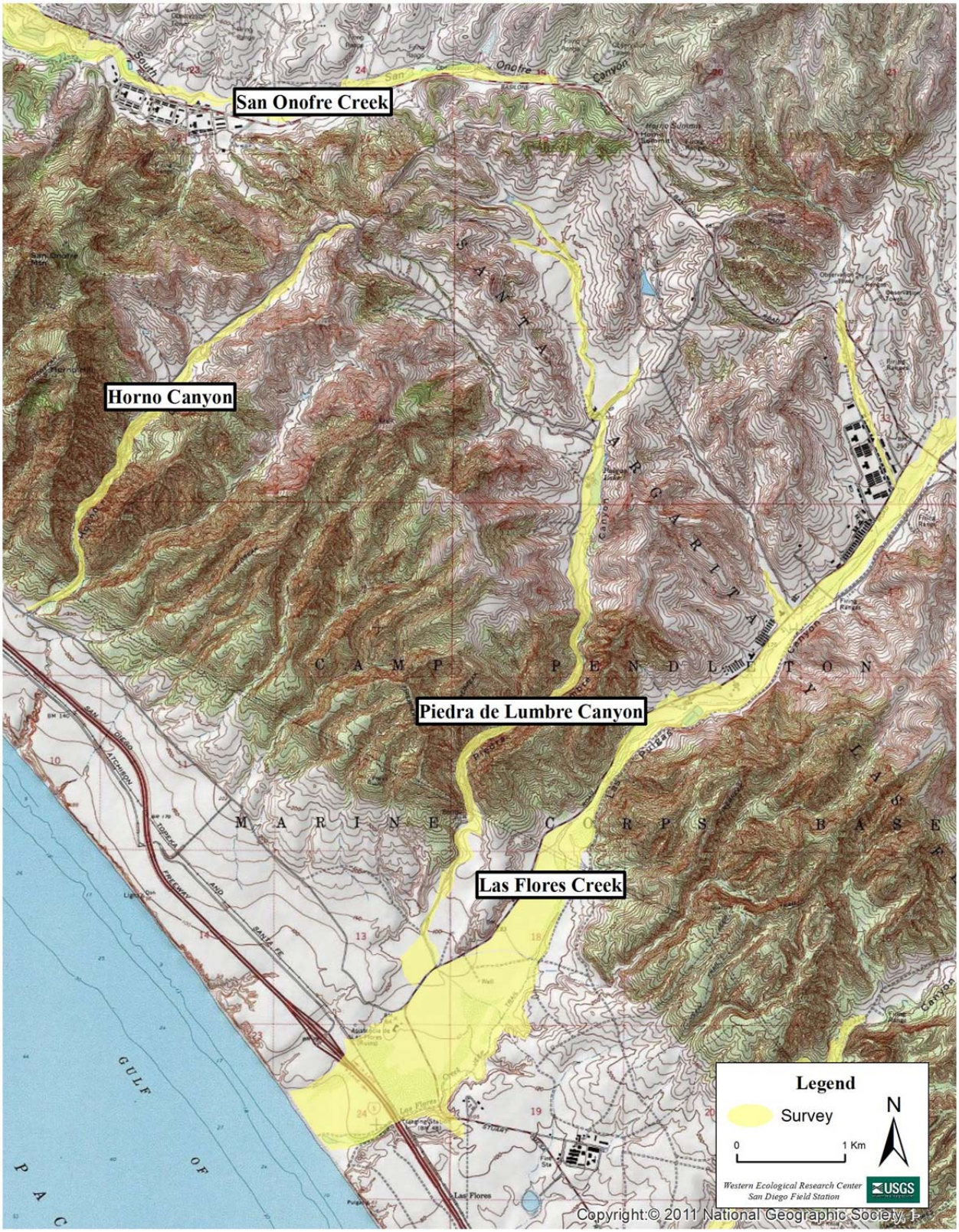

Fig. 8. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2013: Las Flores Creek, Piedra de Lumbre Canyon, Horno Canyon, and San Onofre Creek.

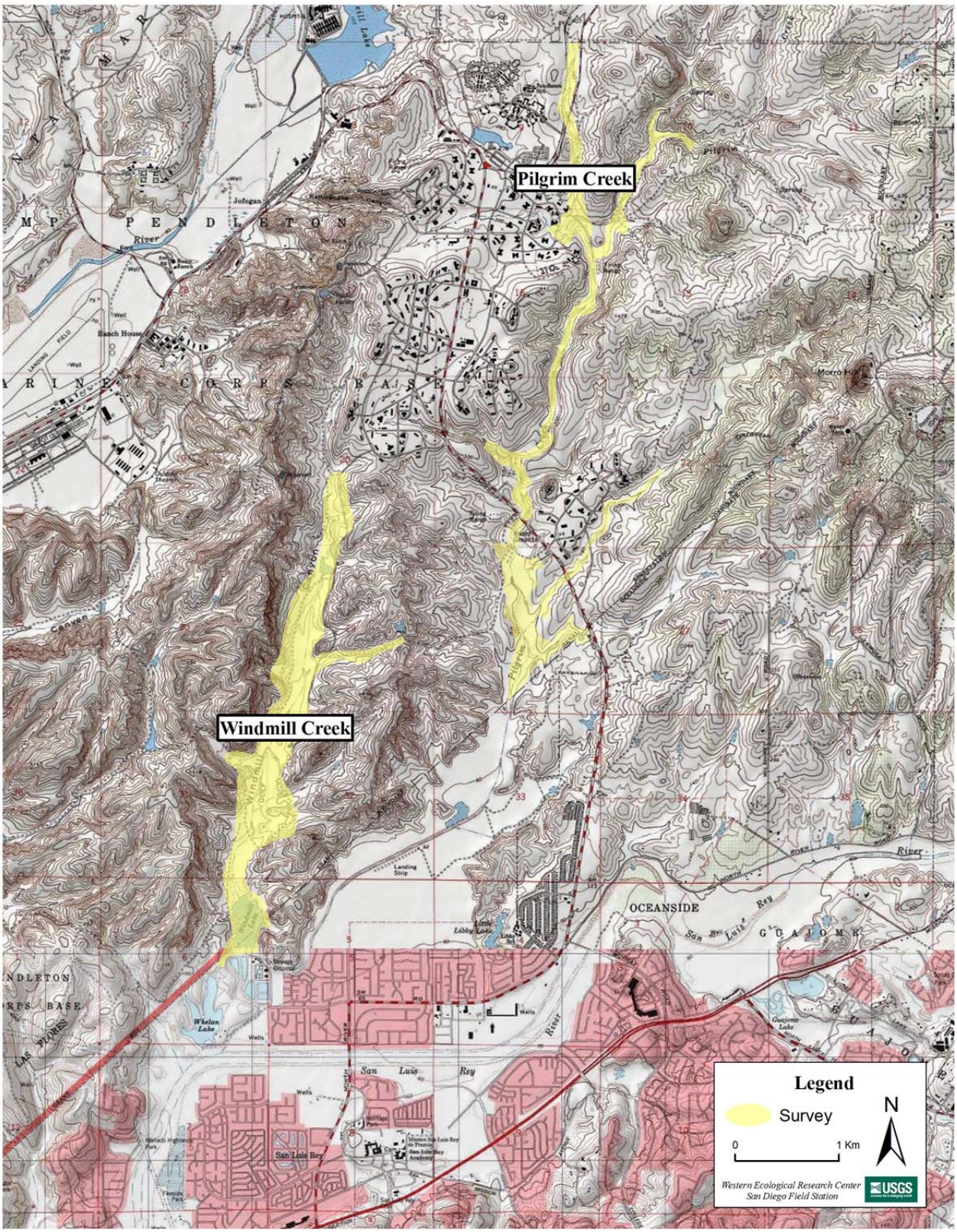

Fig. 9. Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2013: Windmill Canyon and Pilgrim Creek.

