

Ecosystems Mission Area—Species Management Research Program

**Prepared in cooperation with Assistant Chief of Staff, Environmental Security, Marine Corps
Base Camp Pendleton**

**Distribution, Abundance, and Breeding Activities of the
Southwestern Willow Flycatcher at Marine Corps Base
Camp Pendleton, California—2024 Annual Report**



Open—File Report 2025–1023

Cover. Southwestern Willow Flycatcher nest at Marine Corps Base Camp Pendleton. Photograph by Scarlett Howell, U.S. Geological Survey, August 1, 2024.

Distribution, Abundance, and Breeding Activities of the Southwestern Willow Flycatcher at Marine Corps Base Camp Pendleton, California—2024 Annual Report

By Scarlett L. Howell and Barbara E. Kus

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Conversion Factors

International System of Units to U.S. customary units

Multiply	By	To obtain
Length		
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
Area		
hectare (ha)	2.471	acre

Datum

Horizontal coordinate information is referenced to the World Geodetic System of 1984 (WGS 84).

Abbreviations

MCBCP	Marine Corps Base Camp Pendleton
min	minutes
s	seconds

Distribution, Abundance, and Breeding Activities of the Southwestern Willow Flycatcher at Marine Corps Base Camp Pendleton, California—2024 Annual Report

By Scarlett L. Howell and Barbara E. Kus

Executive Summary

The purpose of this report is to provide the Marine Corps with an annual summary of the distribution, abundance, and breeding activity of the endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*; flycatcher) at Marine Corps Base Camp Pendleton (MCBCP or “Base”). Surveys for the flycatcher were conducted on Base between May 8 and July 24, 2024. All of MCBCP’s historically occupied riparian habitat (core survey area) was surveyed for flycatchers in 2024. None of the non-core survey areas were surveyed in 2024.

Three transient Willow Flycatchers of unknown subspecies were observed on two of the five drainages surveyed in 2024, the Santa Margarita River and San Mateo Creek. No Willow Flycatchers were detected at Fallbrook, Las Flores, or Pilgrim Creeks. Transients in 2024 occurred in riparian scrub habitat, dominated by mule fat (*Baccharis salicifolia*). Exotic vegetation, primarily poison hemlock (*Conium maculatum*), was present in all flycatcher locations. None of the transient flycatchers were banded.

In 2024, the resident Southwestern Willow Flycatcher population on Base consisted of one unpaired female occupying one territory in the Air Station breeding area along the Santa Margarita River. No territorial males were observed in 2024. The resident flycatcher territory was located in mixed willow riparian habitat, dominated by arroyo or red willow (*Salix lasiolepis* or *S. laevigata*). The female flycatcher was originally banded as a nestling in 2020 at MCBCP, making her 4 years old in 2024.

The resident female flycatcher returned to the same breeding area and territory she occupied in 2023. Nesting was initiated in late May and continued into early August. Three

nesting attempts were documented; all were unsuccessful as a result of depredation and presumed infertile eggs. No instances of Brown-headed Cowbird (*Molothrus ater*) parasitism were observed. The flycatcher nests were placed in two native plants, sandbar willow (*S. exigua*) and stinging nettle (*Urtica dioica*).

Two measures were initiated in recent years to attract and retain breeding flycatchers on MCBCP: a conspecific attraction playback study (initiated in 2018) and an artificial seep study (initiated in 2019); both were repeated annually through 2024. The one resident flycatcher (female) detected in 2024 occupied a territory near an automated playback unit, and nested 5 meters from an artificial seep output.

Introduction

The purpose of this report is to provide the Marine Corps with an annual summary of the distribution, abundance, and breeding activity of the endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*; flycatcher) at Marine Corps Base Camp Pendleton (MCBCP or “Base”). The results are intended to provide the Base with biological information to inform appropriate management of the flycatcher and support the dual missions of environmental stewardship and maintaining military readiness in accordance with the Base Integrated Natural Resources Management Plan (Marine Corps Base Camp Pendleton, 2023) and U.S. Fish and Wildlife Service Programmatic Biological Opinion (U.S. Fish and Wildlife Service, 1995).

The Southwestern Willow Flycatcher is one of four subspecies of Willow Flycatcher in the United States, with a breeding range that includes southern California, Arizona, New Mexico, extreme southern parts of Nevada and Utah, southwestern Colorado, and western Texas (Hubbard, 1987; Unitt, 1987; Browning, 1993). Restricted to riparian habitat for breeding, the Southwestern Willow Flycatcher has declined in recent decades primarily in response to widespread habitat loss throughout its range and, possibly, Brown-headed Cowbird (*Molothrus ater*; hereafter “cowbird”) parasitism (Wheelock, 1912; Willett, 1912, 1933; Grinnell and Miller, 1944; Remsen, 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 (U.S. Fish and Wildlife Service, 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. After listing, population estimates for flycatchers in California increased to 256 territories, with the increase largely attributed to expanded survey efforts rather than population growth at known sites (U.S. Fish and Wildlife Service, 2002). In the 2014 5-year status review, estimates of California flycatcher territories decreased to 172, with declines occurring statewide (Durst and others, 2008; U.S. Fish and Wildlife Service, 2014).

Southwestern Willow Flycatchers in southern California co-occur with the Least Bell’s Vireo (*Vireo bellii pusillus*; hereafter “vireo”), another riparian obligate endangered by habitat loss and cowbird parasitism. However, unlike the vireo, which has increased ten-fold since the mid-1980s in response to management alleviating these threats (U.S. Fish and Wildlife Service, 2006), Willow Flycatcher numbers have remained low. As of 2023, most of the Southwestern Willow Flycatchers in California are concentrated at two known sites: (1) the Owens River valley in Inyo County (approximately 57 territories; Great Basin Bird Observatory, 2023) and (2) the upper San Luis Rey River at Lake Henshaw in San Diego County (approximately 51 territories; Howell and Kus, 2024d). Outside of these sites, Southwestern Willow Flycatchers occur as small, isolated populations of one to a half-dozen pairs. Many of these small populations in San Diego County have been occupied intermittently, including Bonsall, Couser Canyon, Guajome Lake, and Whelan Lake on the San Luis Rey River, San Dieguito River, San Diego River, and Sweetwater River (Unitt, 1987; Kus and others, 2003). The three locations closest to MCBCP, Bonsall, Guajome Lake, and Whelan Lake, were last occupied in 2021, 2005, and 2007, respectively (B. Kus, unpub. data, 2005; Allen and Kus, 2022; Houston and others, 2024).

Male Southwestern Willow Flycatchers typically begin arriving in southern California in early to mid-May, whereas females arrive approximately 1 week later. Territorial males

sing repeatedly from exposed perches while on the breeding grounds in order to attract a mate. Once a pair bond is established, or in some cases without the presence of a male, the female builds an open-cup nest that usually is placed in a branch fork of a willow (*Salix* spp.) or plant with a similar branching structure, approximately 1–3 meters (m) above the ground. The typical clutch of three to four 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 and early September to their wintering grounds in central Mexico, Central America, and northern South America.

The population of Southwestern Willow Flycatchers at MCBCP was at one time one of the largest in southern California (Unitt, 1987). Flycatcher numbers peaked in 2004 at 42 individuals, followed by declines that began in 2005. In response to declining flycatcher numbers on Base, a conspecific playback study was initiated in 2018 to explore if this method could be used to attract breeding flycatchers to recolonize MCBCP. Conspecific attraction, the tendency for individuals of a species to settle near one another, has been successfully used as a tool for recolonizing restored Sierra Nevada meadows with Willow Flycatchers of the *adustus* and *brewsteri* subspecies (Schofield and others, 2018), but it has not been applied to any populations of the *extimus* subspecies. This report presents a preliminary evaluation of Southwestern Willow Flycatcher response to conspecific playback.

In addition, three artificial seeps were installed in historically occupied flycatcher habitat for the purpose of habitat enhancement. The first seep began operation in 2019, and two additional seeps were added in 2021. The seeps were designed to augment surface water and enhance habitat for breeding flycatchers. Although this enhancement was designed to benefit flycatchers, few flycatchers have inhabited the habitat enhancement areas in recent years. However, Least Bell’s Vireos are abundant in the enhancement areas, and were selected as a surrogate species to determine the effects of the habitat enhancement. Vireos co-occur with flycatchers in riparian habitat and have similar habitat requirements, such as the presence of riparian obligate trees (typically willows and cottonwoods) with a shrubby understory. Vireos and flycatchers have similar territory size and territorial behavior (singing from high perches to advertise territory boundaries), and they share some similarities in nest placement (nests are placed in the understory vegetation). Although there are some differences in habitat requirements between the two species (flycatchers prefer more mesic conditions that include surface water or elevated soil moisture during at least part of the breeding season; vireos are more tolerant of drier, brushier vegetation sometimes lacking an overstory), vireos were considered sufficiently similar to flycatchers to serve as a surrogate species for analysis.

The purpose of this study, which began in 2000, was to document the status of Southwestern Willow Flycatchers at MCBP in San Diego County, California. Specifically, our goals were to (1) determine the size and composition of the Willow Flycatcher population on Base; (2) document annual survival, fidelity, and movement of resident flycatchers; (3) document nesting activities; (4) characterize habitat used by flycatchers; and (5) evaluate the use of conspecific playback to attract breeding Southwestern Willow Flycatchers to historically occupied habitat to facilitate recolonization. Data from 2024, combined with data from 2000 to 2023, will inform natural resource managers about the status of this endangered species at MCBP and guide modification of land use and management practices as appropriate to ensure the species' continued existence.

This work was funded by and performed in cooperation with the Assistant Chief of Staff (AC/S), Environmental Security, Resources Management Division, Marine Corps Base Camp Pendleton, California. All activities were conducted under federal 10(a)1(A) Recovery Permit ESPER0004080_0.2 and a protocol approved by the Western Ecological Research Center (WERC) Institutional Animal Care and Use Committee for conformance with the Animal Welfare Act.

