

Distribution and Abundance of Least Bell's Vireos (*Vireo bellii pusillus*) and Southwestern Willow Flycatchers (*Empidonax traillii extimus*) on the Middle San Luis Rey River, San Diego County, Southern California—2016 Data Summary



Data Series 1065

Cover: Photograph showing banded Southwestern Willow Flycatcher (*Empidonax traillii extimus*). Photograph by Scarlett Howell, U.S. Geological Survey.

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By Lisa D. Allen, Scarlett L. Howell, and Barbara E. Kus

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**U.S. Department of the Interior
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Conversion Factors

International System of Units to Inch/Pound

Multiply	By	To obtain
	Length	
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32.$$

Datum

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Distribution and Abundance of Least Bell's Vireos (*Vireo bellii pusillus*) and Southwestern Willow Flycatchers (*Empidonax traillii extimus*) on the Middle San Luis Rey River, San Diego County, Southern California—2016 Data Summary

By Lisa D. Allen, Scarlett L. Howell, and Barbara E. Kus

Executive Summary

We surveyed for Least Bell's Vireos (LBVI) (*Vireo bellii pusillus*) and Southwestern Willow Flycatchers (SWFL) (*Empidonax traillii extimus*) along the San Luis Rey River, between College Boulevard in Oceanside and Interstate 15 in Fallbrook, California (middle San Luis Rey River), in 2016. Surveys were done from March 30 to July 11 (LBVI) and from May 18 to July 30 (SWFL). We found 142 LBVI territories, at least 106 of which were occupied by pairs. Six additional transient LBVIs were detected. Of 20 banded LBVIs detected in the survey area, 9 had been given full color-band combinations prior to 2016, although we were unable to determine the exact color combination of 1 female LBVI. Seven other LBVIs with single (natal) federal bands were recaptured and banded in 2016. Four vireos with single dark blue federal bands indicating that they were banded as nestlings on the lower San Luis Rey River could not be recaptured for identification.

Three SWFL territories were observed in the survey area in 2016. Two territories were occupied by pairs and one by a male of unknown breeding status. Both pairs attempted to nest at least once, and both pairs were successful, fledging three young each. Nesting began in early June and continued into July. Brown-Headed Cowbird (*Molothrus ater*) eggs were not observed in either nest. An additional 12 transient Willow Flycatchers of unknown subspecies were detected in 2016.

Two of the five resident SWFLs were originally banded as nestlings on Marine Corps Base Camp Pendleton. One male and one female were banded as nestlings on Camp Pendleton in 2009 and 2011, respectively. One natal male of unknown breeding status, originally banded as a nestling on the middle San Luis Rey River in 2015, was recaptured and given a unique color combination in 2016. This male was later detected on Marine Corps Base Camp Pendleton.

Introduction

The Least Bell's Vireo (*Vireo bellii pusillus*; LBVI) is a small, migratory songbird that breeds in southern California and northwestern Baja California, Mexico, from April through July. Historically abundant within lowland riparian ecosystems, LBVI populations began declining in the late 1900s as a result of multiple anthropogenic factors, including habitat loss and alteration associated with urbanization and agricultural conversion of land adjacent to rivers, the expansion in range of the brood-parasitic Brown-Headed Cowbird (*Molothrus ater*; hereinafter "cowbird"), and the introduction of invasive exotic plant species such as giant reed (*Arundo donax*) into riparian systems (U.S. Fish and Wildlife Service [FWS] 1986, 1998; Franzreb, 1989; Kus, 1998, 1999; Riparian Habitat Joint Venture [RHJV], 2004; Kus and others, 2010). By 1986, the LBVI population in California numbered just 300 territorial males (U.S. Fish and Wildlife Service, 1986).

In response to the considerable decline in numbers of LBVIs in California, the California Fish and Game Commission listed the species as endangered in 1980, and the USFWS followed suit in 1986. Since listing, the LBVI population in southern California has rebounded, largely in response to cowbird control and habitat restoration and preservation (Kus and Whitfield, 2005). As of 2006, the statewide LBVI population was estimated to be approximately 2,500–3,000 territories (U.S. Fish and Wildlife Service, 2006), of which approximately 10 percent occurred along the San Luis Rey River between Interstate 15 and Interstate 5.

