

**Ecosystems Mission Area—Species Management Research Program**

# **Distribution and Abundance of Southwestern Willow Flycatchers (*Empidonax traillii extimus*) on the Upper San Luis Rey River, San Diego County, California—2021 Data Summary**



Data Report 1158

Cover. (Left) Southwestern Willow Flycatcher habitat downstream from Lake Henshaw including evidence of coast live oak (*Quercus agrifolia*) mortality. Photograph by Scarlett L. Howell, U.S. Geological Survey, July 7, 2021. (Top right) Photograph showing a Southwestern Willow Flycatcher. Photograph by Scarlett L. Howell, U.S. Geological Survey, June 2012. (Bottom right) Southwestern Willow Flycatcher habitat at Lake Henshaw. Photograph by Suellen Lynn, U.S. Geological Survey, July 20, 2021.

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By Scarlett L. Howell and Barbara E. Kus

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**U.S. Department of the Interior  
U.S. Geological Survey**

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## Conversion Factors

International System of Units to U.S. customary units

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

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

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) / 1.8.$$

## Datum

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

## Abbreviations

CNF	Cleveland National Forest
RRR	Rey River Ranch
VID	Vista Irrigation District
VLH	VID Lake Henshaw

# Distribution and Abundance of Southwestern Willow Flycatchers (*Empidonax traillii extimus*) on the Upper San Luis Rey River, San Diego County, California—2021 Data Summary

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## Executive Summary

We surveyed for Southwestern Willow Flycatchers (*Empidonax traillii extimus*; flycatcher) along the upper San Luis Rey River near Lake Henshaw in Santa Ysabel, California, in 2021. Surveys were completed at four locations: three downstream from Lake Henshaw, where surveys occurred from 2015 to 2020 (Rey River Ranch [RRR], Cleveland National Forest [CNF], Vista Irrigation District [VID]), and one at VID Lake Henshaw (VLH) that has been surveyed annually since 2018. There were 78 territorial flycatchers detected at 3 locations (RRR, CNF, VLH), and 1 transient flycatcher of unknown subspecies was detected at VID. Downstream from Lake Henshaw, five flycatchers, including three males and two females, were detected at RRR and CNF. In total, three territories were established, consisting of two pairs and one male of undetermined breeding status. At VLH, we detected 73 flycatchers, including 32 males, 38 females, and 3 flycatchers of unknown sex. In total, 43 territories were established, containing 38 pairs (22 monogamous pairings, 7 confirmed polygynous groups consisting of 7 males each pairing with 2 different females, and 1 suspected polygynous group consisting of 1 male and 2 females), and 5 flycatchers of undetermined breeding status (2 males and 3 flycatchers of unknown sex). Brown-headed cowbirds (*Molothrus ater*; cowbird) were detected at all four survey locations.

Flycatchers used five habitat types in the survey area: (1) mixed willow riparian, (2) willow-cottonwood, (3) willow-oak, (4) willow-ash, and (5) sycamore-oak. Eighty-seven percent of the flycatchers were detected in habitat characterized as mixed willow riparian, and 94 percent of the flycatchers were detected in habitat with greater than 95-percent native plant cover. Exotic vegetation was not prevalent in the survey area.

There were 15 nests incidentally located during surveys: 1 was successful, 2 were seen with eggs or nestlings on the last visit, 9 failed, and the outcome of the remaining 3 nests

was unknown. Three of these nests were parasitized by cowbirds. There were 13 juveniles detected at VLH during surveys; no juveniles were detected at RRR or CNF.

Of the 10 banded flycatchers detected during surveys, 7 were resighted and confirmed to be adults that held territories in previous years. Three flycatchers with a single dark blue federal band, indicating that they were banded as nestlings in the former demographic study area downstream from Lake Henshaw, were resighted during surveys.

In 2021, we documented both adult and natal flycatchers moving from the former demographic study area downstream from Lake Henshaw upstream to the habitat surrounding Lake Henshaw. Three natal flycatchers that were originally banded as nestlings and three adults that previously held territories downstream dispersed to Lake Henshaw in 2021.

## Introduction

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*; flycatcher) 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 flycatcher has declined in recent decades in response to widespread habitat loss throughout its range and, possibly, brood-parasitism by the Brown-headed Cowbird (*Molothrus ater*; cowbird [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 flycatcher was listed as endangered by the State of California in 1992 and by the U.S. Fish and Wildlife Service in 1995.

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Flycatchers in southern California co-occur with the Least Bell's Vireo (*Vireo bellii pusillus*; vireo), another riparian obligate endangered by habitat loss and cowbird parasitism. However, unlike the vireo, which has increased tenfold since the mid-1980s in response to management practices alleviating threats (U.S. Fish and Wildlife Service, 2006), the number of flycatchers has remained low. Currently, the majority of flycatchers in California are concentrated at one site: the upper San Luis Rey River at Lake Henshaw in San Diego County (Howell and Kus, 2021). Outside of this site, flycatchers occur as small, isolated populations of one to six 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 and others, 2003; Kus and Whitfield, 2005).