Study Areas and Methods

Population Size and Distribution

From 2000 to 2018, all of MCBP's major drainages and several minor ones that supported riparian habitat were surveyed annually for flycatchers. In 2019, a reduced monitoring plan was implemented in which annual surveys for flycatchers were done only in "core" survey areas, where breeding had historically been documented on Base. The remaining unoccupied riparian habitat was divided into five "non-core" survey groups, with each group to be surveyed on a rotational schedule every 5 years, beginning in 2020. In 2024, all of MCBP's historically occupied riparian habitat (core survey area; [fig. 1](#)) was surveyed for flycatchers. Because of funding limitations, none of the non-core survey groups were surveyed for flycatchers in 2022, 2023, or 2024. Protocol surveys were done three times between May 15 and July 31 ([fig. 1](#); [app. 1, figs. 1.1–1.5](#)). Field work was completed by U.S. Geological Survey personnel: Lisa Allen, Annabelle Bernabe, Alexandra Houston, Scarlett Howell, Suellen Lynn, Jessica Medina, Shannon Mendia, and Maia Nguyen. The specific areas surveyed are listed in the following section.

Core Areas

1. Santa Margarita River:

- a. Air Station East, Effluent Seep, Bell North, Bell South: from Basilone Road to a point approximately 8.5 kilometers (km) downstream on the east side of the Santa Margarita River ([app. 1, fig. 1.2](#)).
- b. Rifle Range, Pump Road North: from the Rifle Range along Stagecoach Road to a point approximately 2.5 km downstream ([app. 1, fig. 1.2](#)).
- c. Above Hospital, Below Hospital West: from the confluence with De Luz Creek to Basilone Road ([app. 1, fig. 1.1](#)).

2. Fallbrook Creek, Lake O'Neill: at the inflow to Lake O'Neill, as well as around the lake ([app. 1, fig. 1.1](#)).

3. Las Flores Creek, Upper Las Flores North: between a point 1.6 km downstream from Basilone Road to the Zulu Impact Area boundary approximately 0.8 km upstream from Basilone Road, including the side drainage adjacent to the 43 area ([app. 1, fig. 1.3](#)).

4. San Mateo Creek, Lower San Mateo Bottom: between the Pacific Ocean and a point approximately 3.6 km upstream, including habitat south of the creek and south of the agricultural fields ([app. 1, fig. 1.4](#)).

5. Pilgrim Creek, South of Vandegrift: between the southern Base boundary and Vandegrift Boulevard, including the two side drainages east of Pilgrim Creek ([app. 1, fig. 1.5](#)).

Investigators followed standard survey protocol (Sogge and others, 2010), moving slowly (approximately 2 km per hour) through the riparian habitat, while searching and listening for Willow Flycatchers. Observers walked along the edge(s) of the riparian corridor on the upland 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 typically began at sunrise and were completed by early afternoon, avoiding conditions of high winds and extreme heat that can reduce bird activity and detectability.

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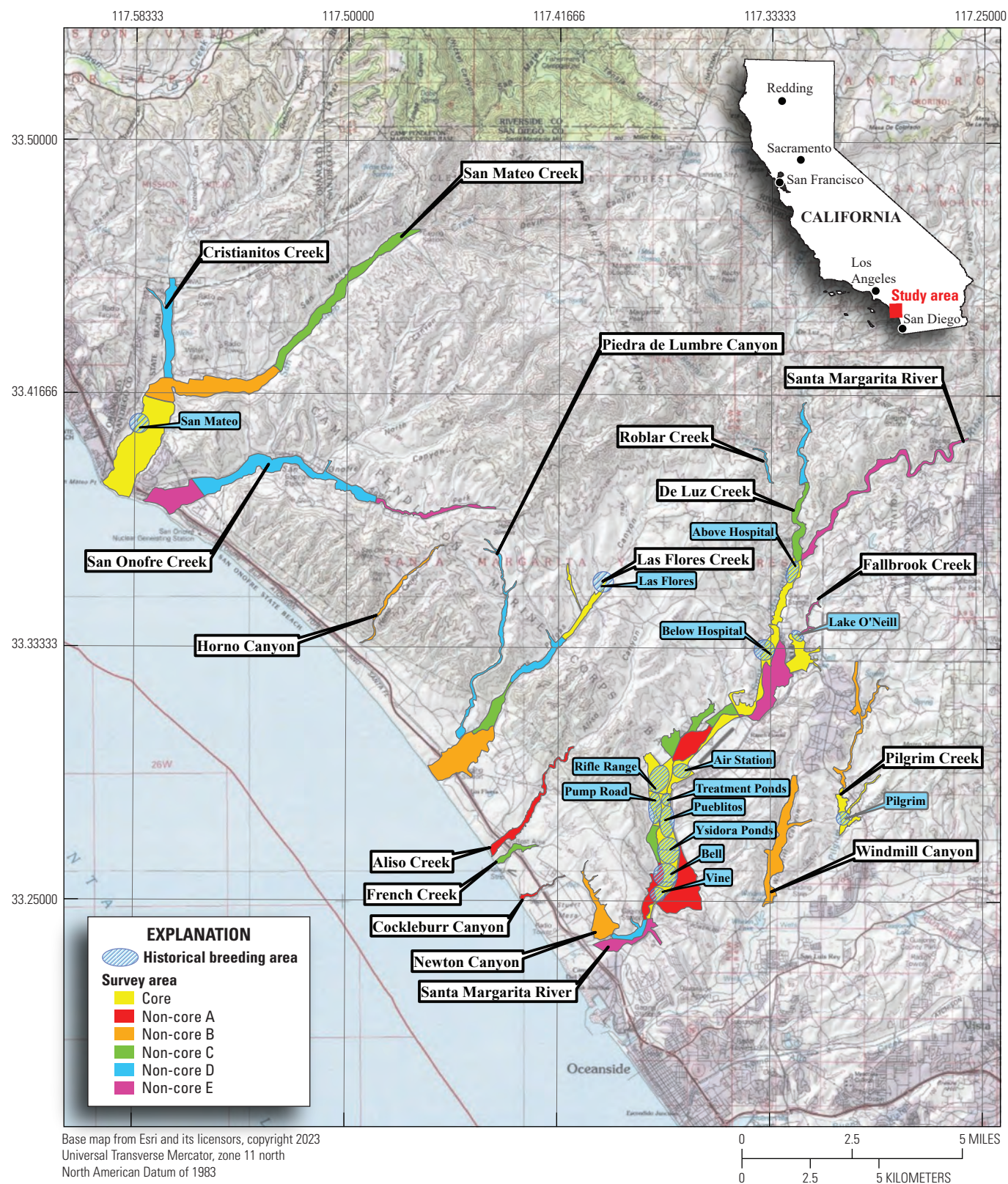


Figure 1. Southwestern Willow Flycatcher survey and historical breeding areas at Marine Corps Base Camp Pendleton, 2024. Only the core areas were surveyed in 2024; non-core areas were last surveyed in 2020 and 2021.

Upon initiation of the survey, investigators stood quietly for 1–2 minutes (min), listening for spontaneously singing Willow Flycatchers and acclimating to surrounding conditions, such as road noise, air traffic, and other bird songs. If flycatchers were not detected during the initial listening period, investigators broadcasted the Willow Flycatcher song (fitz-bew), using an MP3 player or phone and an amplified speaker, at the volume of typical bird songs for approximately 10–15 seconds (s) and then looked and listened for approximately 1 min for a response. Song playback was ceased immediately upon detection of a Willow Flycatcher. Willow Flycatchers typically responded by moving silently toward the song, singing in response to the song or responding with some other call or vocalization. This procedure was repeated (including a 10-s, quiet, pre-broadcast listening period) every 20–30 m throughout the survey site and more often if background noise was loud. If a Willow Flycatcher was detected, the investigator moved approximately 80–100 m beyond the detection before implementing additional playback to avoid double counting birds. Because *Empidonax* flycatchers look very similar, and species other than Willow Flycatchers may be present in the habitat, identification of Willow Flycatchers was not made by sight alone; the primary song (fitz-bew) was required for detection purposes (Sogge and others, 2010). If a potential Willow Flycatcher responded silently, approached, or responded with another vocalization (for example, whitts) but did not sing, observers carefully backed away and waited quietly. In most cases, if the bird was a Willow Flycatcher, it sang within a short time (5–10 min). Flycatchers that did not sing by the end of the encounter but were suspected to be breeding were re-visited within 3 days (see the “[Breeding Productivity Methods](#)” section). Flycatchers that did not sing and were not suspected to be breeding individuals were not counted in survey results unless the flycatcher was detected again in a subsequent survey period (Sogge and others, 2010).

For each bird encountered, investigators recorded age (adult or juvenile), breeding status (paired, unpaired, or transient), and if possible, if the bird was banded. Flycatcher locations were mapped using Esri Field Maps (Esri, 2024) on Samsung Galaxy XCover6 Pro mobile phones with Android

operating systems and built-in Global Positioning Systems to determine geographic coordinates (World Geodetic System 1984).

Habitat Characteristics

Habitat was characterized by visual inspection within 50 m of each flycatcher location. Habitat type was recorded according to the following categories, based on dominant vegetation:

Mixed willow riparian: Habitat dominated by one or more willow species, including Goodding’s 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 Fremont cottonwood (*Populus fremontii*) is a co-dominant.

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

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

Riparian scrub: Dry 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: Areas vegetated primarily with non-native species, such as giant reed (*Arundo donax*) and saltcedar (*Tamarix ramosissima*).

Percent cover of exotic vegetation at each location was estimated using cover categories of less than 5 percent, 5–50 percent, 51–95 percent, and greater than 95 percent; the dominant exotic species was recorded.

Conspecific Playback Surveys

Historical breeding territories at MCBCP were grouped into 14 plots; 7 of the plots received conspecific vocalization broadcasts designed to attract Southwestern Willow Flycatchers, and the remaining 7 served as a control group, receiving no vocalization broadcasts (fig. 2; Schofield and others, 2018). Of the seven conspecific playback plots, five were on the Santa Margarita River, one was at Lake O'Neill, and one was at Pilgrim Creek. Six of the control plots were on the Santa Margarita River, and the remaining plot was on Pilgrim Creek. In the conspecific playback plots, an automated unit broadcasted a combination of Willow Flycatcher vocalizations (primary “fitz-bew” song and various calls, interspersed with silence) from 0100 to 0600, 0700 to 0900, and 2000 to 2100 Pacific Standard Time (PST). Vocalizations were broadcast at a volume level mimicking the typical level of spontaneously singing Willow Flycatchers and could be heard by observers at a maximum of 80 m away from the broadcast unit. Automated broadcast units consisted of a FOXPRO NX4 wildlife caller (FOXPRO, Lewiston, Pennsylvania, USA) connected to a Favolcano CN101A digital programmable timer (Favolcano, Fujian, China) and an external power source (12-volt, 9 amp-hours, AH, battery). The automated broadcast units were operated from April 30 to August 1, 2024, spanning the time when northbound flycatchers would be searching for locations to settle and potentially encompassing southbound flycatchers that might settle in future breeding seasons. Control plots not receiving broadcast vocalizations were located a minimum of 200 m from the broadcast unit to eliminate influence from the broadcast.