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*; SWFL) is one of four subspecies of Willow Flycatcher in the United States, with a breeding range including southern California, Arizona, New Mexico, extreme southern parts of Nevada and Utah, and western Texas (Hubbard, 1987; Unitt, 1987). Restricted to riparian habitat for breeding, the SWFL has declined in recent decades in response to widespread habitat loss throughout its range and, possibly, brood-parasitism by cowbirds (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 (U.S. Fish and Wildlife Service, 1993) in small, disjunct populations. The SWFL was listed as endangered by the State of California in 1992 and by the FWS in 1995.

SWFL in southern California co-occur with the LBVI. However, unlike the LBVI, which has increased 10-fold since the mid-1980s in response to management alleviating these threats (U.S. Fish and Wildlife Service, 2006), SWFL numbers have remained low. Currently, most SWFLs in California are concentrated in three sites—the Owens River Valley in Inyo County (Lacey Greene, California Department of Fish and Wildlife, written commun., 2015), the South Fork of the Kern River in Kern County (Mary Whitfield, Southern Sierra Research Station, written commun., 2016), and the Upper San Luis Rey River, including a part of the Cleveland National Forest in San Diego County (Howell and Kus, 2015). Outside of these sites, SWFLs occur as small, isolated populations of 1–6 pairs. Data on the distribution and demography of the SWFL, as well as identification of factors limiting the species, are critical information needs during the current stage of recovery planning (Kus and others, 2003; Kus and Whitfield, 2005).

The purpose of this study was to document the status of LBVIs and SWFLs along an 18-km stretch of the San Luis Rey River from College Boulevard in Oceanside, California, east to Interstate 15 (middle San Luis Rey River) (fig. 1). Our goals for LBVIs were to (1) determine abundance and distribution of LBVIs on the middle San Luis Rey River to facilitate population trend analyses, and (2) collect information on dispersal and site fidelity of banded LBVIs. Our goals for SWFLs were to (1) determine the size and composition of the SWFL population on the middle San Luis Rey River, (2) document and monitor nesting activities of resident SWFLs, and (3) band and resight all SWFLs to facilitate the estimation of SWFL survivorship and movement.

These data, when compared with data from other sites, will inform natural resource managers about the status of these endangered species on the San Luis Rey River and guide modification of land-use and management practices as appropriate to ensure the species' continued existence.

Methods

Surveys

USGS biologists conducted LBVI and SWFL surveys on the middle San Luis Rey River following standard survey techniques for LBVIs (U.S. Fish and Wildlife Service, 2001) and SWFLs (Sogge and others, 2010). Four surveys for LBVIs were done from March 30 to July 11, 2016, and four surveys for SWFLs were completed from May 18 to July 30, 2016. Observers walked slowly through or adjacent to suitable riparian habitat, listening and searching for LBVI and SWFL, occasionally playing a recording of a LBVI or SWFL song to elicit a territorial response. Surveys typically began at sunrise and were completed by early afternoon, depending on wind and weather conditions.

For each vireo or flycatcher encountered, observers recorded age (adult or juvenile), sex, breeding status (paired, single, undetermined, or transient), and whether the bird was banded. A vireo or flycatcher was considered transient if detected only once, or if more than once, detections were less than 2 weeks apart. Transient status was assigned only in years with more than three surveys. Vireo and flycatcher locations were mapped using a Trimble Juno SB with 2–5 m accuracy to determine geographic coordinates (WGS84). Habitat type, dominant plants, and the presence of cowbirds were also recorded.

Nest Monitoring

From May 18 to July 31, USGS biologists monitored nesting attempts of two SWFL pairs on the middle San Luis Rey River to determine nest success (percentage of nests fledging at least one SWFL young) and productivity (number of SWFL fledglings produced per pair). Pairs were visited weekly from their date of detection until the completion of their final nest to obtain a complete record of breeding activity within the territory. Pairs were observed for evidence of nesting, and their nests were located and monitored following standard protocol (Rourke and others, 1999). To minimize the chances of leading predators or cowbirds to nest sites, nests were visited only as frequently as needed to collect sufficient data. Typically, there were three to four visits per nest, corresponding to approximately one visit per week; the first visits were timed to determine the number of eggs laid and to remove cowbird eggs from parasitized nests; subsequent visits were to determine whether eggs had hatched and age of young, and the last to band the nestlings.