APPENDIX B

LOCATIONS OF SOUTHWESTERN WILLOW FLYCATCHERS AT MARINE CORPS BASE CAMP PENDLETON, 2013

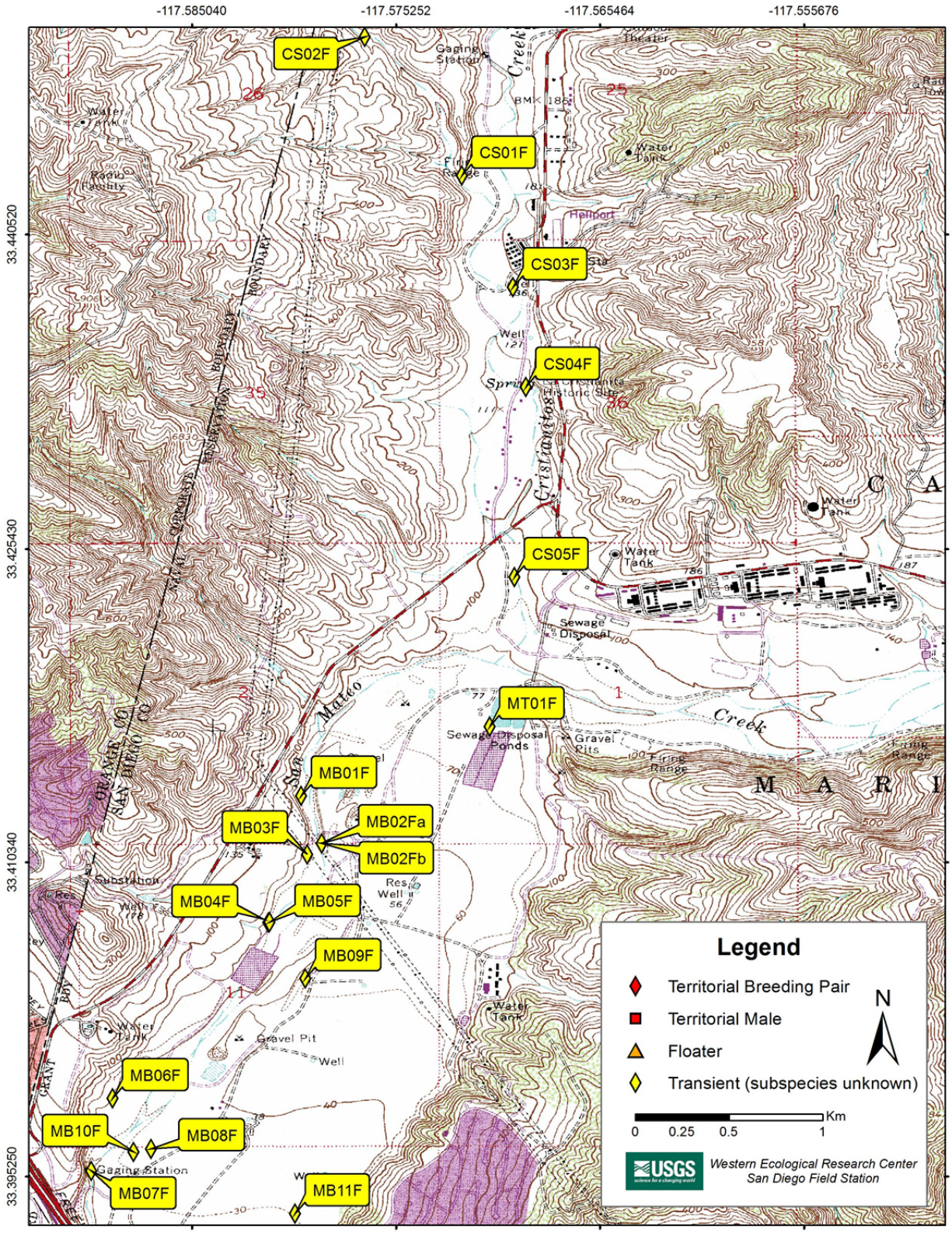

Fig. 10. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2013: San Mateo Creek (downstream) and Cristianitos Creek.