Surveys were done every other week from May to July in the conspecific playback and control plots to determine if any Southwestern Willow Flycatchers had established a territory. Surveys in 2024 began on May 8 and concluded on July 24. Investigators surveyed within 50 m of all historical breeding territories that fell within the playback or control plot, following a slightly modified survey protocol developed to attract Willow Flycatchers of the *adustus* and *brewsteri* subspecies to restored Sierra Nevada meadows (Schofield and others, 2018). Upon initiation of the survey, investigators stood quietly for 3–5 min, listening for spontaneously singing or calling Willow Flycatchers. If flycatchers were not detected during the initial listening period, investigators broadcasted the Willow Flycatcher song for approximately 30 s and then looked and listened for approximately 2 min for a response. If no response was detected, investigators repeated the 30-s broadcast and 2-min listening period. If flycatchers were not detected after the second round of broadcasting/listening, the investigator moved to the next historical location within the survey plot and repeated the sequence with a 1-min, pre-broadcast listening period before beginning the 30-s playback. In plots with automated broadcast units, if the survey was done during the time the broadcast was scheduled, the units were turned off before beginning the survey.

Artificial Seep Monitoring

Three artificial seeps were installed by MCBCP to increase surface water in Southwestern Willow Flycatcher breeding habitat: one in 2019 and two in 2021. The seeps were located within three of the conspecific playback plots (fig. 2) along the Santa Margarita River. During the course of conspecific playback surveys, we observed the habitat immediately surrounding the seeps and recorded if any Willow Flycatchers were using the area.

Breeding Productivity Methods

Flycatchers observed during protocol surveys that were suspected to be resident birds (for example, observed in more than one survey period, pair vocalizations heard, evidence of nesting seen) were revisited within 3 days of the detection date. Resident birds were observed for evidence of nesting, and nests were located and monitored following standard protocol (Rourke and others, 1999). Nests were visited as infrequently as possible to minimize disturbance and reduce the chances of leading predators or cowbirds to nest sites. Typically, there were three to four visits per nest, spaced approximately 5–10 days apart, depending on the stage of the nest when initially detected. 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: Nests that fledged at least one young. Fledging was confirmed by detection of young outside the nest.

(PRE) Nest failed as a result of predation: This category included (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 and others, 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 and others, 2004).

(PAR) Nest failed as a result of parasitism: This category included (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.

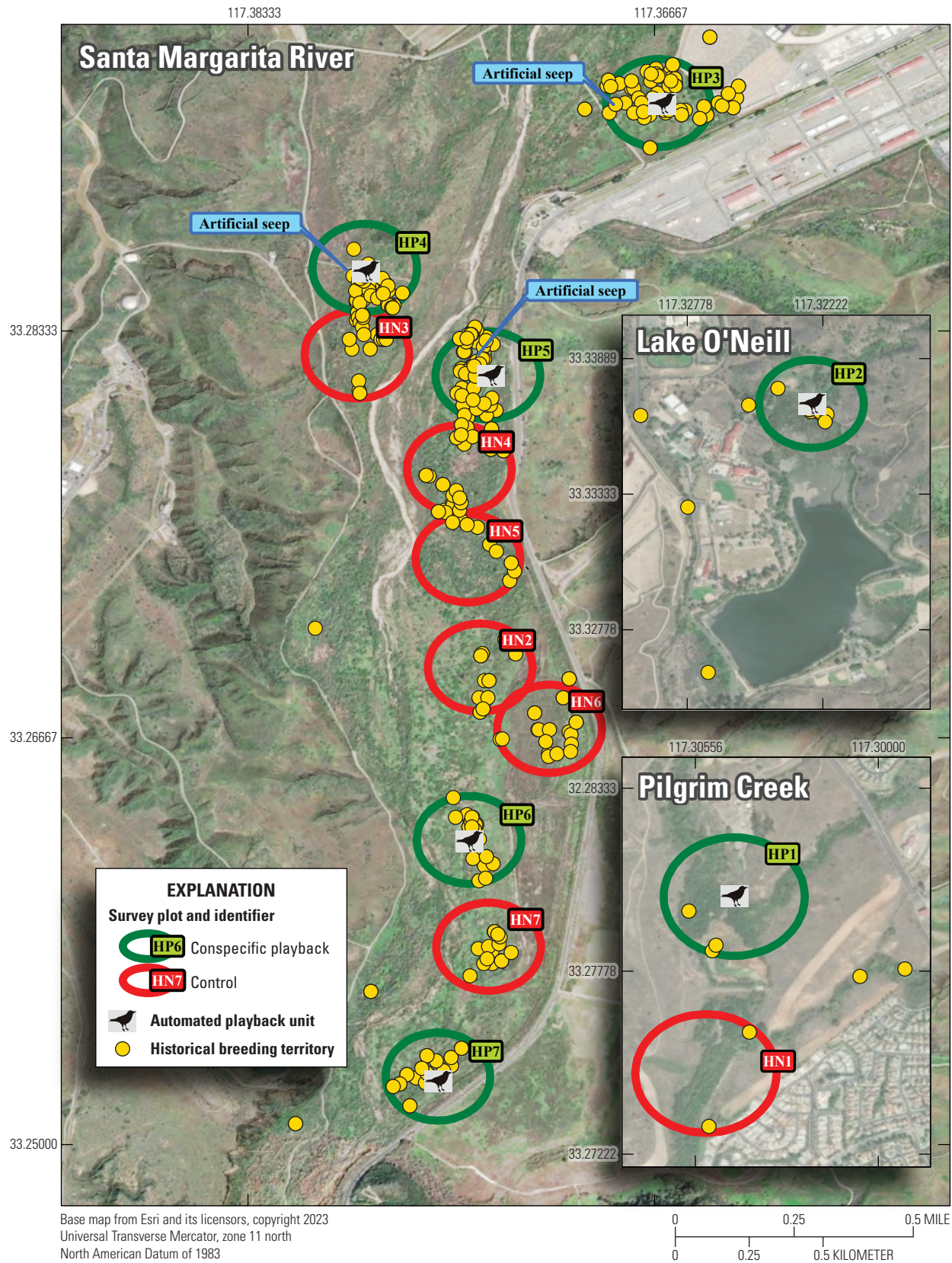


Figure 2. Southwestern Willow Flycatcher conspecific playback survey plots, automated playback unit locations, artificial seep locations, and historical breeding territories at Marine Corps Base Camp Pendleton, 2024.

(OTH) Nest failed for other reasons that are known:

This category included (1) nests that failed for reasons that were known, such as host plant failure or surrounding vegetation falling and crushing a nest; (2) nests with inviable eggs that did not hatch after more than two weeks; (3) or human disturbance, such as mowing or weed-whacking. This category also included 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 was 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; these failures are explained more fully in the “[Results](#)” section.

Nest Site Characteristics

Nest site characteristics were recorded after 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 (Rourke and others, 1999). Distance to edge of the clump was expressed as a negative number if the nest was not in a clump of riparian vegetation. For example, if the nest was in a field of poison hemlock (*Conium maculatum*) without any other riparian vegetation present, the distance to the nearest clump of riparian vegetation was measured and the value expressed as a negative number.

Banded Bird Observations, Site Fidelity, and Movement

We attempted to capture and color band all resident flycatchers detected on MCBCP starting in 2000. Attempts were made each year to capture any unbanded adults within their territories using mist nets and band them with a numbered federal band on one leg and a solid or bi-colored metal band on the other. Nestlings were banded at 7–10 days of age with a silver colored, aluminum, federal numbered band on the right leg. Returning adults previously banded as nestlings (natal) were target netted to determine their identity, and their original band supplemented with one additional band to generate a unique color combination.

During surveys, we attempted to resight all Willow Flycatchers to determine whether they were banded, and if so, to confirm their identity by reading their unique color

band combination or by recapturing birds with single federal bands. We used resighting data to determine the number of banded birds present in one year that returned the following year, and of the birds that returned, to determine site fidelity and movement. Site fidelity and between-year and within-year movements of flycatchers were determined by measuring the distance between the center of a flycatcher’s breeding territory in 2023 (or last year detected) and the center of the same flycatcher’s breeding territory in 2024. Adult flycatchers exhibited site fidelity if they returned to within 100 m of their last occupied territory, and natal flycatchers exhibited natal site fidelity if detected anywhere on Base.

Data Comparisons

All data from previous years at MCBCP used in comparisons with current data can be found in the following documents: Kus, 2001; Kus and Ferree, 2003; Kus and Kenwood, 2003, 2005, 2006a, b; Kenwood and Kus, 2007; Rourke and others, 2008; Howell and Kus, 2009a, b, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2024a, b, c, 2025; and Howell and others, 2018, 2020.

Results

Population Size and Distribution

Transients

Three Willow Flycatchers of unknown subspecies were observed during protocol and conspecific playback surveys in 2024 ([app. 2](#), [figs. 2.1–2.3](#)). All transients were detected between May 16 and June 5. Transients were detected on the Santa Margarita River and San Mateo Creek, but were not detected on Fallbrook, Las Flores, or Pilgrim Creeks.

Residents

One Southwestern Willow Flycatcher (female) was detected during the 2024 breeding season ([table 1](#); [app. 2](#), [fig. 2.2](#); [app. 3](#), [fig. 3.1](#)). The resident female was initially detected during conspecific playback surveys. One territory was established, consisting of one unpaired female. No males were observed in 2024. Overall, the resident flycatcher population on Base was the same as in 2023 ([fig. 3](#); [table 1](#)).