Male flycatchers begin arriving in southern California at the end of April, whereas females arrive approximately 1-week later. While on the breeding grounds, males sing repeatedly from exposed perches. Once the pair bond is established, the female builds an open cup nest that is usually 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 America and northern South America.

The goal of the 2021 effort was to assess the status, banding status, breeding status, and habitat attributes of the flycatcher population along the upper San Luis Rey River, in an area downstream from Lake Henshaw, where demographic monitoring occurred from 2015 to 2019 (B.E. Kus, U.S. Geological Survey, unpub. data, 2015–19), as well as the habitat surrounding Lake Henshaw. This report is the annual update to surveys that have been completed since 2015 (B.E. Kus, U.S. Geological Survey, unpub. data, 2015–19; Howell and Kus, 2021). The data contained in this report can be found in the associated data release (Howell and Kus, 2022)

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

## Methods

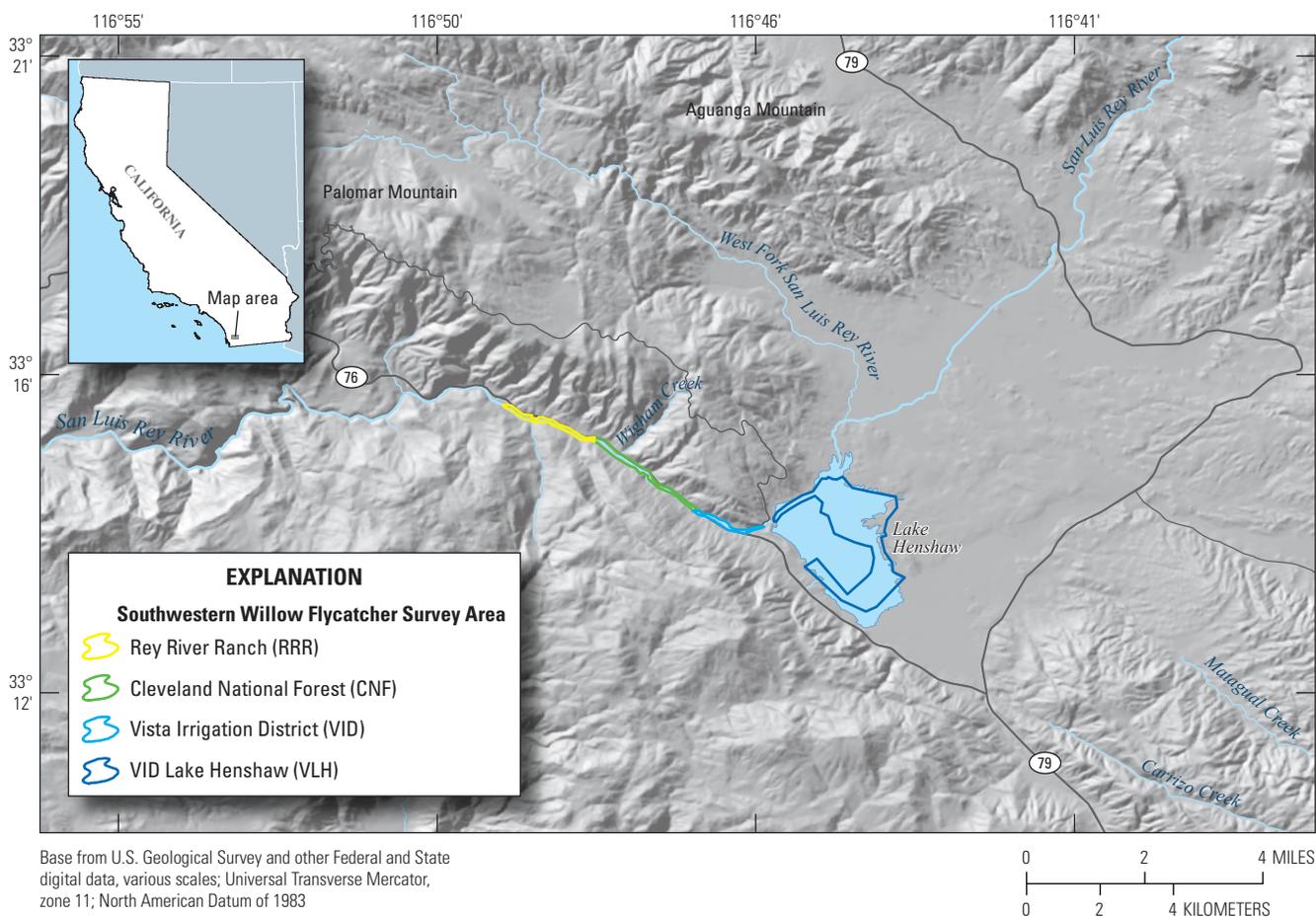
### Study Area

The study area consisted of an approximately 6.9-kilometer (km; 4.3-miles [mi]) reach of the upper San Luis Rey River downstream from Lake Henshaw and the habitat surrounding Lake Henshaw (fig. 1). Four locations along the