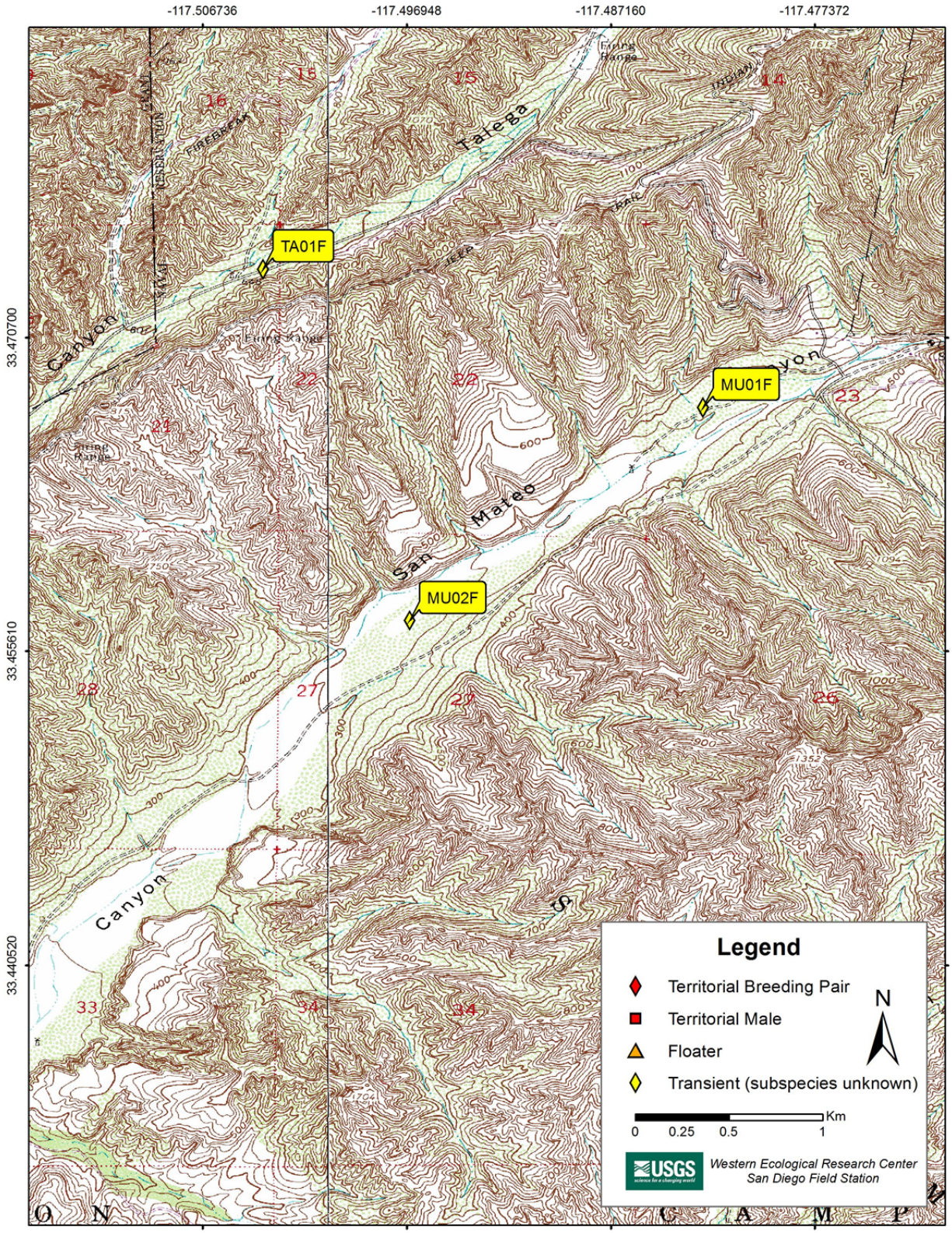

Fig. 11. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2013: San Mateo Creek (upstream) and Talega Canyon.

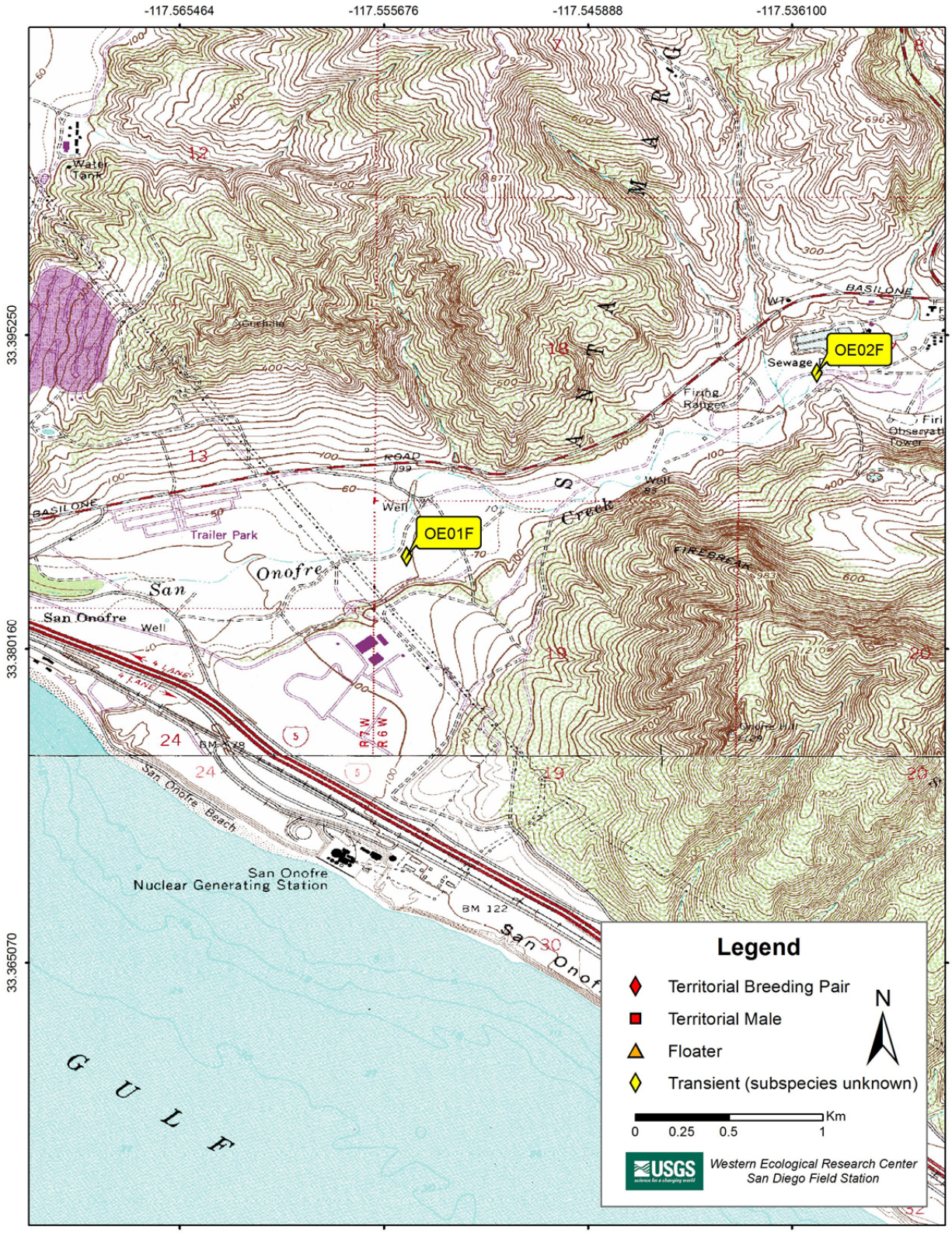

Fig. 12. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2013: San Onofre Creek.