In 2024, only the Air Station flycatcher breeding area along the Santa Margarita River was occupied. All other breeding areas along the Santa Margarita River that historically supported resident flycatchers (Vine, Bell, Ysidora Ponds, Pump Road, Pueblitos, and Treatment Ponds; [fig. 1](#)) were devoid of flycatcher territories in 2024 ([table 1](#)).

Table 1. Distribution of territorial Southwestern Willow Flycatchers at Marine Corps Base Camp Pendleton, 2000–24.[Refer to [fig. 1](#) for drainage/breeding areas. **Drainage/breeding area.** FC, Fallbrook Creek; LF, Las Flores Creek; PC, Pilgrim Creek; SO, San Mateo Creek; SR, Santa Margarita River]

Drainage/ breeding area	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
FC/Lake O'Neill	2	2	2	3	2	1	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
LF/Las Flores	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PC/Pilgrim	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
SO/San Mateo	0	0	0	0	0	0	2	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
SR/Above Hospital	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SR/Below Hospital	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SR/Air Station	6	5	2	0	2	0	0	4	4	5	6	5	6	5	3	0	1	0	20	1	0	0	0	1	1
SR/Rifle Range	0	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SR/Pump Road	2	6	6	5	11	9	6	8	3	3	3	2	11	2	0	0	0	0	0	0	0	0	0	0	0
SR/ Treatment Ponds	1	1	0	0	0	1	5	4	2	4	4	3	3	4	3	4	2	0	20	0	0	0	0	0	0
SR/Pueblitos	4	7	6	9	8	4	9	2	5	3	11	1	0	11	2	11	0	0	3	2	2	1	0	0	0
SR/Ysidora Ponds	5	8	4	4	6	9	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SR/Bell	4	4	6	3	10	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SR/Vine	4	2	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SR/Stuart Mesa	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	28	35	33	32	40	29	31	26	14	16	15	12	12	13	9	5	3	0	3	3	2	1	0	1	1

¹One male's territory overlapped two breeding areas, included in Treatment Ponds total.²Two different females utilized additional breeding areas (Air Station and Treatment Ponds) before settling in Pueblitos, included in Pueblitos total.

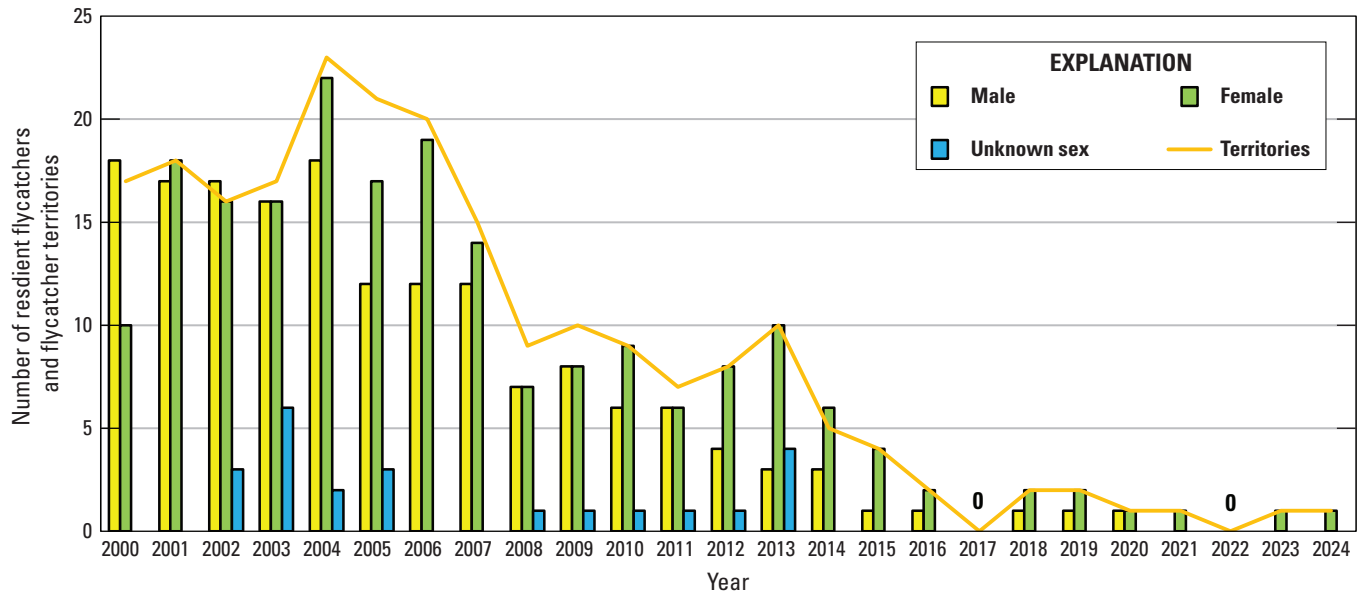


Figure 3. Number of resident Southwestern Willow Flycatchers and flycatcher territories at Marine Corps Base Camp Pendleton, 2000–24.

Conspecific Playback Surveys and Artificial Seep Monitoring

Transient flycatchers were not detected in any of the conspecific playback plots and were detected in 14 percent (1/7) of control plots with no playback. We detected a resident flycatcher in 1/7 of conspecific playback plots (14 percent) and none of the control plots. The female resident flycatcher detected on Base in 2024 settled within 55 m of an automated playback unit and nested within 5 m of an artificial seep output.

Habitat Characteristics

All transient flycatcher detections occurred in habitat classified as riparian scrub, which was dominated by mule fat or sandbar willow, whereas the one resident female occupied mixed willow habitat dominated by red or arroyo willow (table 2). Exotic vegetation was present in all flycatcher locations in 2024. The most common exotic plant in habitat used by flycatchers was poison hemlock (table 2). Forty percent (2/5) of flycatcher locations were composed of 5–50 percent exotic vegetation, and 60 percent (3/5) of locations were dominated by exotic vegetation (percent cover of exotics greater than 50 percent).

During the course of surveys, observers incidentally observed large stands of dead and dying trees within many of the historical flycatcher breeding areas, as the result of past invasive shothole borer (*Euwallacea* spp.) infestation (Nobua-Behrmann and others, 2023). The tops of many willow trees were snapped off, which reduced overall canopy

height and density. In addition to trees that were already dead, others showed evidence of active infestation (for example, frass and wet staining at entrance holes; Nobua-Behrmann and others, 2023).

Breeding Productivity

Nesting was observed for the one unpaired female and was initiated in late May. The earliest estimated egg-laying date was June 3, and nesting continued into early August. Three nesting attempts in two different nest locations were documented during the 2024 breeding season. The first nest was depredated, and the second and third nests failed as a result of presumably infertile eggs, as the eggs remained unhatched beyond the average incubation period (12 days). After the eggs in nest two did not hatch within 17 days, the female added new nest material, buried the unhatched clutch, and laid a new clutch in the same nest. Mean clutch size (\pm SD) calculated from three nests known to have full clutches was 3.7 ± 0.6 eggs.

Nest Site Characteristics

Of the two flycatcher nest locations at MCBCP in 2024, nest one was placed in sandbar willow, and nests two and three (same nest location) were placed in stinging nettle under a red or arroyo willow canopy. Nest height averaged 1.7 ± 0.2 m, and the host vegetation height averaged 3.5 ± 0.1 m. Nest placement averaged 0.2 ± 0.1 m from the edge of the nest host plant and averaged 2.2 ± 0.6 m from the edge of the clump of vegetation that contained the nest.

Table 2. Habitat characteristics of Willow Flycatcher locations at Marine Corps Base Camp Pendleton, 2024.[CON, poison hemlock (*Conium maculatum*)]

Bird identification	Drainage	Breeding status	Habitat type	Exotic cover class (percentage)	Dominant exotics
MB01F	San Mateo Creek	Transient	Riparian Scrub	5–50	CON
APL	Santa Margarita River	Unpaired	Mixed Willow	5–50	CON
BN01F	Santa Margarita River	Transient	Riparian Scrub	51–95	CON
HN601F	Santa Margarita River	Transient	Riparian Scrub	51–95	CON
HW01F	Santa Margarita River	Transient	Riparian Scrub	5–50	CON

Cowbird Parasitism

No nest parasitism of Southwestern Willow Flycatcher nests by cowbirds was documented in 2024.

Banded Bird Observations

Overview of Banded Population

All Willow Flycatchers were observed closely enough to confidently determine if they were banded. The one banded flycatcher (female) present on Base in 2023 returned in 2024. The female was banded as a nestling in 2020 at MCBCP, making her 4 years old in 2024. At the end of the breeding season, the female was showing signs of possible leg injury (holding leg up, unsteady landing); consequently, the flycatcher was captured, and both bands were removed to prevent any irritation that may have been exacerbated by the bands. None of the transient Willow Flycatchers were seen to carry bands.

Site Fidelity and Movement

Southwestern Willow Flycatchers at MCBCP generally settle into historically occupied breeding areas to establish territories (see historical breeding areas; [fig. 1](#)). Resighting banded birds allowed us to examine between-year and within-year site fidelity of flycatchers. No between-year or within-year movement of fully banded adult flycatchers was observed in 2024. The female banded flycatcher present in both 2023 and 2024 at MCBCP returned to the same breeding area and territory last occupied. No emigration or immigration of banded flycatchers was documented in 2024.

Discussion

In 2024, one unpaired female Southwestern Willow Flycatcher was detected on MCBCP, the same as in 2023. The Southwestern Willow Flycatcher population at MCBCP remains in a critical state, having declined 98 percent from the record high of 42 individuals in 2004. An overall downward trend began in 2005, characterized by several stepwise population declines, where the resident population dropped by more than 24 percent from one year to the next (2004–05: 24 percent; 2007–08: 42 percent; 2013–14: 47 percent; 2014–15: 44 percent; and 2015–16: 40 percent). Resident flycatchers were not detected on Base in 2017, but in 2018, three flycatchers that were previously detected on Base returned and resumed breeding. The resident population remained at three individuals from 2018 to 2019 before resuming the downward trend, with a 67-percent decline from 2019 to 2020, followed by a 50-percent decline from 2020 to 2021 when no breeding male flycatchers were detected on Base, leaving a single resident female that was not detected in 2022. After no resident flycatchers were observed in 2022, a natal female established a territory in 2023 but remained unpaired throughout the breeding season.