upper San Luis Rey River were surveyed for flycatchers in 2021. Three locations were downstream from Lake Henshaw (Rey River Ranch (RRR), Cleveland National Forest (CNF), and Vista Irrigation District (VID) and were previously surveyed in 2015–20. One location was upstream from the dam, VID Lake Henshaw (VLH), and was previously surveyed in 2018–20. The study area included property managed by Vista Irrigation District, Cleveland National Forest, and private and county property downstream from the Forest Service property. Surface flows downstream were regulated by a dam at Lake Henshaw operated by the Vista Irrigation District and water was present year-round. Spring and summer flows were swift and slow-moving backwater/marshy habitats were absent. The flood plain in the downstream part of the study area was narrow and bordered by steep slopes that supported chaparral vegetation. Riparian habitat downstream included a diverse mix of mature willow (*Salix* spp.) woodland and coast live oak (*Quercus agrifolia*) woodland, dominated by coast live oak, willow, velvet ash (*Fraxinus velutina*), California sycamore (*Platanus racemosa*), and white alder (*Alnus rhombifolia*). Thick understory vegetation was present, including wild rose (*Rosa californica*), poison oak (*Toxicodendron diversilobum*), stinging nettle (*Urtica dioica*), and California blackberry (*Rubus ursinus*) interspersed with patches of open habitat dominated by annual grasses and bracken fern (*Pteridium* sp.). The habitat surrounding the lake was dominated by Gooding's black willow (*Salix goodingii*), with some arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), Fremont cottonwood (*Populus fremontii*), and coast live oak present where the west fork of the San Luis Rey River and several other minor creeks flowed into the lake. There were several patches of non-native tamarisk (*Tamarix ramosissima*) further from the outside edge of the lake.

### Surveys

U.S. Geological Survey (USGS) biologists Scarlett Howell and Suellen Lynn completed flycatcher surveys following standard survey techniques for flycatchers (Sogge and others, 2010). Flycatcher surveys were performed under U.S. Fish and Wildlife Service (USFWS) 10(a)1(A) Recovery Permit ESPER0004080\_0. Four surveys were done at least 5 days apart during three consecutive survey periods between May 15 and July 31, 2021, except for the CNF location, which was only surveyed three times because of access restrictions. Surveys were completed between dawn and early afternoon, depending on wind and weather conditions. Surveys were not done during inclement weather, such as temperatures below freezing, rain, or strong winds that inhibit detection of vocalizations. Surveys were performed by walking next to the river, using caution to avoid disturbing the habitat or damaging nests. In wider stands, observers traversed the habitat, choosing routes that permitted detection of all birds throughout its extent, such as multiple straight transects, serpentine, zig-zag, or criss-cross routes.



**Figure 1.** Location of Southwestern Willow Flycatcher (*Empidonax traillii eximus*) survey area on the upper San Luis Rey River, San Diego County, California, 2021.

Upon initiation of the survey, investigators stood quietly for 1–2 minutes (min), listening for spontaneously singing flycatchers and acclimating to surrounding conditions, such as road and river noise. If there were no birds detected during the initial listening period, investigators broadcasted the flycatcher song (fitz-bew) using an MP3 player and an amplified speaker at the volume of normal bird songs for approximately 10–15 seconds and then looked and listened for approximately 1 minute for a response. Song playback was ceased immediately upon detection of a flycatcher. Flycatchers typically responded by moving silently toward the song, singing in response to the song or producing some other call or vocalization. This procedure was repeated (including 10-second quiet pre-broadcast listening period) every 20–30 m throughout the survey site and more often if background noise was loud. If a flycatcher was detected, the investigator moved approximately 50–80 m beyond the detection before additional playback occurred to avoid double counting birds.

For each flycatcher encountered, observers recorded age (adult or juvenile), sex (male, female, or unknown), breeding status (paired, undetermined, or transient), and whether the bird was banded. A flycatcher was considered transient if

detected only once, or if more than once, detections were less than 2 weeks apart. The flycatcher locations were mapped using ESRI Collector (Environmental Systems Research Institute, 2020) on an Android phone with 1- to 15-m accuracy to determine geographic coordinates (World Geodetic System of 1984, WGS 84). Dominant native and exotic plants were recorded at each location, and percent cover of native vegetation was estimated using cover categories of less than 5 percent, 5–50 percent, 51–95 percent, and greater than 95 percent. Overall habitat type was specified according to the following categories:

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

**Willow-alder:** Willow riparian habitat in which white alder is a co-dominant.

**Willow-ash:** Willow riparian habitat in which velvet ash is a co-dominant.

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**Willow-cottonwood:** Willow riparian habitat in which Fremont cottonwood is a co-dominant.