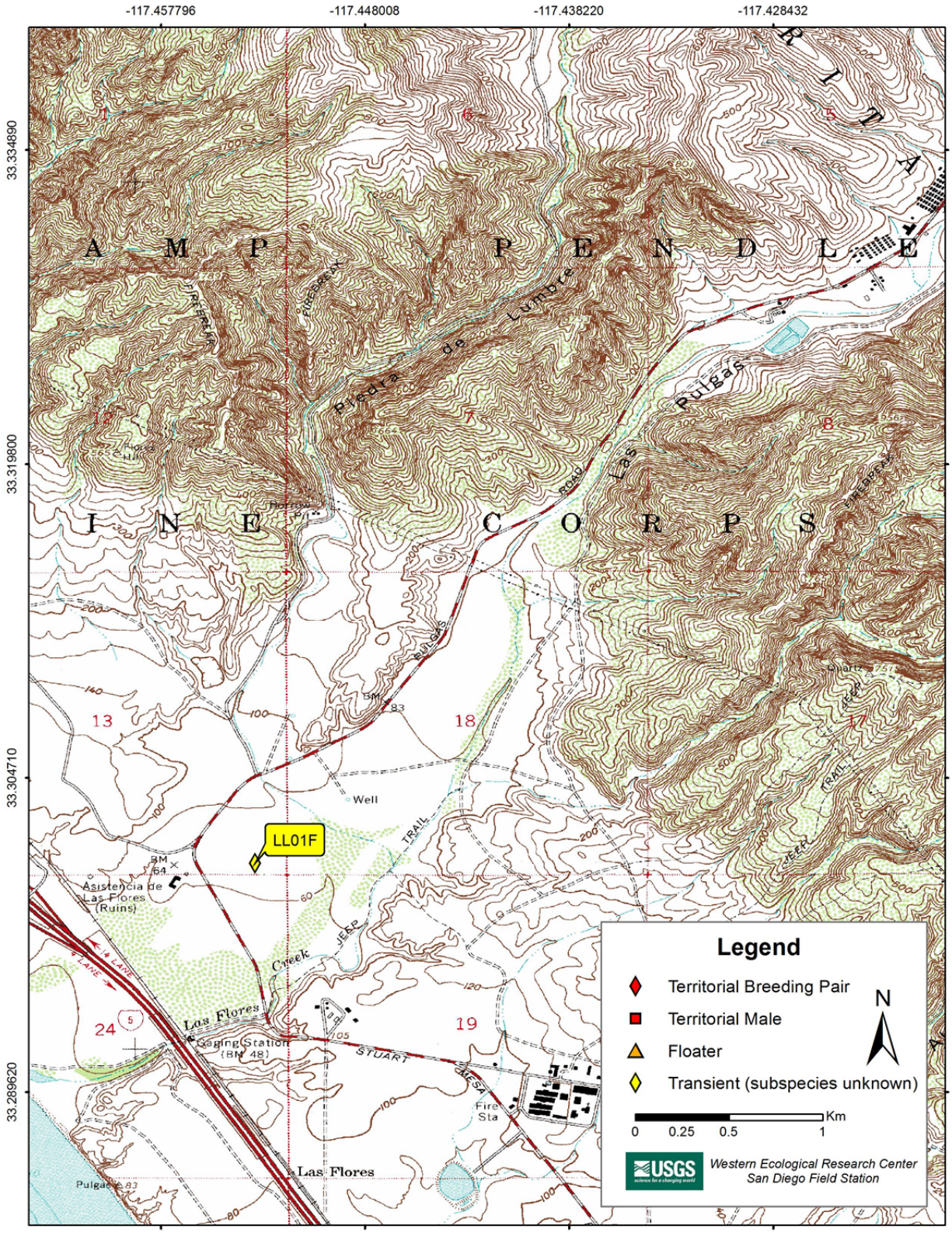

Fig. 13. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2013: Las Flores Creek.

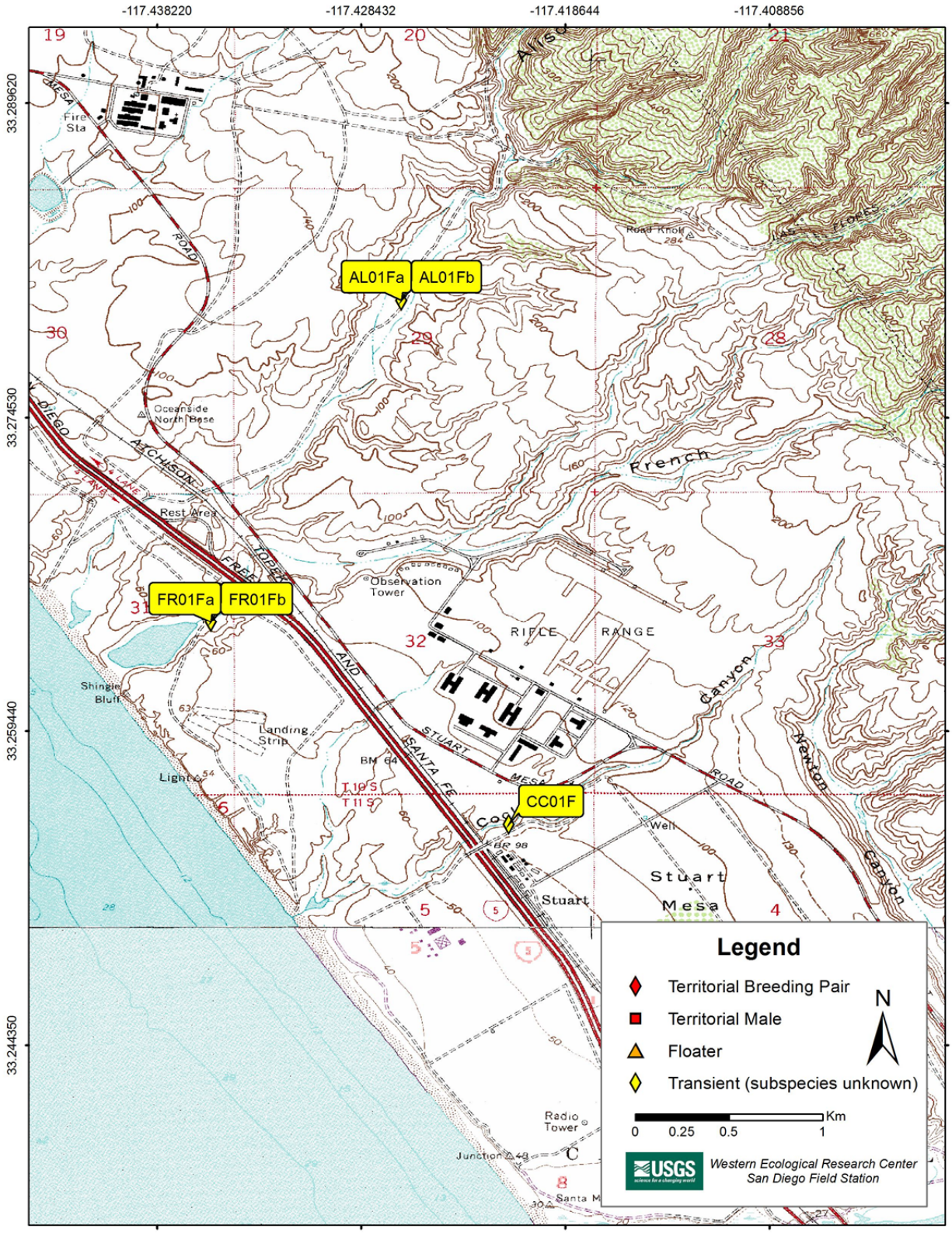

Fig. 14. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2013: Aliso Creek, French Creek, and Cockleburr Canyon.