The number of transient Willow Flycatchers detected annually in the core survey area has varied greatly, despite consistent survey scope and effort, from a low of 2 in 2000 to a high of 42 in 2016. Although factors influencing the migratory route and variable timing of transient Willow Flycatchers are unclear, it remains clear that MCBCP provides important stop-over habitat for migrating Willow Flycatchers. Transient flycatchers were observed along two drainages on Base in 2024, including the Santa Margarita River and San Mateo Creek. Transient flycatchers in 2024 were all found in riparian scrub habitat, compared to the one resident flycatcher who occupied habitat with a wider variety of willow species. Exotic vegetation was dominant at multiple transient locations in 2024.

In the past 5 years, the small number of resident flycatchers on Base have occupied either the Air Station or Pueblitos breeding area, and only the Air Station breeding area has been occupied since 2023. In 2024, the same female flycatcher that was present in 2023 returned to her previous breeding area and territory and made three nesting attempts, but no male flycatcher was detected and breeding was ultimately unsuccessful. Prior to 2023, the Air Station breeding area was last occupied by breeding flycatchers in 2019. The Air Station breeding area had been occupied by breeding birds on and off since 2000 and provided habitat for one to five breeding pairs in most years before the 2014 Las Pulgas fire, which burned approximately 350 hectares (ha) of riparian habitat along the Santa Margarita River. The Air Station breeding area has not been occupied by a male flycatcher since the fire; however, an unpaired breeding female attempted to nest in the area in 2016 and 2018, building a nest and laying presumably infertile eggs both years. In 2018, the breeding female present in the Air Station breeding area remained in the area for approximately 1 month before moving to the Pueblitos breeding area to pair with a male in that area. In 2019, the same breeding female returned to the Air Station breeding area and successfully fledged young. In 2020, 2021, and 2022, breeding flycatchers were not detected in the Air Station breeding area. The Pueblitos breeding area has been the most consistently occupied breeding area on Base, supporting up to six pairs annually in 19 of the 25 years since annual monitoring began in 2000. Beginning in 2009, occupancy fluctuated between zero and one pair, with the exception of 2018 when two pairs occupied the area. In 2019 and 2020, Pueblitos was occupied by a single pair, and in 2021, Pueblitos was occupied only by an unpaired female. Resident flycatchers were not detected in the Pueblitos breeding area in 2022, 2023, or 2024.

Over the past two decades, many factors have been suggested as potential reasons for the decline among the remaining historically occupied breeding areas, including habitat senescence, overgrowth of exotic vegetation, habitat changes related to drought and changes in surface water, habitat loss from fire, and invasive insects. Detailed discussion on the potential reasons flycatchers may have moved out of all other breeding areas can be found in previous reports (Howell and Kus, 2024a, b, c). Habitat declines resulting from invasive the shot hole borer, which was first noted in 2023, continued in 2024. Large stands of trees, including willow and sycamore along the Santa Margarita River, appeared to be infested and were declining in health or dead. The canopy appeared to be less dense in many historically occupied breeding areas, and there were many dead trees with the tops snapped off. Although some willow trees that appeared to have been affected by shot hole borer in past years were sprouting

new growth and may eventually recover, the overall character of the area has changed, which may reduce suitability for breeding flycatchers in the short term.

The primary obstacle that must be overcome in order for the MCBCP flycatcher population to rebound is low population size. Because there has been no productivity from the breeding flycatchers on MCBCP since 2020, there is no additional recruitment expected in the coming years. In order for the population to rebound, immigration will have to occur. In past years, our banding studies have allowed us to document both immigration into and emigration out of the MCBCP population, providing clear evidence that MCBCP played a role in the regional metapopulation. Immigration from nearby populations on the San Luis Rey River occurred multiple times in the early years of the study (2002, 2004, 2006–08), with adult and first-year flycatchers moving onto Base. However, populations along the San Luis Rey River that once augmented the MCBCP population, including Guajome Lake, Whelan Lake, and Bonsall, were extirpated in 2006, 2008, and 2021, respectively, and there is no longer a close source of potential immigrants (B. Kus, U.S. Geological Survey, unpub. data, 2006; Allen and Kus, 2022; Houston and others, 2024). The closest known population of Southwestern Willow Flycatchers in San Diego County is at Lake Henshaw on the upper San Luis Rey River, approximately 60 km from MCBCP. The upper San Luis Rey River population has been monitored annually since 2015, and during that time, only one MCBCP natal has been detected in the area (Howell and Kus, 2022; Howell and others, 2022). Although long distance dispersal can occur, most of the movements documented on MCBCP and other locations in San Diego County have been shorter dispersals (Howell and others, 2022).

Although the drivers of the decline of resident flycatchers on MCBCP remain unclear, several measures have been initiated in recent years in an attempt to reverse the declines, including the use of conspecific attraction to facilitate recolonization of historically occupied breeding areas. An experimental study using conspecific playback was initiated on Base in 2018 and has continued annually through 2024 (Howell and others, 2018, 2020; Howell and Kus, 2024a, b, c). In 2018, when the study on Base was first initiated, a previously unknown male settled adjacent to the playback, allowing breeding activities to resume after no breeding flycatchers were detected on Base in 2017. This male returned for two additional breeding seasons (2019, 2020) but was not present in 2021 or 2022. In 2023, a natal female settled within 110 m of the conspecific attraction playback in the Air Station breeding area, but remained unpaired. This female returned to the same area in 2024, and once again, remained unpaired. It is possible that conspecific attraction will be effective in attracting a male to this area in future years. The continuation of conspecific attraction playback may play an important role in restoring the population of resident flycatchers on Base.

The seep habitat enhancement project initiated by AC/S Environmental Security to augment surface water in historically occupied habitat is another important step in attempting to mitigate declines in the flycatcher population that could be related to changes in surface water on Base. In 2024, the nesting female placed her first nest approximately 90 m from the closest seep output in the Air Station breeding area, where she nested in 2023. However, her second nesting attempt was placed within 5 m of the surface water pool provided by the seep output, and the female was observed foraging and catching aerial insects among the vegetation surrounding the water pool (S. Howell, pers. obs., 2024). Additional surface water provided by the seeps may increase food resources, which in turn, could increase fitness and body condition. The addition of surface water may also assist in creating desirable habitat conditions for breeding flycatchers, such as a dense understory from 0 to 3 m, which was reported to be an important variable in previous nest vegetation studies (Rourke and others, 2004). Recreating these conditions may prompt flycatchers to establish territories in the enhanced areas in future years. A combination of surface-water enhancement and the related benefits to breeding habitat, and conspecific broadcasts in enhanced areas could be key to restoring the Southwestern Willow Flycatcher population on MCBCP.

Conclusions

The Southwestern Willow Flycatcher population in California seems to be experiencing a statewide decline that is not isolated to Marine Corps Base Camp Pendleton (MCBCP or “Base”). Populations on the Kern River (Mary Whitfield, Southern Sierra Research Station, written commun., 2023), Bonsall on the San Luis Rey River (Allen and Kus, 2022), and the lower San Luis Rey River (Houston and others, 2024) have experienced steep declines or have been extirpated in recent years. The one exception within the San Diego region appears to be the upper San Luis Rey River population at Lake Henshaw, which has experienced rapid growth since 2018, increasing to 74 individuals by 2023 (Howell and Kus, 2024d). After a high of 42 flycatchers in 2004, the population at MCBCP has been on a downward trajectory from 2005

to the present (2024), with temporary extirpations occurring in 2017 and 2022. Although one resident Willow Flycatcher returned to the Base in 2023, and was present again in 2024, the population continues to be at a critical low. Habitat loss from fire, potential changes in habitat composition, prolonged drought, and invasive insects have likely been detrimental to the long-term persistence of this endangered species on Base. Southwestern Willow Flycatchers also may be facing pressures on their wintering grounds, including, but not limited to, habitat degradation and conversion to agriculture (M. Whitfield, Southern Sierra Research Station, written commun., 2020).

Our long-term research supports the environmental stewardship program at MCBCP to protect endangered species and promote their recovery. Based on our observations of Southwestern Willow Flycatchers breeding under a variety of environmental conditions, the following actions have high potential for enhancing habitat suitability and availability on Base, thereby contributing to flycatcher recovery:

1. Evaluating potential changes in vegetation structure related to invasive shot hole borer that may have reduced the suitability of historically occupied areas on Base, and developing restoration scenarios if warranted.
2. Continuing to operate artificial seeps to create desirable habitat conditions for breeding flycatchers.
3. Continuing to operate conspecific broadcasts to facilitate recolonization of historically occupied breeding areas.

Until the Southwestern Willow Flycatcher population on Base increases, any projects that alter the habitat in current and historically occupied areas warrant careful consideration. In addition, communication between the AC/S Environmental Security and other military departments will become increasingly important. Our findings and experience indicate that effects to flycatcher habitat can be minimized when maintenance activities, such as clearing vegetation, are coordinated among personnel. This coordination and cooperation among various departments could help maintain a balance among the sometimes competing land uses on Base, including military activities, recreation, habitat protection, and endangered species management.