**Willow-oak:** Willow-riparian habitat in which coast live oak is a co-dominant.

**Willow-sycamore:** Willow riparian habitat in which California sycamore is a co-dominant.

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

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

**Upland scrub:** Coastal sage scrub adjacent to riparian habitat.

**Non-native:** Areas vegetated exclusively with non-native species, such as giant reed (*Arundo donax*) and tamarisk.

### Breeding Activities

We documented any breeding activities observed during surveys. Incidental nest locations observed during surveys were recorded and the contents observed whenever possible.

### Brown-headed Cowbirds

We documented the presence of cowbirds during surveys. Whenever possible, the contents of incidentally located flycatcher nests were observed for the presence of cowbird eggs. If present, cowbird eggs were removed from the nest and destroyed to promote nest success because parasitized flycatcher nests are rarely successful in fledging host young (Rothstein and others, 2003).

### Banding

Flycatchers were banded at three locations (RRR, CNF, and VID) as part of a separate demographic study that was done from 2015 to 2019 (B.E. Kus, U.S. Geological Survey, unpub. data, 2015–19). In that study, adults were captured at monitored territories using mist nets and song playback and were banded with a unique color-band combination. Nestlings from accessible nests, in monitored territories, were banded with a single metal dark blue band on the left or right leg. In subsequent years, flycatchers that were resighted with a single dark blue band (natal) were recaptured using the same methods described for adults and given a second leg band to yield a unique band combination. In 2021, we attempted to resight all flycatchers to identify individuals

based on color-band combinations. Color-band resighting data were used to determine age and document movement from banding sites.

## Results

### Distribution and Abundance

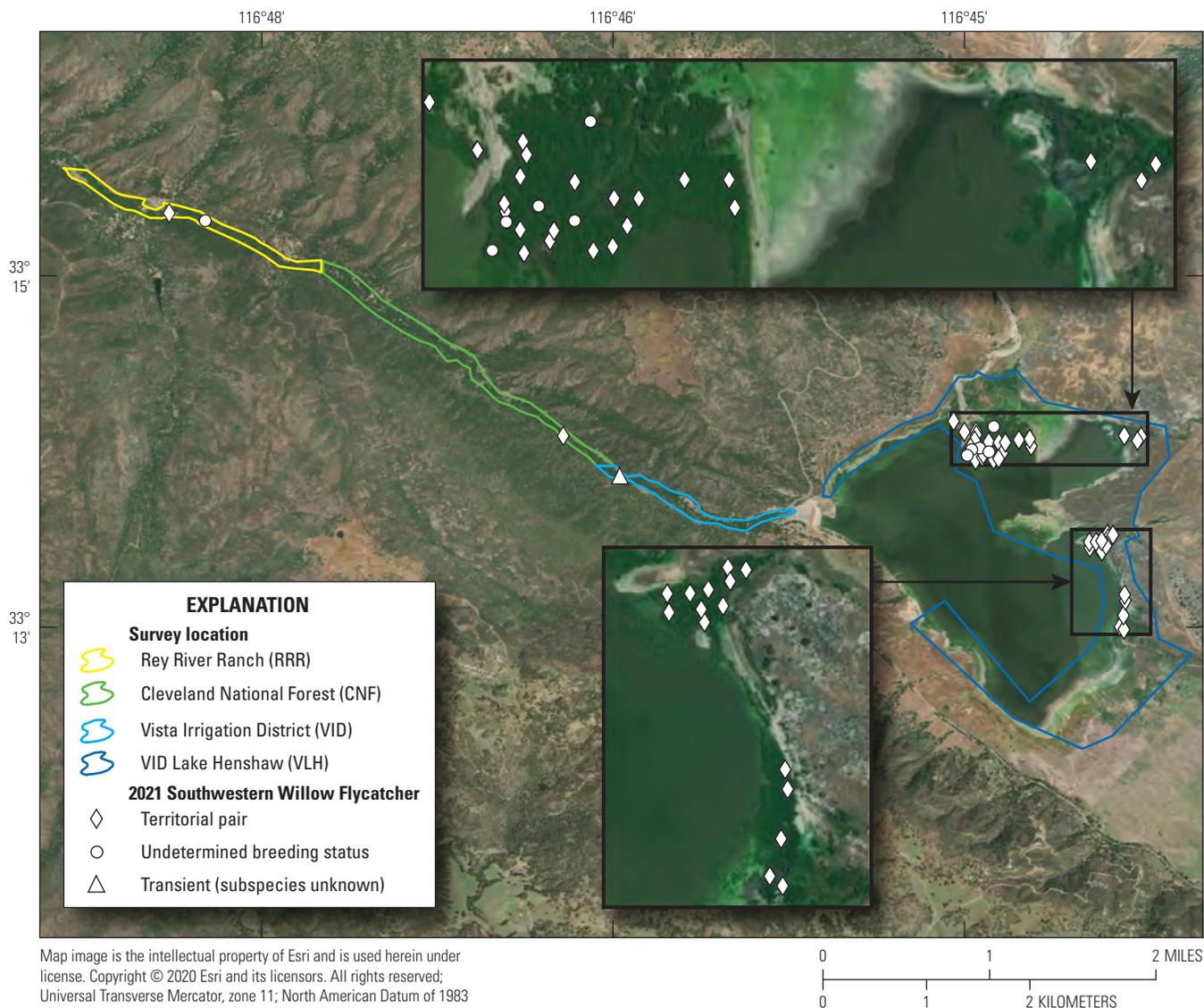
In 2021, there were 78 territorial flycatchers and 1 transient flycatcher of unknown subspecies observed at the 4 survey locations along the upper San Luis Rey River (fig. 2; tables 1, 2). Of the 78 territorial flycatchers, 35 were males, 40 were females, and 3 were of unknown sex. The flycatcher population at the upper San Luis Rey River increased by 26 percent from 2020 (62 territorial flycatchers; Howell and Kus, 2021; Howell and Kus, 2022) to 2021.