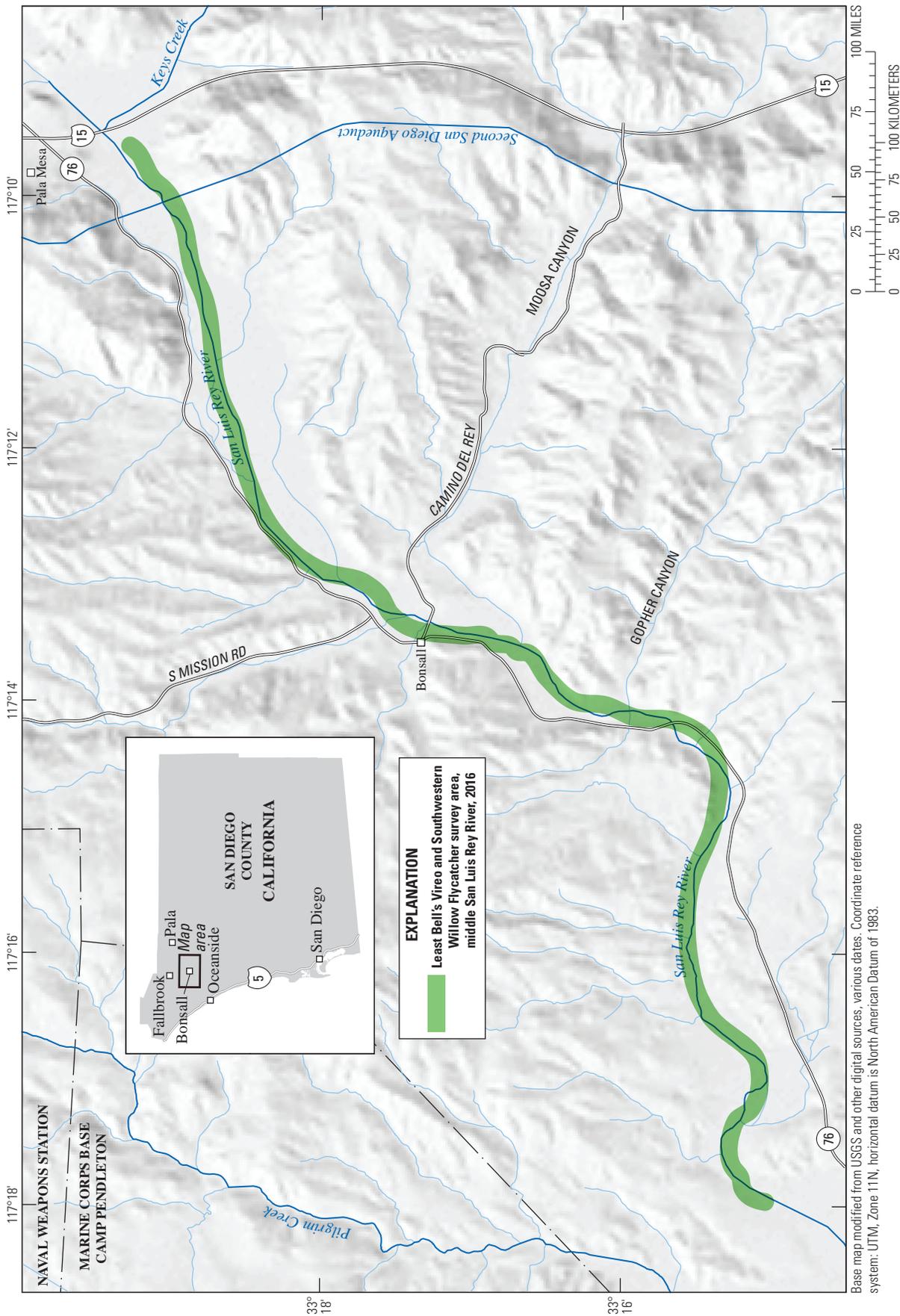


Figure 1. Location of Least Bell's Vireo (*Vireo bellii pusillus*) and Southwestern Willow Flycatcher (*Empidonax traillii eximius*) survey area on the middle San Luis Rey River, San Diego County, southern California, 2016.

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After a nest became inactive, five possible nest fates were assigned based on the following parameters.