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Appendix 1. Southwestern Willow Flycatcher Survey Areas at Marine Corps Base Camp Pendleton, 2024

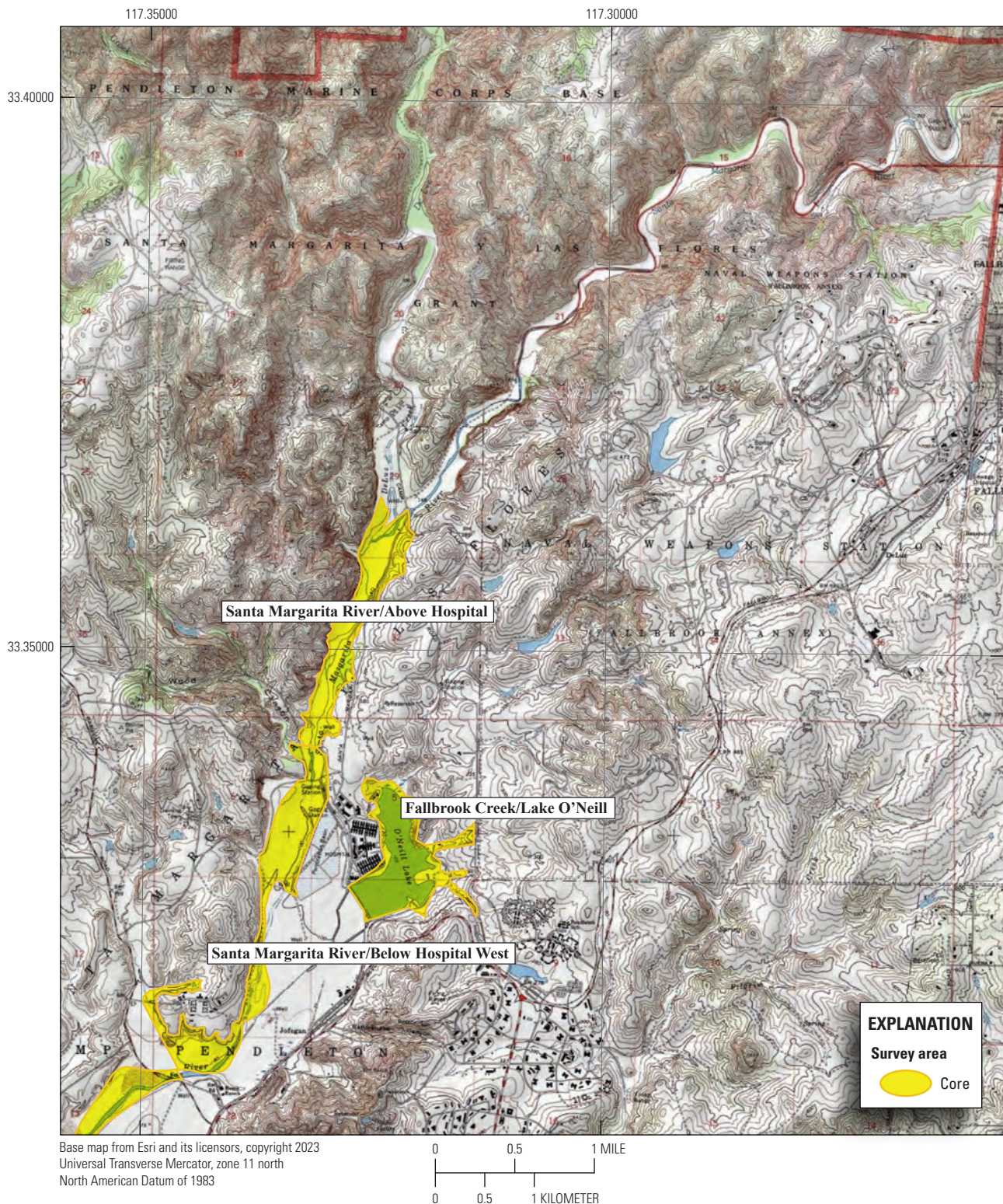


Figure 1.1. Southwestern Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2024: Santa Margarita River (upstream) and Fallbrook Creek.

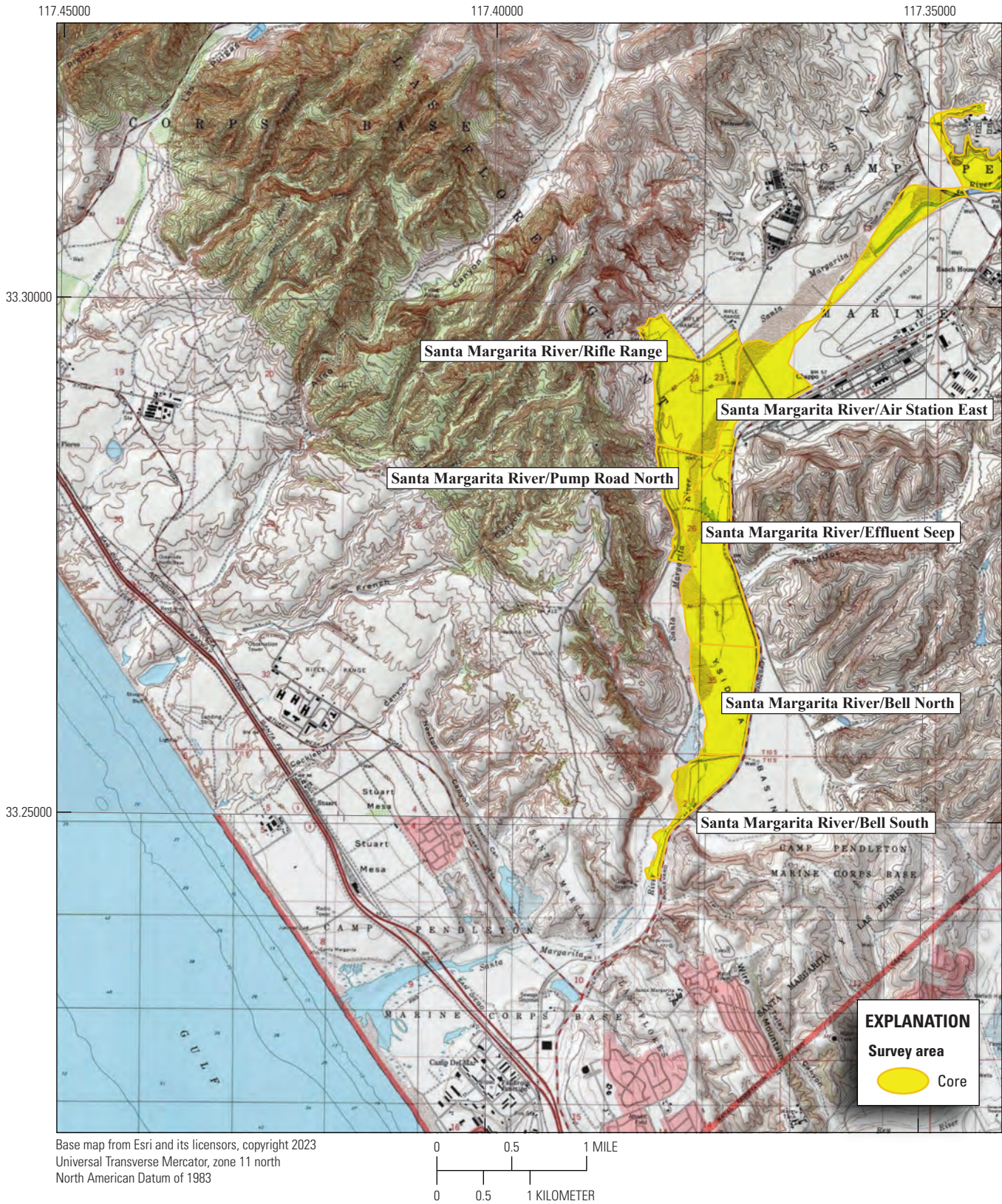


Figure 1.2. Southwestern Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2024: Santa Margarita River (downstream).

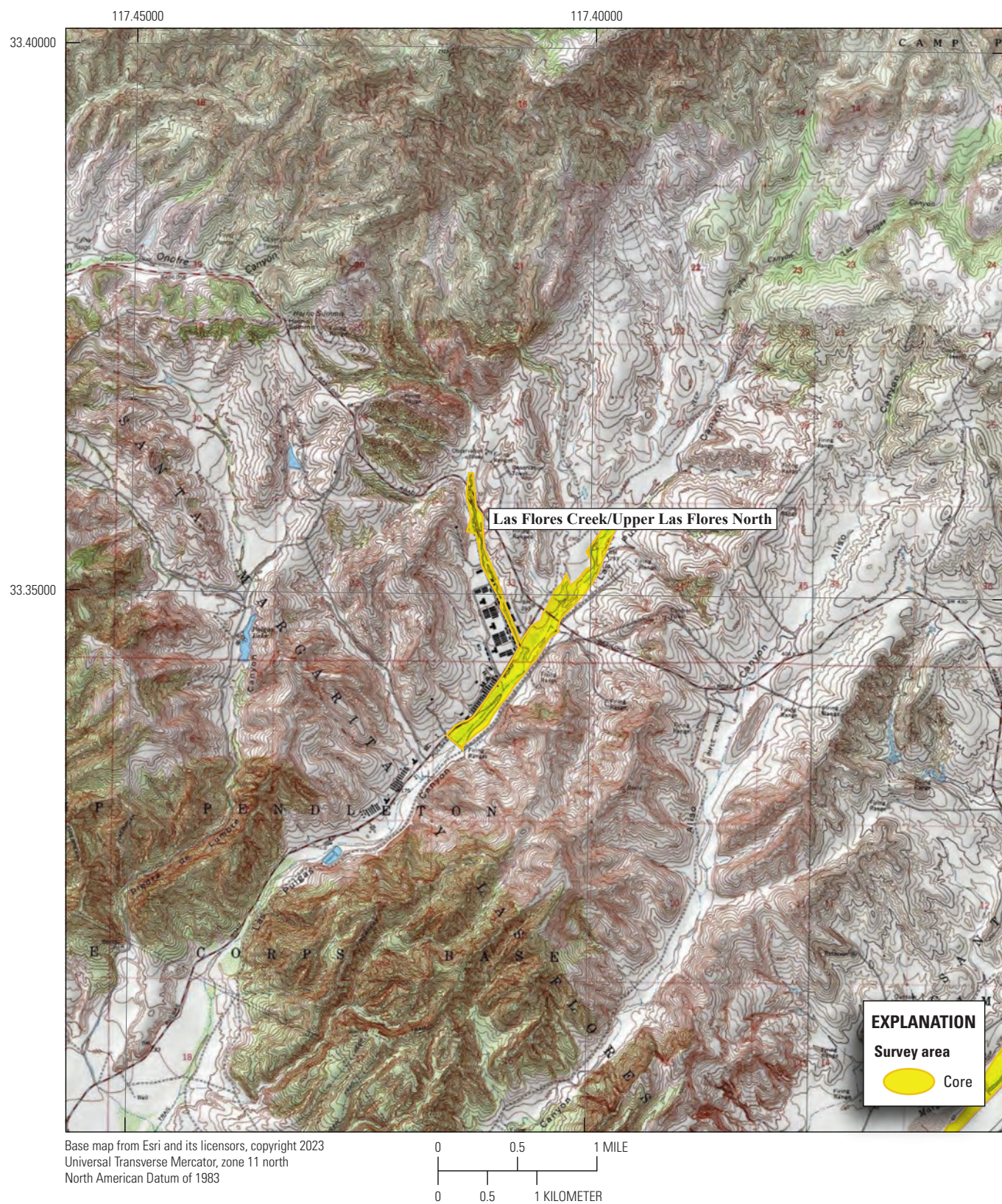


Figure 1.3. Southwestern Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2024: Las Flores Creek.