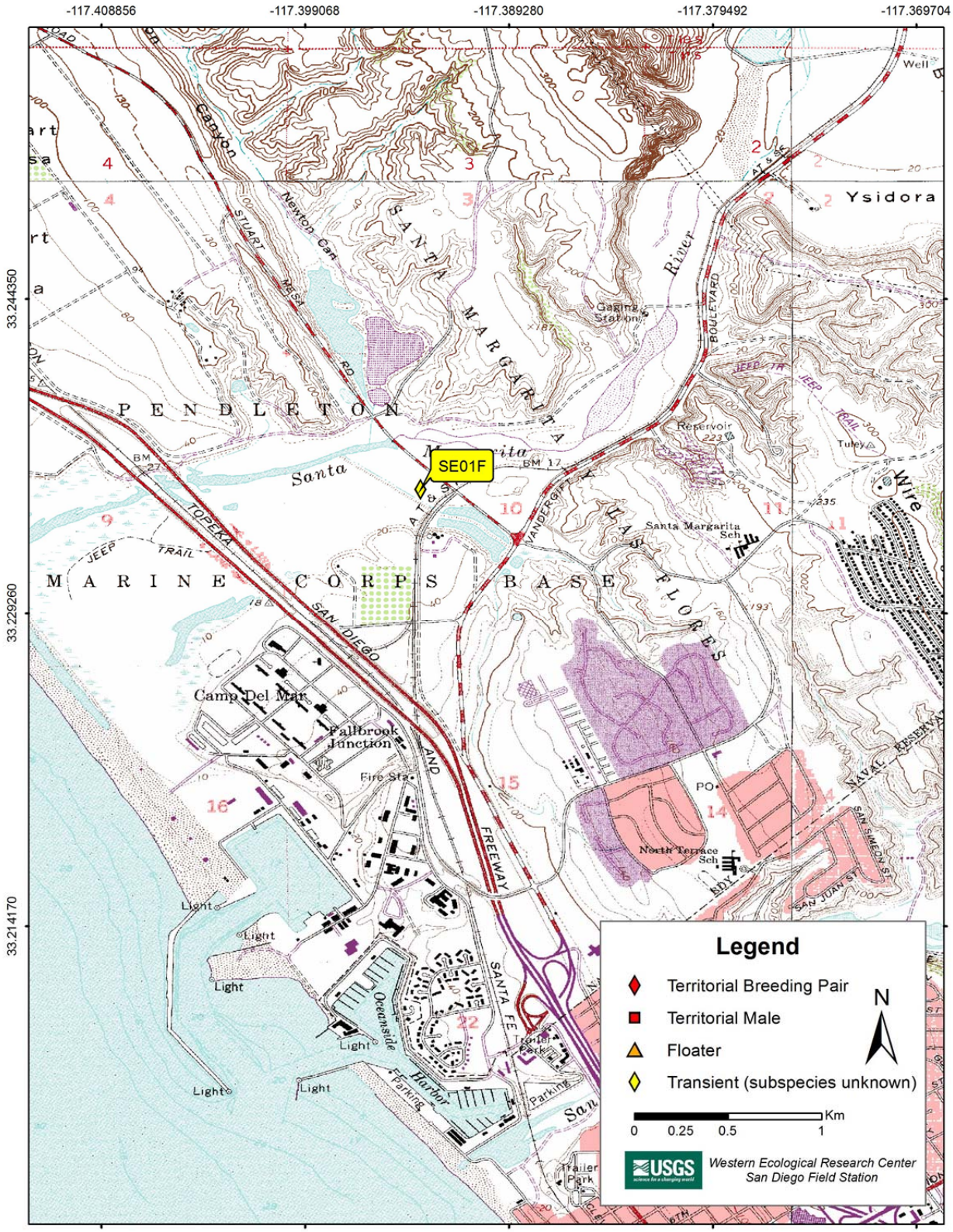

Fig. 15. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2013: Santa Margarita River (downstream).

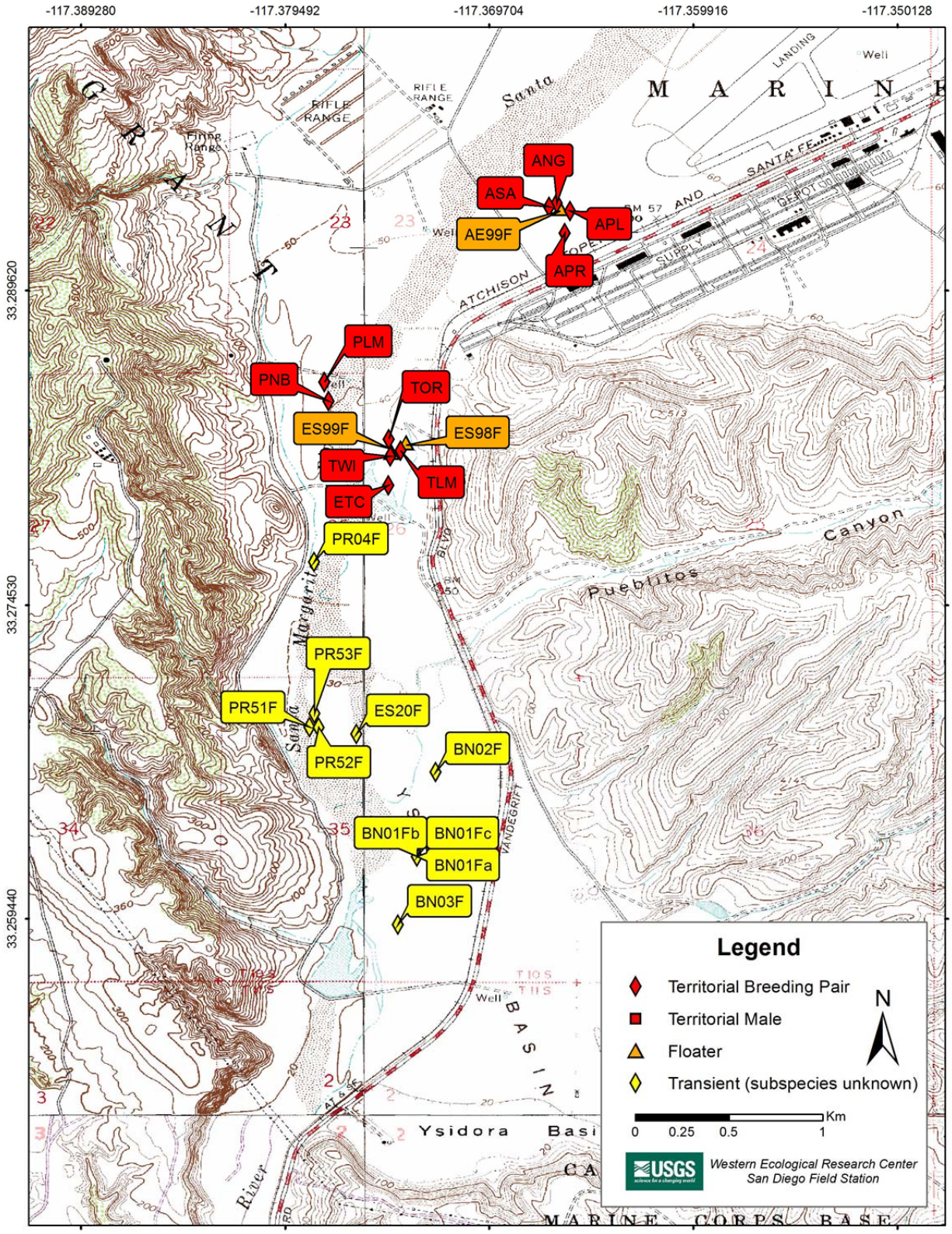

Fig. 16. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2013: Santa Margarita River (midstream).