A total of five flycatchers (three males and two females) were detected at CNF and RRR (fig. 2; tables 1, 2). No territorial flycatchers were observed at VID, but one transient individual was detected. In total, three territories were established, consisting of two pairs and one male of undetermined breeding status. The number of territorial flycatchers observed downstream from Lake Henshaw decreased by 55 percent compared to 2020 (11; Howell and Kus, 2021; Howell and Kus, 2022).

A total of 73 flycatchers were detected at VLH (fig. 2; tables 1, 2), including 32 males, 38 females, and 3 flycatchers of unknown sex. There were 43 territories established, containing 38 pairs (22 monogamous pairings; 7 confirmed polygynous pairings, consisting of 1 male and 2 females; and 1 suspected polygynous pairing, consisting of 1 male and 2 females) and 5 flycatchers of undetermined breeding status (2 males and 3 flycatchers of unknown sex). The number of territorial flycatchers observed at VLH increased by 43 percent compared to 2020 (51; Howell and Kus, 2021; Howell and Kus, 2022). Some of the increase at VLH can be attributed to increased access in 2021 because we were able to survey habitat that was flooded and inaccessible by foot in 2020.

The distribution of flycatcher territories along the upper San Luis Rey River changed relative to 2020. In 2021, 93 percent of all territories (43/46) were located at VLH and 7 percent (3/46) were downstream from Lake Henshaw, compared to 2020 when 80 percent of all territories (28/35) were located at VLH and 20 percent (7/35) downstream.

Flycatchers used five different habitat types in the survey area. Eighty-seven percent (41/47) of flycatchers were detected in habitat characterized as mixed willow riparian, 11 percent (5/47) were detected in willow riparian habitats co-dominated by cottonwood, oak, or ash, and 2 percent (1/47) were detected in sycamore-oak. Ninety-four percent (44/47) of flycatchers were detected in habitat with greater than 95-percent native plant cover (table 3).



**Figure 2.** Southwestern Willow Flycatcher (*Empidonax traillii extimus*) detections and breeding status on the upper San Luis Rey River, San Diego County, California, 2021.

**Table 1.** Total number and breeding status of Willow Flycatchers (*Empidonax traillii*) detected in the study area on the upper San Luis Rey River, San Diego County, California, 2021.

[Survey location: RRR, Rey River Ranch; CNF, Cleveland National Forest; VID, Vista Irrigation District; VLH, VID Lake Henshaw. Abbreviations: Juv., juveniles; Unk., unknown]

Survey location	Number of							Breeding status	
	Transient fly-catchers	Territorial fly-catchers	Males	Females	Unk. sex	Juv.	Territories	Paired	Undetermined
RRR	0	3	2	1	0	0	2	1	1
CNF	0	2	1	1	0	0	1	1	0
VID	1	0	0	0	0	0	0	0	0
VLH	0	73	32	38	3	13	43	38	5
Total	1	78	35	40	3	13	46	40	6

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**Table 2.** Locations, breeding status, and band status of Willow Flycatchers (*Empidonax traillii*) detected in the study area on the upper San Luis Rey River, San Diego County, California, 2021.