1. Nests that fledged at least one SWFL young were considered successful (SUC). Fledging was confirmed by detection of young outside the nest.
2. Unsuccessful nests were placed into one of four nest fate categories. Nests found empty or destroyed prior to the estimated fledge date and where the adult SWFLs were not found tending fledgling(s) were considered depredated (PRE).
3. Previously active nests that were subsequently abandoned by adult SWFLs after one or more cowbird eggs were laid in the nest were considered to have failed because of nest parasitism (PAR). Any nests that fledged cowbird young without fledging flycatcher young were also considered to have failed because of nest parasitism (PAR).
4. Nests failing for reasons such as poor nest construction or the collapse of a host plant that caused a nest's contents to be dumped onto the ground, or the presence of a clutch of infertile eggs, were classified as failing because of other causes that were known (OTH).
5. Nests that appeared intact and undisturbed but were abandoned with flycatcher eggs and (or) nestlings were classified as having failed because of unknown causes (UNK).

Banding

Attempts were made to recapture adult LBVIs and SWFLs banded with a single metal band (natal) with mist nets to determine their original banding location. When captured, birds were fitted with colored leg bands in a unique color-band combination so that individuals could be identified in the future without recapture. Additionally, attempts were made to capture and color-band unbanded adult SWFLs. SWFL nestlings were banded at 7–10 days of age. Each bird received a silver aluminum federal numbered band on the left leg.

All summary data are presented as mean \pm standard deviation. Data from 2008 to 2015 used in comparisons with current (2016) data are available in Ferree and Kus (2008) and Ferree and others (2010, 2012, 2015); Houston and Kus (2011, 2012, 2013, 2014); Houston, Allen, Howell, and others (2015); Houston, Allen, Pottinger, and others (2015); Houston and others (2016); Lynn and Kus (2008, 2010a, 2010b); Lynn and others (2011, 2016).

Least Bell's Vireo

Distribution and Abundance

A total of 142 LBVI territories and 6 LBVI transients were detected on the middle San Luis Rey River in 2016 (table 1 and fig. 2). This was a 1 percent population size increase in the survey area relative to 2015, but still well above the 8-year average (2008–15) of 126 ± 24 .

Table 1. Total number of Least Bell's Vireo (*Vireo bellii pusillus*) territories detected and breeding status in the study area on the middle San Luis Rey River, San Diego County, southern California, 2008–16.

[Number of single males: Least Bell's Vireo nest monitoring did not occur in 2008, 2011, 2015, and 2016; therefore the number of times a territory was visited was not sufficient to determine whether the territory contained a pair or a single male. Transients: Transients not included in the total number of territories. Transient status not assigned in years when fewer than four surveys were conducted (2008–14). NA, not applicable]

Year	Total number of territories	Number of pairs	Number of birds with undetermined status	Number of single males	Transients
2008	100	47	53	NA	NA
2009	115	67	48	NA	NA
2010	146	115	30	1	NA
2011	126	69	57	NA	NA
2012	101	66	29	6	NA
2013	110	69	39	2	NA
2014	168	134	33	1	NA
2015	141	92	49	NA	2
2016	142	106	36	NA	6