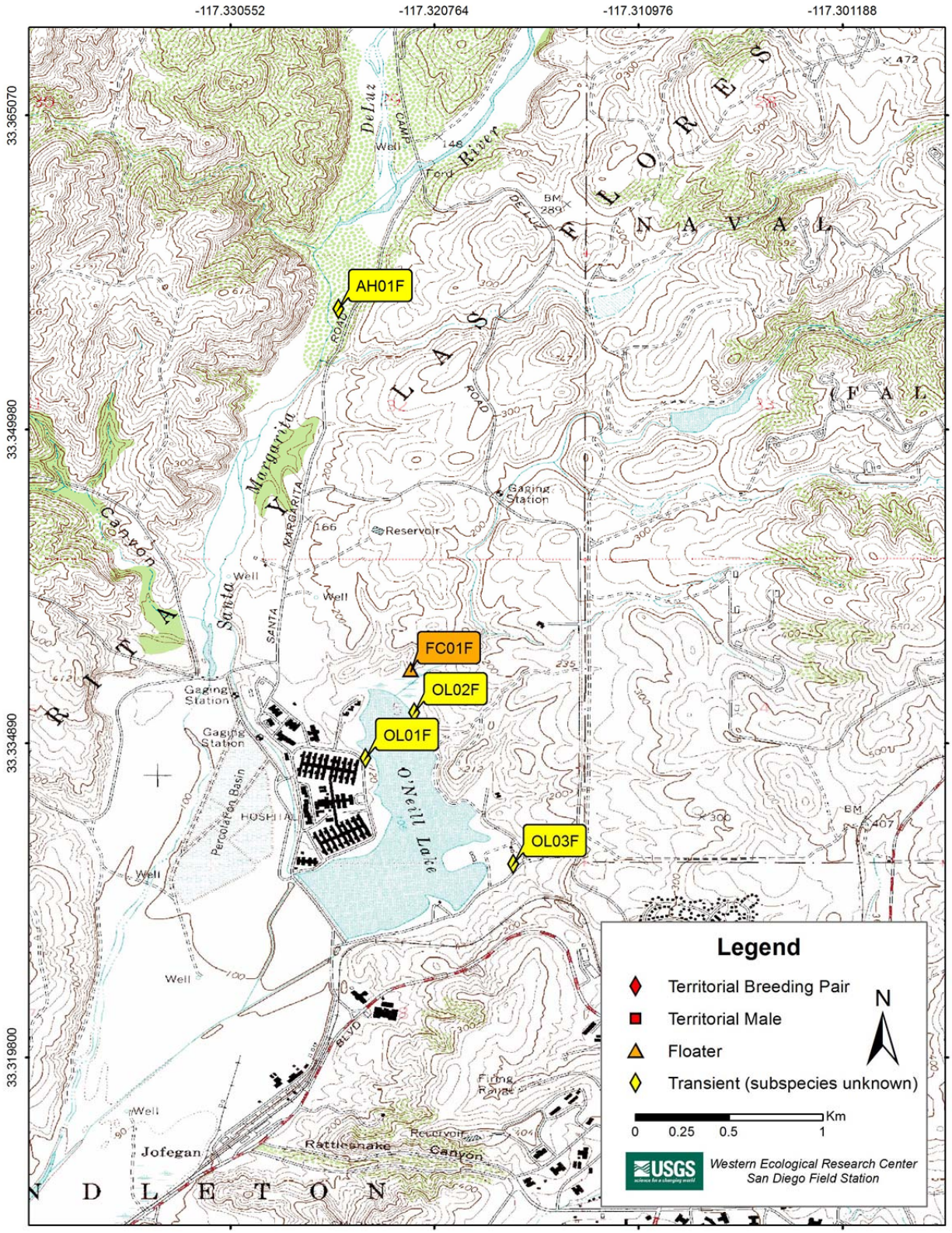

Fig. 17. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2013: Santa Margarita River (upstream) and Fallbrook Creek.

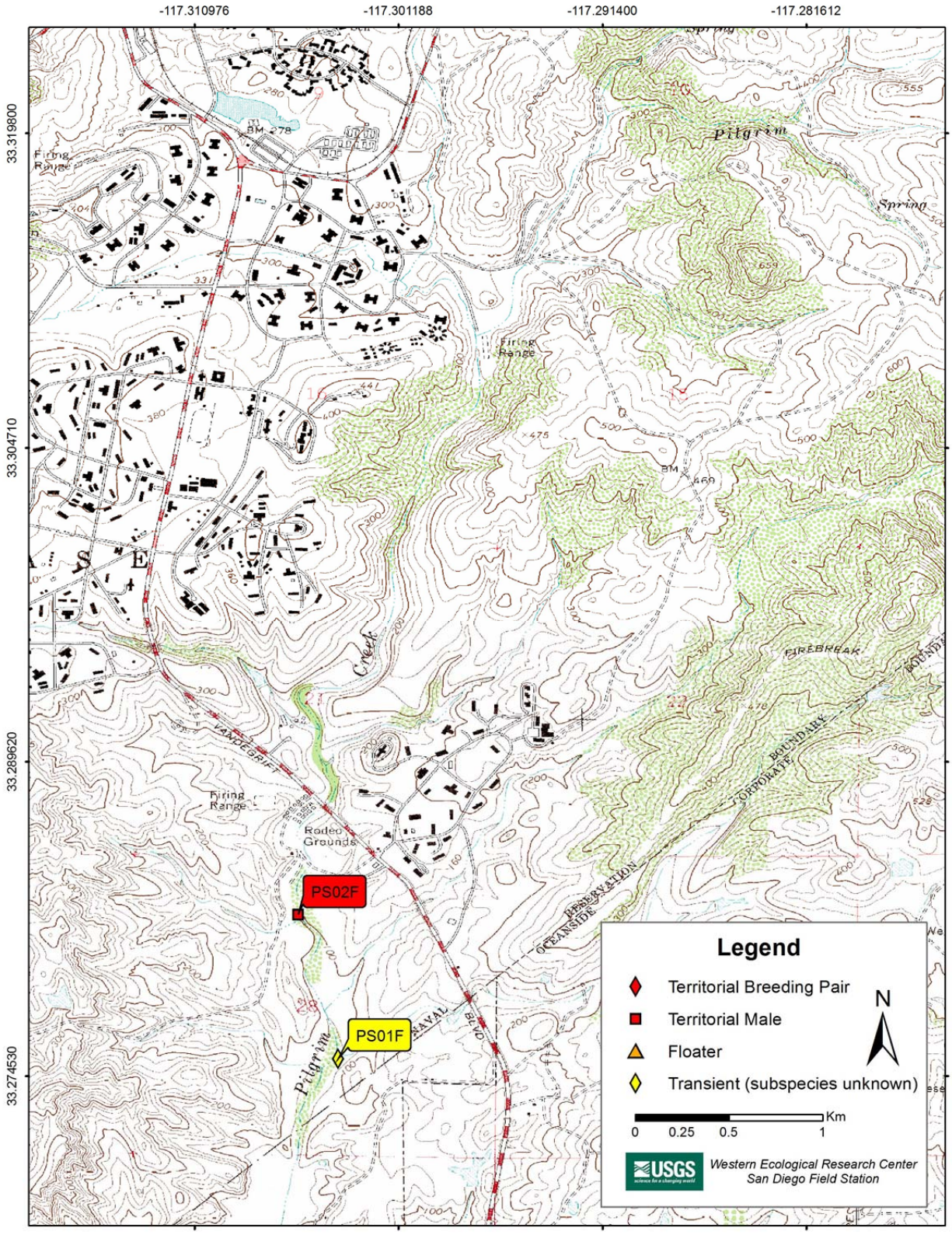

Fig. 18. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2013: Pilgrim Creek.