[Survey location: RRR, Rey River Ranch; CNF, Cleveland National Forest; VID, Vista Irrigation District; VLH, VID Lake Henshaw. Breeding status: P, pair; T, Transient (subspecies unknown); U, undetermined. Sex: F, female; M, male. Banded bird(s) present: N, no; U, unknown; Y, yes. Abbreviations: &, and; —, no additional comment; WGS 84, World Geodetic System of 1984]

Survey location	Territory	Number of adults	Breeding status	Sex	Banded bird(s) present	Comments
CNF	CNF01F	2	P	M & F	Y	Male banded.
RRR	RRR01F	2	P	M & F	Y	Male banded.
RRR	RRR02F	1	U	M	Y	Male banded.
VID	VID01F	1	T	U	N	—
VLH	LHW01F	2	P	M & F	N	—
VLH	LHW02F	2	P	M & F	N	—
VLH	LHW04F	2	P	M & F	N	—
VLH	LHW05F	2	P	M & F	Y	Male banded.
VLH	LHW06F	1	U	M	N	—
VLH	LHW07F	2	P	M & F	N	—
VLH	LHW08F	2	P	M & F	N	—
VLH	LHW09F	2	P	M & F	N	—
VLH	LHW10F	2	P	M & F	U	Did not resight female.
VLH	LHW11F	2	P	M & F	N	—
VLH	LHW12F	2	P	M & F	N	—
VLH	LHW13F	2	P	M & F	Y	Female banded.
VLH	LHW14F	2	P	M & F	N	—
VLH	LHW15F	2	P	M & F	Y	Male banded.
VLH	LHW16F	2	P	M & F	N	—
VLH	LHW17F	1	U	M	N	—
VLH	LHW18F	2	P	M & F	Y	Male banded.
VLH	LHW19F	1	U	U	Y	Unknown sex banded.
VLH	LHW20F	2	P	M & F	N	Polygynous male (LHW20/22F).
VLH	LHW21F	2	P	M & F	N	Polygynous male (LHW21/23F).
VLH	LHW22F	1	P	F	N	Second female of LHW20F.
VLH	LHW23F	1	P	F	N	Second female of LHW21F.
VLH	LHW24F	2	P	M & F	N	—
VLH	LHW25F	1	U	U	N	Possible second female of LHW02F.
VLH	LHW26F	1	U	U	N	Probable female.
VLH	MLH01F	2	P	M & F	N	—
VLH	MLH02F	2	P	M & F	Y	Polygynous male (MLH02/03F). Female banded.
VLH	MLH03F	1	P	F	N	Second female of MLH02F.
VLH	VLH01F	2	P	M & F	N	Polygynous male (VLH01/14F).
VLH	VLH02F	2	P	M & F	N	—
VLH	VLH03F	2	P	M & F	N	Polygynous male (VLH03/12F).
VLH	VLH04F	2	P	M & F	Y	Male banded.
VLH	VLH05F	2	P	M & F	N	—
VLH	VLH06F	2	P	M & F	N	—
VLH	VLH07F	2	P	M & F	N	Polygynous male (VLH07/11F).

**Table 2.** Locations, breeding status, and band status of Willow Flycatchers (*Empidonax traillii*) detected in the study area on the upper San Luis Rey River, San Diego County, California, 2021.—Continued

[Survey location: RRR, Rey River Ranch; CNF, Cleveland National Forest; VID, Vista Irrigation District; VLH, VID Lake Henshaw. **Breeding status:** P, pair; T, Transient (subspecies unknown); U, undetermined. **Sex:** F, female; M, male. **Banded bird(s) present:** N, no; U, unknown; Y, yes. **Abbreviations:** &, and; —, no additional comment; WGS 84, World Geodetic System of 1984]

Survey location	Territory	Number of adults	Breeding status	Sex	Banded bird(s) present	Comments
VLH	VLH08F	2	P	M & F	N	—
VLH	VLH09F	2	P	M & F	N	—
VLH	VLH10F	2	P	M & F	N	Polygynous male (VLH10/15F).
VLH	VLH11F	1	P	F	N	Second female of VLH07F.
VLH	VLH12F	1	P	F	N	Second female of VLH03F.
VLH	VLH13F	1	P	F	N	Second female of VLH04F?
VLH	VLH14F	1	P	F	N	Second female of VLH01F.
VLH	VLH15F	1	P	F	N	Second female of VLH10F.

**Table 3.** Habitat characteristics of Willow Flycatchers (*Empidonax traillii*) on the upper San Luis Rey River, San Diego County, California, 2021.