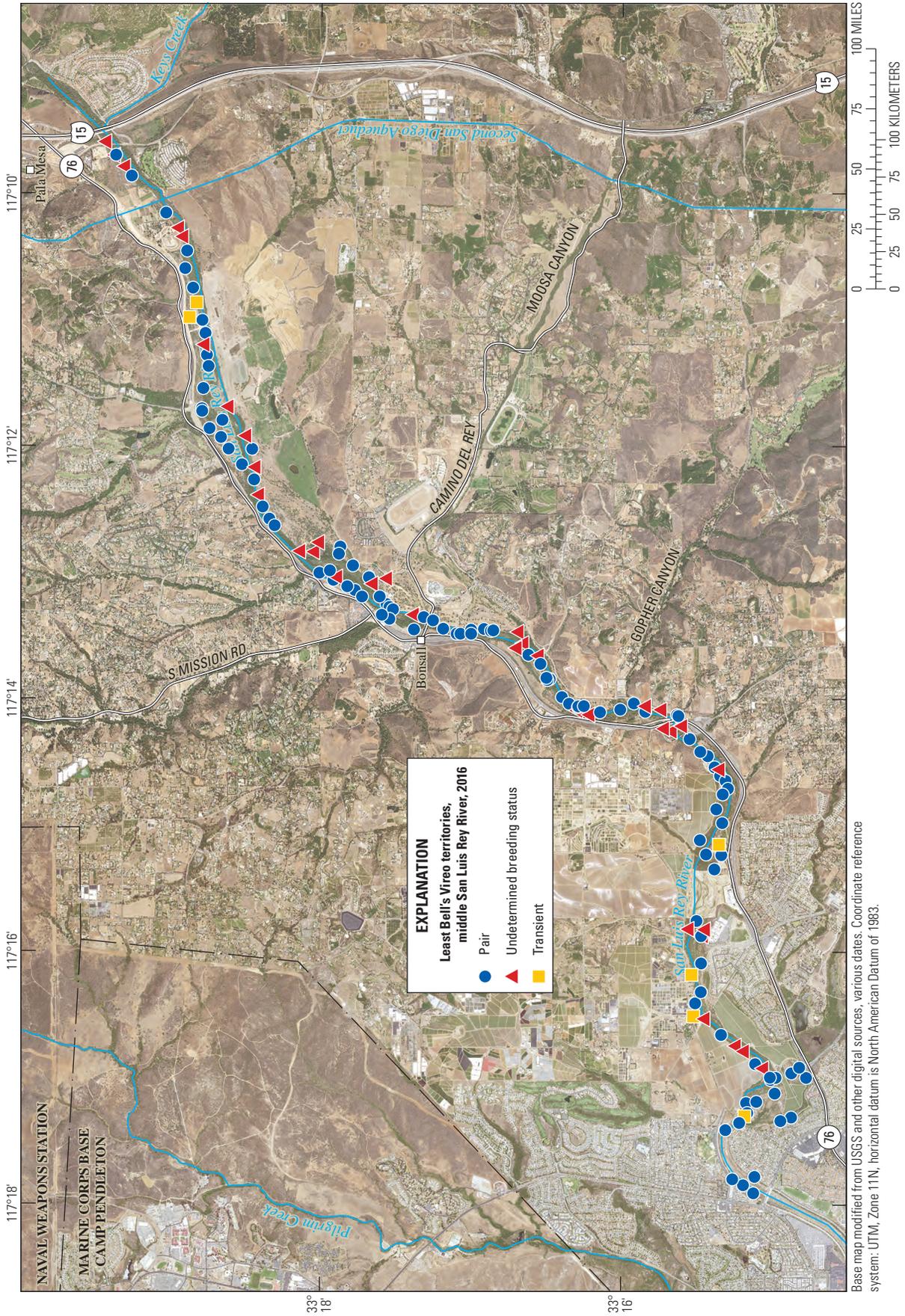


Figure 2. Least Bell's Vireo detections (*Vireo bellii pusillus*) and breeding status on the middle San Luis Rey River, San Diego County, southern California, 2016.

Least Bell’s Vireos used four different habitat types in the survey area. Nearly three-quarters of the LBVIs (72 percent) occurred in habitat characterized as willow (*Salix* sp.)–cottonwood (*Populus fremontii*), 25 percent occurred in mixed willow riparian habitat, 2 percent in riparian scrub vegetation, and 1 percent occupied willow-sycamore (*Platanus racemosa*) habitat (table 2).

The most commonly reported dominant species at LBVI territories included red or arroyo willow (*S. laevigata* or *S. lasiolepis*), Fremont cottonwood, black willow (*S. gooddingii*), and mule fat (*Baccharis salicifolia*). The most prevalent exotic species were black mustard (*Brassica nigra*) and poison hemlock (*Conium maculatum*).

Banded Birds

Twenty banded LBVIs were detected on the middle San Luis Rey River in 2016 (tables 3 and 4). The oldest identified LBVI was an 8-year-old male that was banded in 2008 as a nestling on the lower San Luis Rey River (Interstate 5 to College Boulevard) and has occupied a territory on the middle San Luis Rey River for multiple years (table 4). Fifteen LBVIs

had unique color-band combinations and could be identified, eight of which were color-banded on the middle San Luis Rey River prior to 2016. Eleven banded LBVIs that were detected in 2016 immigrated to the middle San Luis Rey River from the lower San Luis Rey River. Seven were detected with only a single (natal) dark blue federal band and were recaptured in 2016 to confirm that they were originally banded on the lower San Luis Rey River as nestlings. Four (two males and two females) were detected with a single dark blue federal band identifying that they were originally banded on the Lower San Luis Rey River as nestlings, but we were unable to recapture them to confirm their natal sites. We were unable to identify one female banded bird in 2016 because the band combination could not be confirmed.