APPENDIX C

SOUTHWESTERN WILLOW FLYCATCHER TERRITORY LOCATIONS AT MARINE CORPS BASE CAMP PENDLETON, 2013

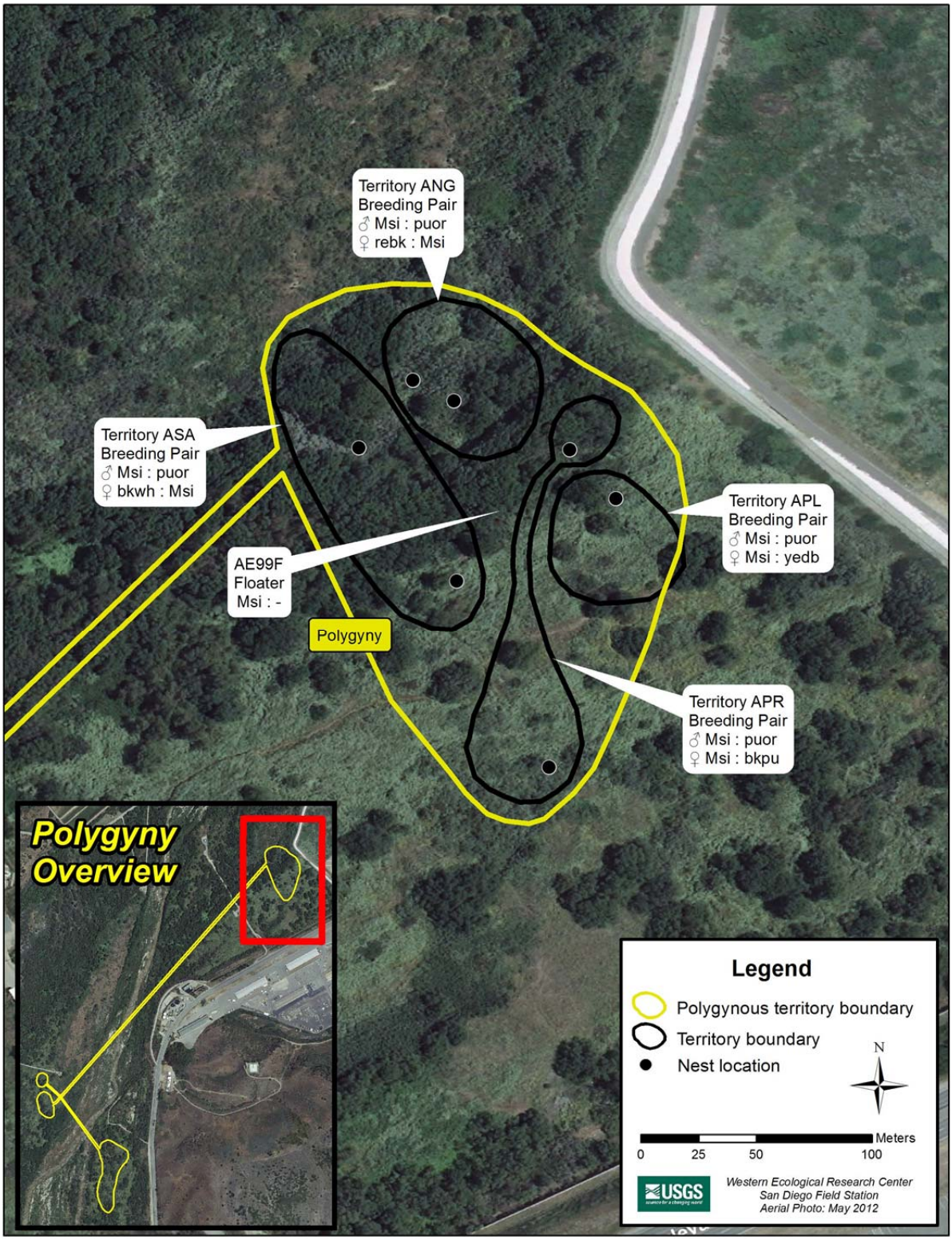

Fig. 19. Southwestern Willow Flycatcher territories at Marine Corps Base Camp Pendleton, 2013: Air Station Breeding Area, Santa Margarita River.