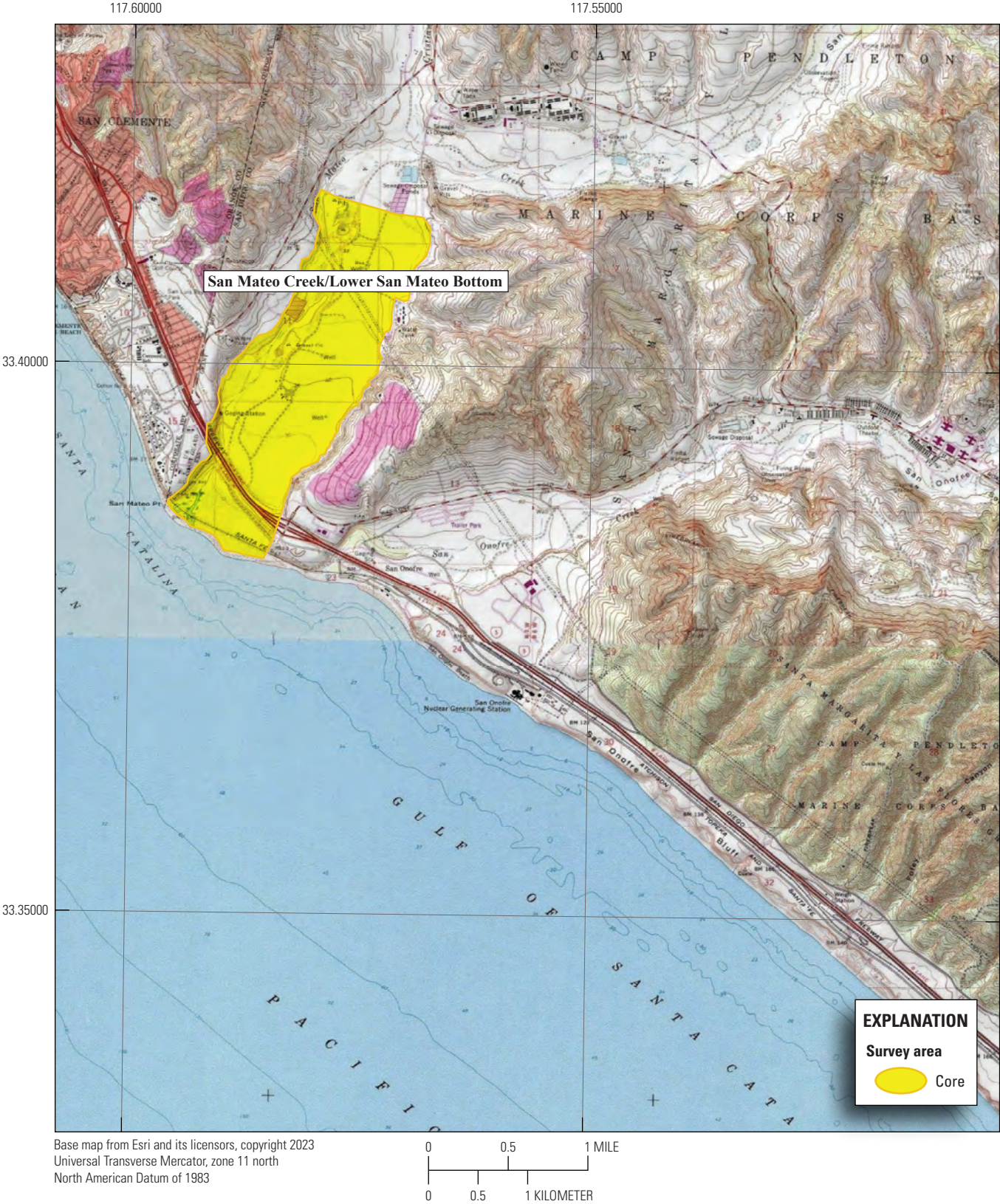


Figure 1.4. Southwestern Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2024: San Mateo Creek (downstream).

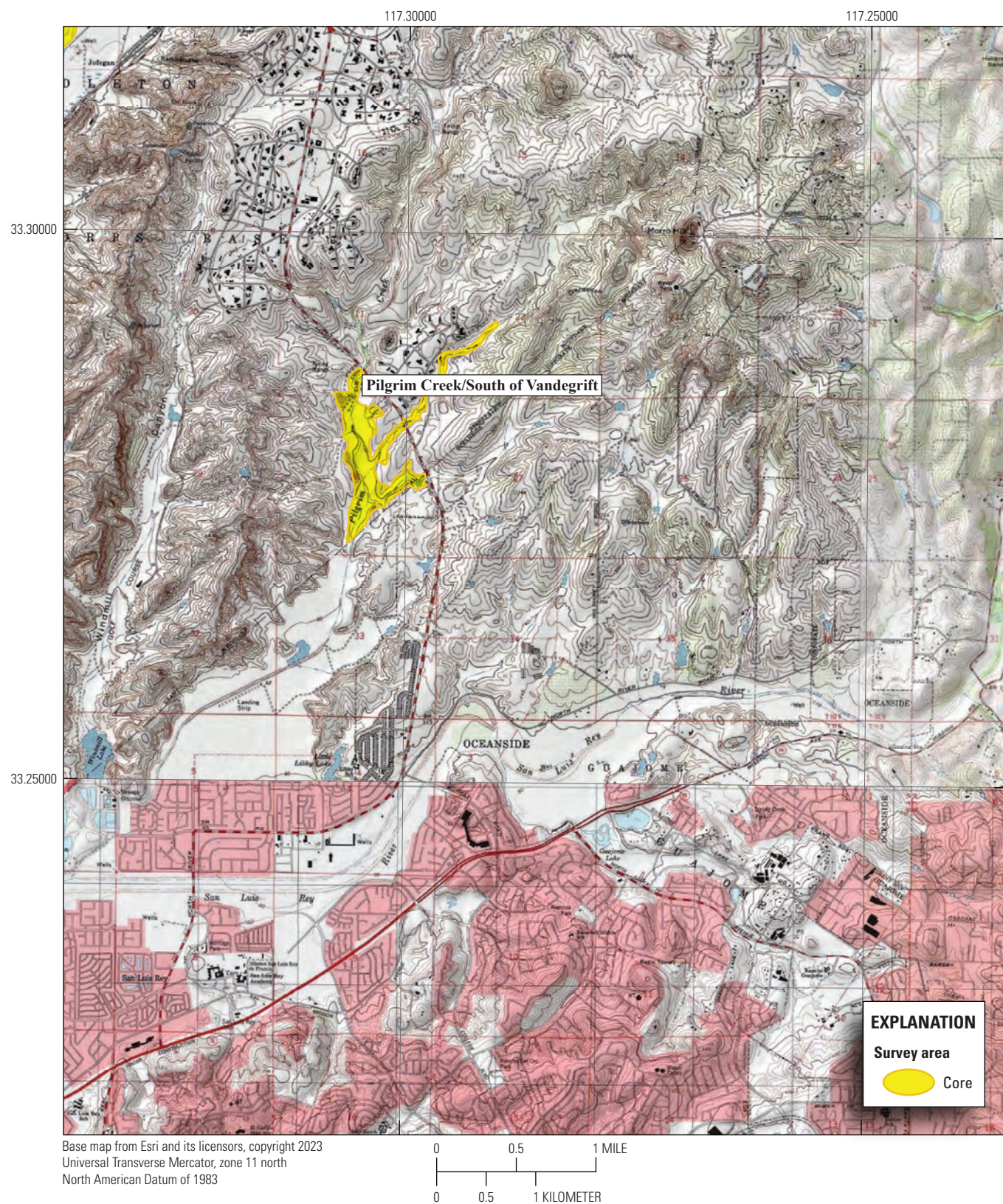


Figure 1.5. Southwestern Willow Flycatcher survey areas at Marine Corps Base Camp Pendleton, 2024: Pilgrim Creek.