[Survey location: RRR, Rey River Ranch; CNF, Cleveland National Forest; VID, Vista Irrigation District; VLH, VID Lake Henshaw. **Mixed willow riparian:** Habitat dominated by one or more willow species, including Gooding's black willow, arroyo willow, and red willow, with mule fat as frequent co-dominant. **Sycamore-oak:** Woodlands in which California sycamore and coast live oak occur as co-dominants. **Willow-ash:** Willow riparian habitat in which velvet ash is a co-dominant. **Willow-cottonwood:** Willow riparian habitat in which Fremont cottonwood is a co-dominant. **Willow-oak:** Willow riparian habitat in which coast live oak is a co-dominant. **Percent native cover:** 1, greater than 95 percent native plant cover; 2, 50–95 percent native plant cover; —, no data]

Survey location	Territory	Habitat type	Dominant species	Percent native cover	Dominant exotic species
CNF	CNF01F	Willow-ash	Velvet ash, red or arroyo willow	1	—
RRR	RRR01F	Willow-oak	Coast live oak	2	Black mustard
RRR	RRR02F	Sycamore-oak	Coast live oak	1	—
VID	VID01F	Willow-oak	Coast live oak	1	—
VLH	LHW01F	Mixed willow	Gooding's black willow	1	—
VLH	LHW02F	Mixed willow	Gooding's black willow	1	—
VLH	LHW04F	Mixed willow	Gooding's black willow	1	—
VLH	LHW05F	Mixed willow	Gooding's black willow	1	—
VLH	LHW06F	Mixed willow	Gooding's black willow	1	—
VLH	LHW07F	Mixed willow	Gooding's black willow	1	—
VLH	LHW08F	Mixed willow	Gooding's black willow	1	—
VLH	LHW09F	Mixed willow	Gooding's black willow	1	—
VLH	LHW10F	Mixed willow	Gooding's black willow	1	—
VLH	LHW11F	Mixed willow	Gooding's black willow	1	—
VLH	LHW12F	Mixed willow	Gooding's black willow	1	—
VLH	LHW13F	Mixed willow	Gooding's black willow	1	—
VLH	LHW14F	Mixed willow	Gooding's black willow	1	—
VLH	LHW15F	Mixed willow	Gooding's black willow	1	—
VLH	LHW16F	Mixed willow	Gooding's black willow	1	—
VLH	LHW17F	Mixed willow	Gooding's black willow	1	—
VLH	LHW18f	Mixed willow	Gooding's black willow	1	—

## 8 Distribution and Abundance of Southwestern Willow Flycatchers on the Upper San Luis Rey River

**Table 3.** Habitat characteristics of Willow Flycatchers (*Empidonax traillii*) on the upper San Luis Rey River, San Diego County, California, 2021.—Continued

[Survey location: RRR, Rey River Ranch; CNF, Cleveland National Forest; VID, Vista Irrigation District; VLH, VID Lake Henshaw. **Mixed willow riparian:** Habitat dominated by one or more willow species, including Gooding's black willow, arroyo willow, and red willow, with mule fat as frequent co-dominant. **Sycamore-oak:** Woodlands in which California sycamore and coast live oak occur as co-dominants. **Willow-ash:** Willow riparian habitat in which velvet ash is a co-dominant. **Willow-cottonwood:** Willow riparian habitat in which Fremont cottonwood is a co-dominant. **Willow-oak:** Willow riparian habitat in which coast live oak is a co-dominant. **Percent native cover:** 1, greater than 95 percent native plant cover; 2, 50–95 percent native plant cover; —, no data]

Survey location	Territory	Habitat type	Dominant species	Percent native cover	Dominant exotic species
VLH	LHW19F	Mixed willow	Gooding's black willow	1	—
VLH	LHW20f	Mixed willow	Gooding's black willow	1	—
VLH	LHW21F	Mixed willow	Gooding's black willow	1	—
VLH	LHW22f	Mixed willow	Gooding's black willow	1	—
VLH	LHW23F	Mixed willow	Gooding's black willow	1	—
VLH	LHW24F	Mixed willow	Gooding's black willow	1	—
VLH	LHW25F	Mixed willow	Gooding's black willow	1	—
VLH	LHW26f	Mixed willow	Gooding's black willow	1	—
VLH	MLH01F	Mixed willow	Gooding's black willow	1	—
VLH	MLH02F	Mixed willow	Gooding's black willow	2	Tamarisk
VLH	MLH03F	Mixed willow	Gooding's black willow	2	Tamarisk
VLH	VLH01F	Mixed willow	Gooding's black willow	1	—
VLH	VLH02F	Mixed willow	Gooding's black willow	1	—
VLH	VLH03F	Mixed willow	Gooding's black willow	1	—
VLH	VLH04F	Mixed willow	Gooding's black willow	1	—
VLH	VLH05F	Mixed willow	Gooding's black willow	1	—
VLH	VLH06F	Mixed willow	Gooding's black willow	1	—
VLH	VLH07F	Mixed willow	Gooding's black willow	1	—
VLH	VLH08F	Willow-cottonwood	Gooding's black willow	1	—
VLH	VLH09F	Mixed willow	Gooding's black willow	1	—
VLH	VLH10F	Mixed willow	Gooding's black willow	1	—
VLH	VLH11F	Willow-cottonwood	Gooding's black willow	1	—
VLH	VLH12F	Mixed willow	Gooding's black willow	1	—
VLH	VLH13F	Mixed willow	Gooding's black willow	1	—
VLH	VLH14F	Mixed willow	Gooding's black willow	1	—
VLH	VLH15F	Mixed willow	Gooding's black willow	1	—