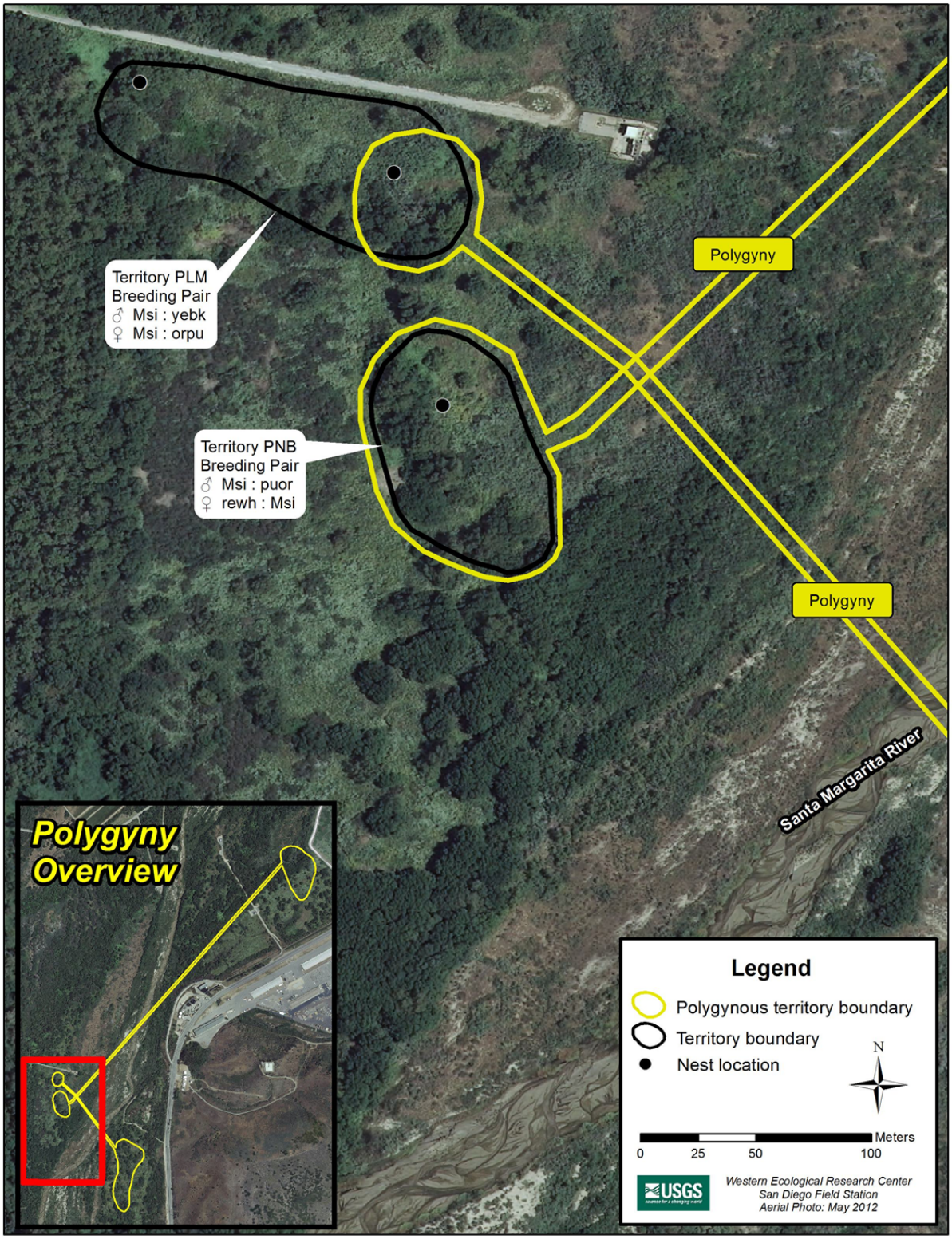

Fig. 20. Southwestern Willow Flycatcher territories at Marine Corps Base Camp Pendleton, 2013: Pump Road Breeding Area, Santa Margarita River.

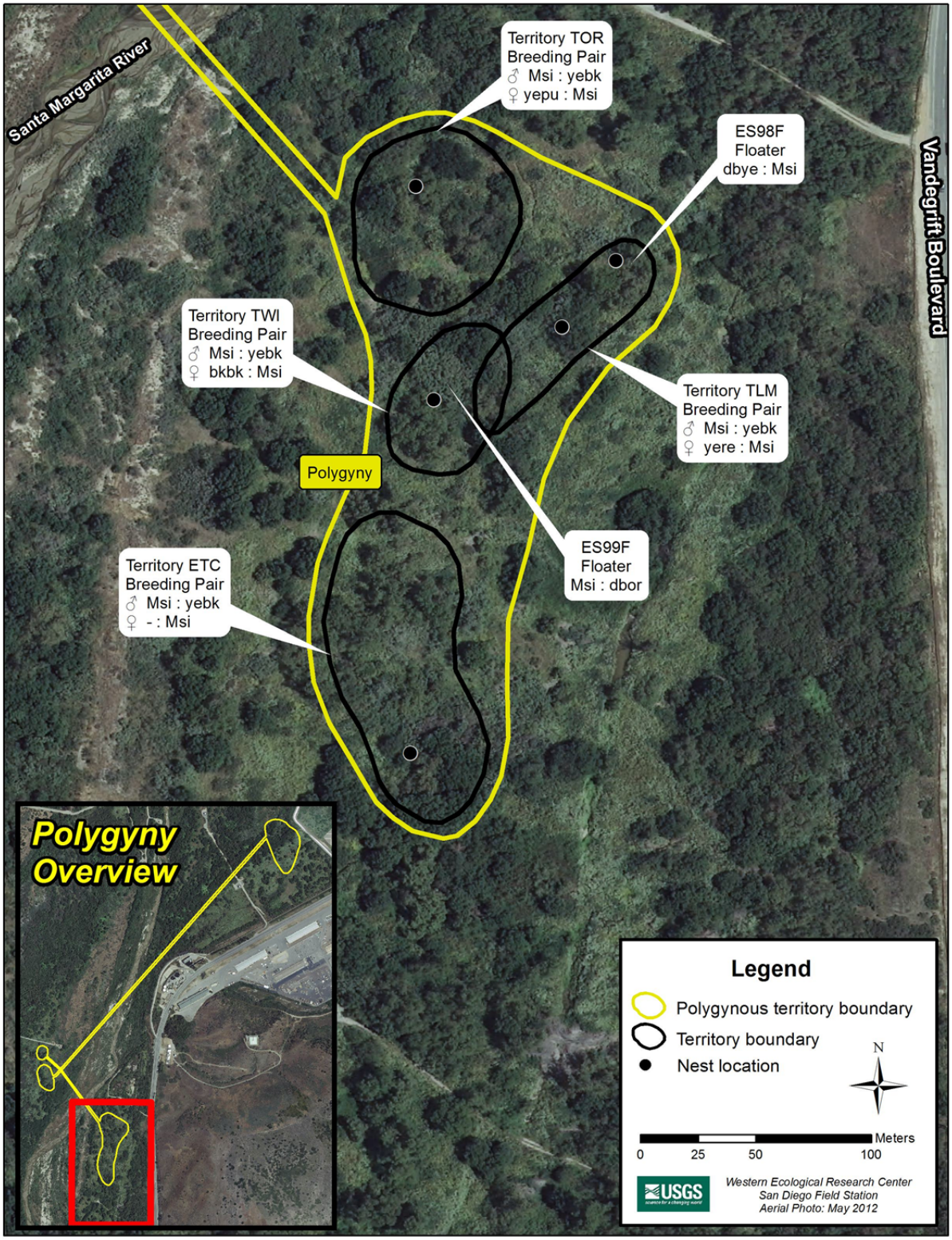

Fig. 21. Southwestern Willow Flycatcher territories at Marine Corps Base Camp Pendleton, 2013: Treatment Ponds and Northern Pueblitos Breeding Areas, Santa Margarita River.

Fig. 22. Southwestern Willow Flycatcher territories at Marine Corps Base Camp Pendleton, 2013: Pilgrim Creek.

APPENDIX D

BAND COMBINATIONS AND IDENTIFICATION OF SOUTHWESTERN WILLOW FLYCATCHER NESTLINGS BANDED ON MARINE CORPS BASE CAMP PENDLETON, 2013

Band combinations and identification of Southwestern Willow Flycatcher nestlings banded on Marine Corps Base Camp Pendleton in 2013.

Territory ID	Nest ID	Nestling Band Combination[a]	Federal Band Number
APR	1	none : Msi	245087100
APR	1	none : Msi	271029301
APR	1	none : Msi	271029302
PLM	1	none : Msi	271029303
PLM	1	none : Msi	271029304
PLM	1	none : Msi	271029305
PLM	1	none : Msi	271029306
APL	1	none : Msi	271029307
APL	1	none : Msi	271029308
APL	1	none : Msi	271029309
TLM	1	none : Msi	271029310
TLM	1	none : Msi	271029311
TLM	1	none : Msi	271029312
ANG	1	none : Msi	271029313
ANG	1	none : Msi	271029314
ANG	1	none : Msi	271029315
TOR	1	none : Msi	271029317
TOR	1	none : Msi	271029318
TOR	1	none : Msi	271029319
PNB	1	none : Msi	271029320
PNB	1	none : Msi	271029321
PNB	1	none : Msi	271029322
TWI	1	none : Msi	271029323
TWI	1	none : Msi	271029324
TWI	1	none : Msi	271029325
ANG	2	none : Msi	271029328
ANG	2	none : Msi	271029329

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