Appendix 2. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2024

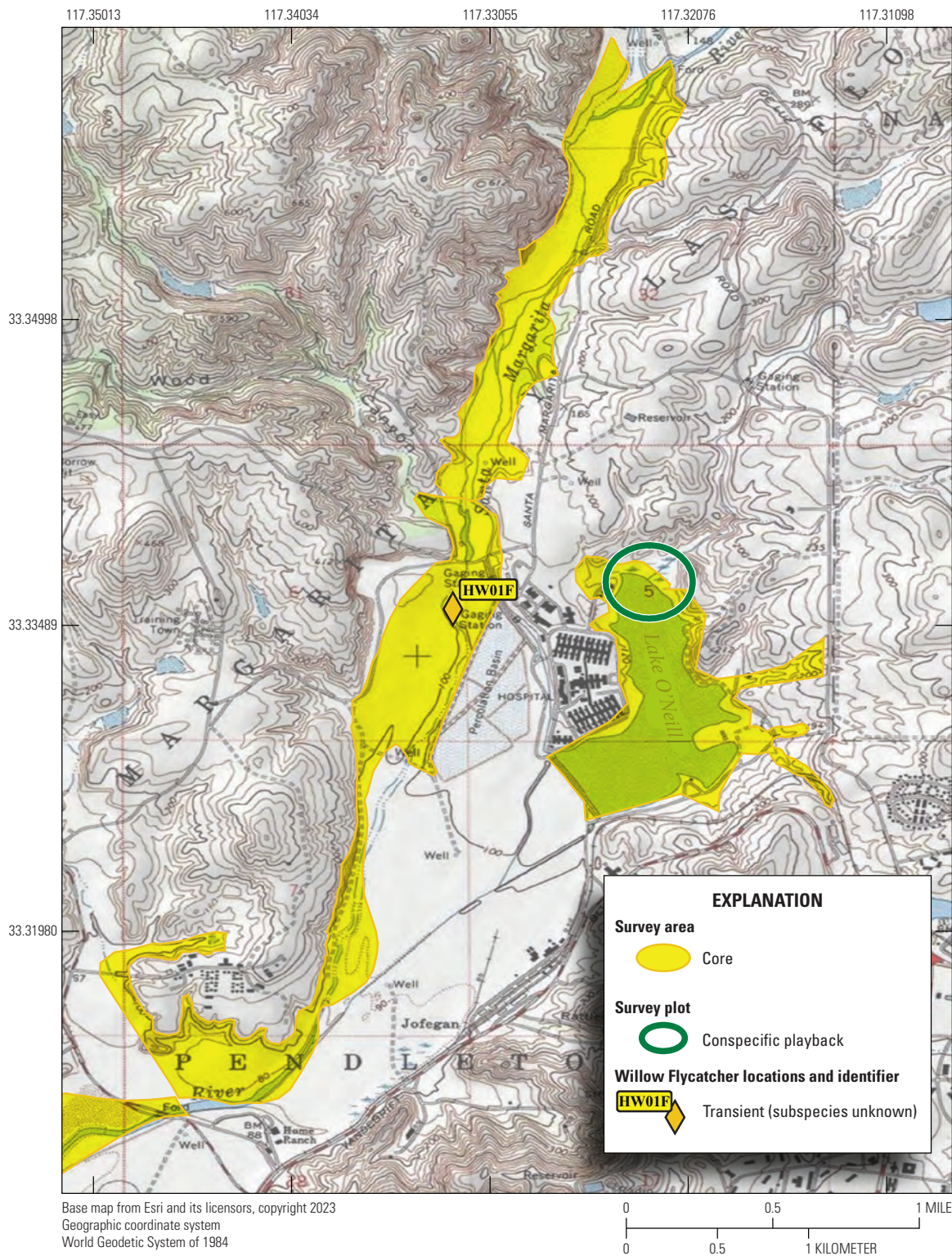


Figure 2.1. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2024: Santa Margarita River (upstream).

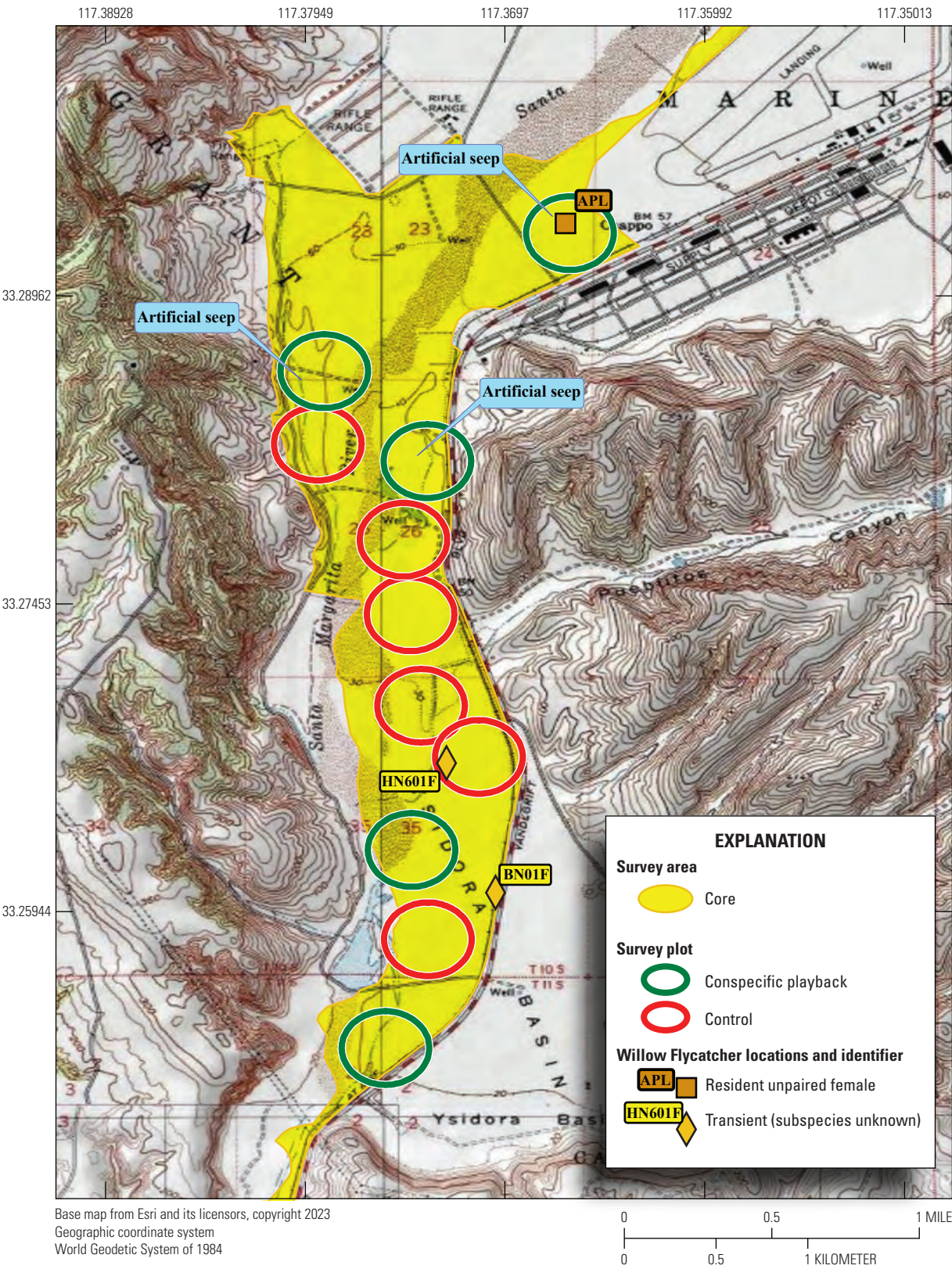


Figure 2.2. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2024: Santa Margarita River (downstream).

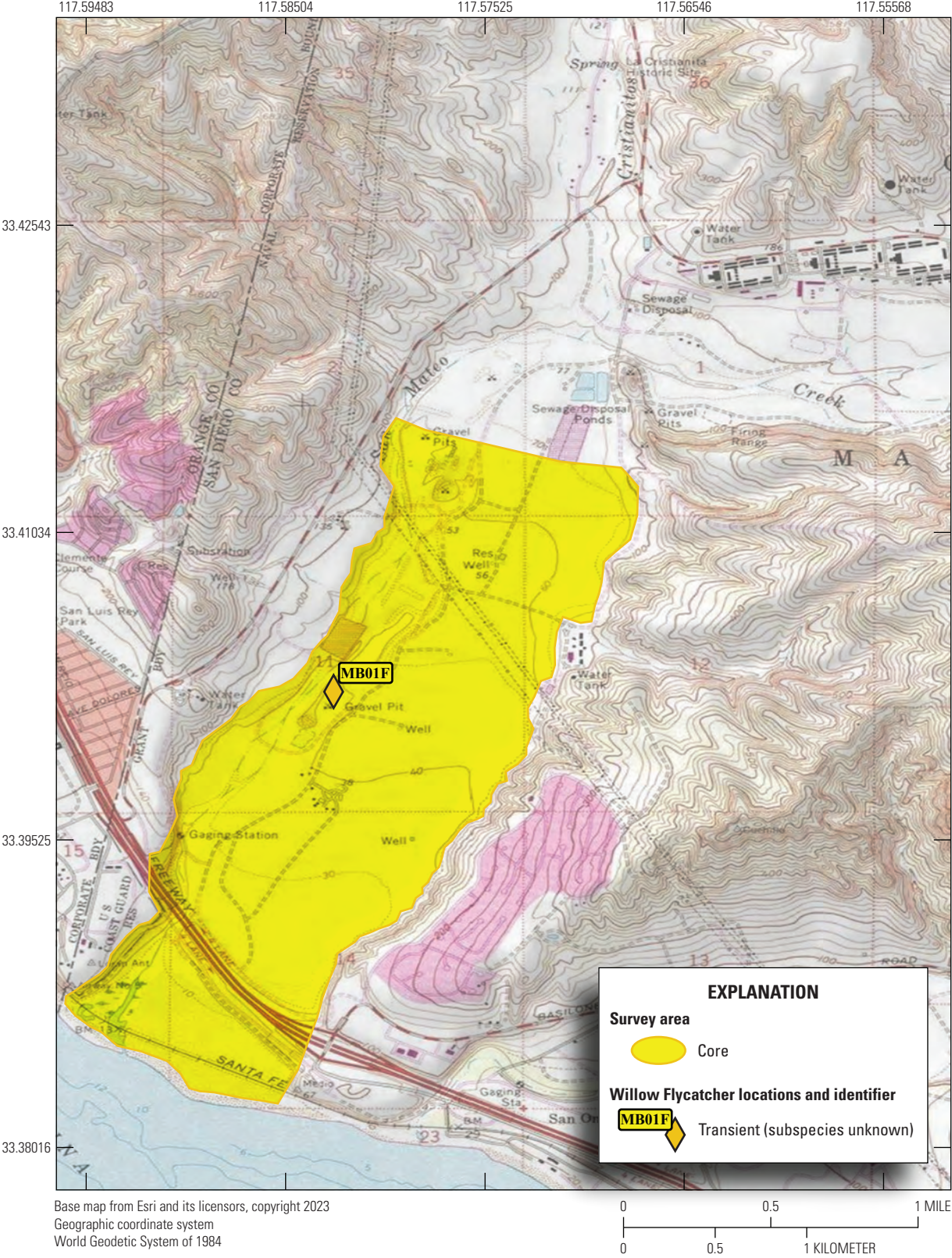


Figure 2.3. Locations of Willow Flycatchers at Marine Corps Base Camp Pendleton, 2024: San Mateo Creek.

Appendix 3. Southwestern Willow Flycatcher Territory Locations at Marine Corps Base Camp Pendleton, 2024



Figure 3.1. Southwestern Willow Flycatcher territories at Marine Corps Base Camp Pendleton, 2024: Air Station Breeding Area, Santa Margarita River.

For more information concerning the research in this report,
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