All five of the color-banded male LBVIs that were detected on the middle San Luis Rey River in 2015 and 2016 moved 200 m or less from their 2015 territories (table 4). Two male vireos that were not observed in 2015 moved from 0.4 to 0.8 km from their 2014 territories. The seven natal LBVIs that were recaptured on the middle San Luis Rey River dispersed from 2.4 to 13.2 km from their natal territories.

Table 2. Habitat types used by Least Bell’s Vireos (*Vireo bellii pusillus*) on the middle San Luis Rey River, San Diego County, southern California, 2016.

[Number of territories: Data not collected at two territories. Abbreviation: >, greater than]

Habitat type	Number of territories				Percentage of total
	>95 percent native	50–95 percent native	5–50 percent native	Total	
Willow-cottonwood	65	36	0	101	72
Mixed willow riparian	14	20	1	35	25
Riparian scrub	0	3	0	3	2
Willow-sycamore	0	1	0	1	1
Total	79	60	1	140	100

Table 3. Band status of Least Bell’s Vireos (*Vireo bellii pusillus*) detected on the middle San Luis Rey River, San Diego County, southern California, 2016.

Band status	Color-banded on the middle San Luis Rey River	Immigrants		Unknown origin	Total
	Male	Male	Female	Female	
Uniquely banded prior to 2016	¹ 8	0	0	² 1	9
Natal recaptured in 2016	0	5	2	0	7
Natal not recaptured	0	2	2	0	4
Total	8	7	4	1	20

¹Six of these birds were originally banded as nestlings outside of the study area, but have had established territories in the study area for multiple years.

²We were unable to determine the full color combination.

Table 4. Movement of banded Least Bell's Vireos (*Vireo bellii pusillus*) and Southwestern Willow Flycatchers (*Empidonax traillii extimus*) detected on the middle San Luis Rey River, San Diego County, southern California, 2016.

[2015 and 2016 territory: LSLR, lower San Luis Rey River (Interstate 5 to College Boulevard); Natal, Natal vireos were originally banded as nestlings with a single numbered federal band. **Color-band combination:** Left Leg: Right Leg (colors read top to bottom). **Metal band acronyms:** Mdb, numbered dark blue band; Mgo, numbered gold band; Msi, numbered silver band; gogo, gold band. **Plastic Band acronyms:** BKBK, black; BKLP, black-light pink split; BWST, blue-white striped; BYST, black-yellow striped; DBDP, dark blue-dark pink split; DBWH, dark blue-white split; DPDB, dark pink-dark blue split; DPDP, dark pink; LPBK, light pink-black split; WHDB, white-dark blue split; WHDP, white-dark pink split; WHPU, white-purple split; WHWH, white; YEPU, yellow-purple split; YEYE, yellow. **Pin-striped metal band acronyms:** bkye, black-yellow split; pudg, purple-dark green split; repu, red-purple split; whbk, white-black split. **Sex:** F, female; M, male. **Abbreviation:** km, kilometer]

Year originally banded	2015 territory	2016 territory	Distance moved (km)	Color-band combination	Sex	Minimum age in 2016 (years)
Least Bell's Vireos						
2008	MSL127	MSL113	0.0	WHDB Mdb : LPBK	M	8
2009 ¹	MSL107	MSL105	0.4	gogo : DBDP Mdb	M	7
2009 ²	Cherry	BO26	0.2	BKLP gogo : Mgo	F	7
2012 ¹	MSL35	MSL123	0.8	DBWH Mdb : DBDP	M	4
2012	BO20	BO07	0.0	YEPU Mdb : DPDB	M	5
2012	MSL315	MSL325	0.2	BKLP Mdb : BWST	M	4
2012	MSL105	MSL104	0.0	BKBK Mdb : WHDB	M	4
2012	MSL109	MSL107	0.1	BWST Mdb : WHDP	M	4
2014	WEMM (LSLR Natal)	MSL108	5.4	YEYE Mdb : WHDP	F	2
2015	BBUT (LSLR Natal)	MSL119	8.7	DBWH : DBDP Mdb	M	1
2015	CJAS (LSLR Natal)	MSL110	2.4	WHDB : WHPU Mdb	M	1
2015	DBRU (LSLR Natal)	MSL203	8.4	WHDB : YEYE Mdb	M	1
2015	CJET (LSLR Natal)	MSL131	3.4	WHDB Mdb : DPDP	F	1
2015	CPAS (LSLR Natal)	MSL114	2.5	WHDB : BKBK Mdb	M	1
2015	WOUT (LSLR Natal)	BO12	13.2	BYST : WHWH Mdb	M	1
Unknown	LSLR	DT01	unknown	- : Mdb	M	1
Unknown	LSLR	MSL130	unknown	- : Mdb	M	1
Unknown	LSLR	MSL104	unknown	- : Mdb	F	1
Unknown	LSLR	MSL127	unknown	- : Mdb	F	1
Unknown	Unknown	MSL106	NA	??? : ??? ³	F	1
Southwestern Willow Flycatchers						
2009	BO01F	BO01F	0.0	pudg : Msi	M	7
2011	BO01F	BO01F	0.0	whbk : Msi	F	5
2014 ¹	Wanda (MSLR Natal)	BO02F	0.3	Msi : bkye	M	2
2015	BO01F (MSLR Natal)	MSL111F	7.4	repu : Msi	M	1

¹Not detected in 2015; last detected in 2014.

²Not detected in 2015; last detected in 2013.

³We were unable to determine the combination for this banded bird.

Southwestern Willow Flycatcher

Distribution and Abundance

Three SWFL territories were observed on the middle San Luis Rey River in 2016. Two males paired with one female each and one SWFL male of unknown breeding status were detected. Twelve transient Willow flycatchers that could not be identified to subspecies were detected from May 18 to June 16, 2016 (fig. 3).

Nest Monitoring

Nesting began in early June and continued into July. Three nesting attempts were documented during the 2016 breeding season. Both pairs successfully fledged three flycatcher young each. One pair, BO01F territory, had an initial nest that failed as a result of predation during the nestling stage. No cowbird eggs were observed in SWFL nests in 2016.

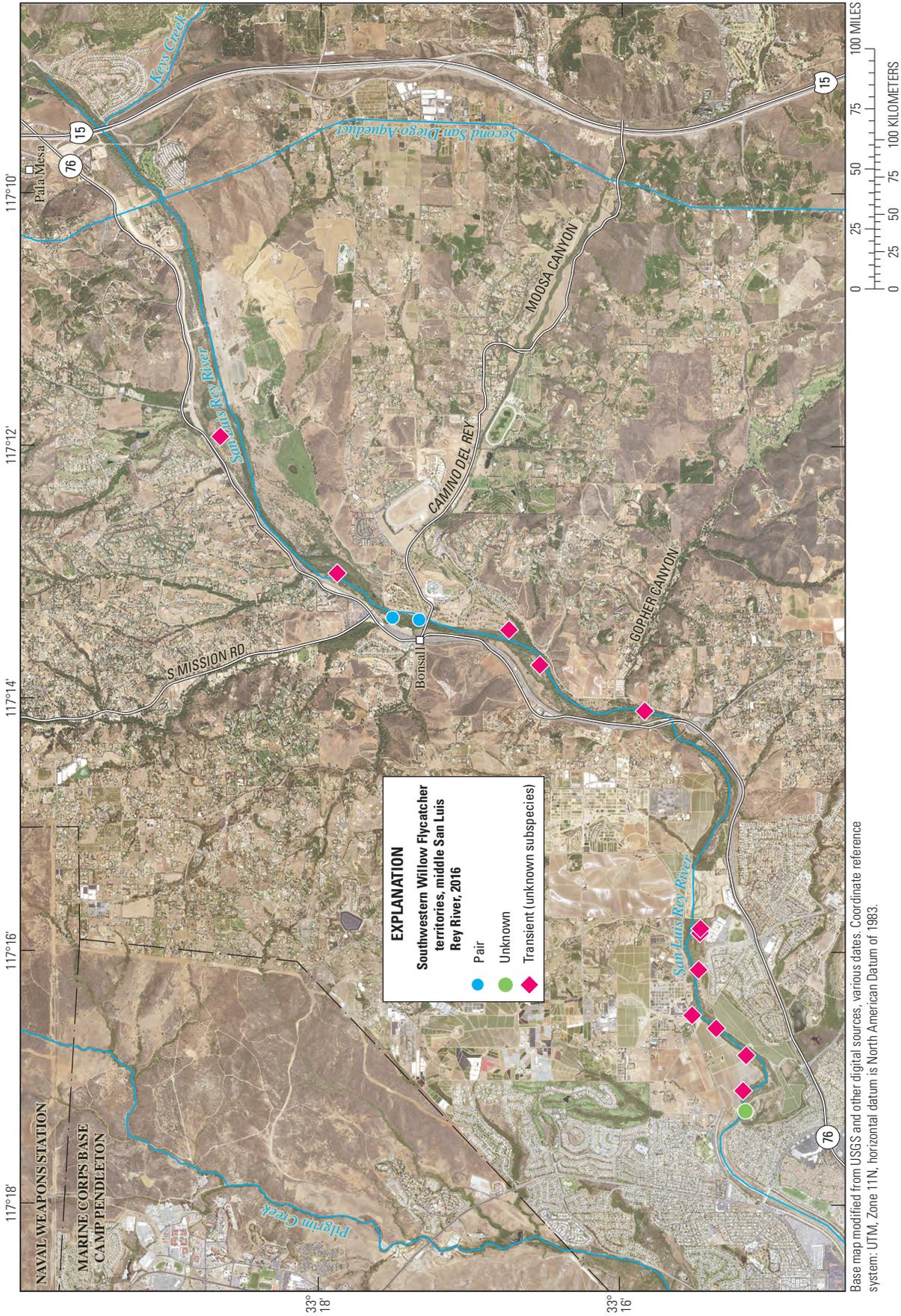


Figure 3. Southwestern Willow Flycatcher (*Empidonax trailii extimus*) detections and breeding status on the middle San Luis Rey River, San Diego County, southern California, 2016.

Banded Birds

Two of the five resident SWFLs (BO01F; one male and one female) were originally banded as nestlings on Marine Corps Base Camp Pendleton, and the third (BO02F; male) was originally banded as a nestling on the middle San Luis Rey River in 2014 (table 4; Howell and Kus, 2009, 2011, 2014). The BO01F male has bred on the middle San Luis Rey River since 2011, and both the BO01F male and female occupied the same territory as in 2015 (table 4). One SWFL of unknown breeding status (MSL111F) was observed with a natal band; the male was subsequently captured and given a unique color combination. This bird was originally banded as a nestling on the middle San Luis Rey River in 2015 (table 4). He was not seen in his initial location after capture, but was later detected on Marine Corps Base Camp Pendleton, where he paired and successfully nested with a female (Howell and Kus, 2016). The BO02F female was initially unbanded and was captured and given a unique color combination. Of six nestlings that were banded, all were believed to have successfully fledged.

Summary

The number of Least Bell's Vireo (LBVI) territories on the middle San Luis Rey River remained stable (increased by 1 percent) from 2015 (141) to 2016 (142), but Southwestern Willow Flycatcher (SWFL) territories increased by 50 percent (from two to three territories). SWFLs declined by 40 percent on Marine Corps Base Camp Pendleton from 2015 to 2016. Vireos increased on Marine Corps Base Camp Pendleton (15 percent) but declined substantially on the lower San Luis Rey River (18 percent).

The number of LBVI territories on the middle San Luis Rey River has fluctuated since 2008 from 100 to 168, with a peak in 2014. Although the LBVI population remained stable in 2016, the population still exceeded the 8-year mean (126 ± 24).

We have documented LBVIs immigrating to the survey area from the lower San Luis Rey River and Marine Corps Base Camp Pendleton. Eleven natal LBVIs that were originally banded as nestlings at the lower San Luis Rey River occupied territories at the middle San Luis Rey River in 2016.

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Director, Western Ecological Research Center
U.S. Geological Survey
3020 State University Drive East
Sacramento, California 95819
<https://www.werc.usgs.gov/>