The most commonly recorded dominant species at flycatcher locations included Gooding's black willow and coast live oak. The most prevalent exotic species were tamarisk and black mustard (*Brassica nigra*).

### Breeding Activities

There were 15 flycatcher nests incidentally located during surveys. Nest building was observed during the first survey period. Of the 15 nests, 1 successfully fledged at least one flycatcher young, 2 nests were seen with eggs or nestlings on the last survey, 9 nests failed, and the outcome of the

remaining 3 nests was unknown. A minimum of 13 flycatcher juveniles were seen during the study period (table 1), including 2 from incidentally found nests and 11 detected during surveys. No juveniles were seen at RRR or CNF.

### Brown-headed Cowbirds

Cowbirds were detected at all four survey locations. Three flycatcher nests were each observed to contain one cowbird egg. The cowbird eggs were removed from the nests, but all three nests failed despite removal. One flycatcher was observed feeding a cowbird fledgling.

## Banded Birds

There were 10 banded flycatchers, all banded prior to 2021, that were detected on the upper San Luis Rey River in 2021 (tables 4, 5). Seven banded flycatchers (six males and one female) with unique color-band combinations were resighted in 2021; all were previously detected as adults on the upper San Luis Rey River in 2019 or 2020 (table 4). Of the seven color-banded flycatchers, three males were detected in the former demographic study area, two at RRR and one at CNF. Two of these males were originally banded as adults in 2016, and one male was originally banded as an adult in 2018. The remaining four full color-band combination adults (three males and one female) were detected at VLH. One male and one female were originally banded as adults at CNF in 2016. Two males were originally banded as nestlings but had been captured at CNF and given unique color-band combinations:

one was originally banded as a nestling in 2017 and color banded in 2018, and one was originally banded as a nestling in 2018 and color banded in 2019.

In 2021, most of the adult flycatchers returned to the same location they last occupied; however, two males (last seen in 2019) and one female (last seen in 2020) moved from 3.2 to 7.3 km from the former demographic study area to VLH (table 4).

Three natal flycatchers (one male, one female, and one bird of unknown sex) were detected on the upper San Luis Rey River in 2021; all were detected at VLH (table 5). Of the three natal birds, one male and one bird of unknown sex were originally banded in 2016 or 2018 and the female was originally banded in 2017 (table 5). The dispersal distances moved by natal flycatchers from the former demographic study area to VLH were estimated to range from 2.3 km (minimum) to 8.1 km (maximum). Banded flycatcher ages ranged from 3 to 6 years old (tables 4, 5).

**Table 4.** Band status and movement of adult Southwestern Willow Flycatchers (*Empidonax traillii extimus*) detected on the upper San Luis Rey River, San Diego County, California, 2021.

[2021 Location/territory: CNF, Cleveland National Forest; RRR, Rey River Ranch; VLH, VID Lake Henshaw. Sex: F, female; M, male. Age originally banded: A, adult; N, nestling. Year/location originally banded/previously seen: CNF, Cleveland National Forest; RRR, Rey River Ranch; VID, Vista Irrigation District; VLH, VID Lake Henshaw. Abbreviation: km, kilometer]

2021 Location/territory	Sex	Minimum age in 2021 (years)	Age originally banded	Year/location originally banded	Year/location previously seen	Distance moved (km)
CNF/CNF01F	M	4	A	2018/CNF	2020/CNF	0.0
RRR/RRR01F	M	6	A	2016/RRR	2020/RRR	0.0
RRR/RRR02F	M	6	A	2016/RRR	2020/RRR	0.0
VLH/LHW13F	F	6	A	2016/CNF	2020/CNF	3.6
VLH/LHW15F	M	4	N	2017/CNF	2019/RRR	7.3
VLH/LHW18F	M	6	A	2016/CNF	2019/VID	3.2
VLH/VLH04F	M	3	N	2018/RRR	2020/VLH	0.0

**Table 5.** Band status and movement of natal Southwestern Willow Flycatchers (*Empidonax traillii extimus*) detected on the upper San Luis Rey River, San Diego County, California, 2021.

[2021 Location/territory: VLH, VID Lake Henshaw. Sex: F, female; M, male; U, unknown. Distance moved (km): minimum and maximum values represent estimates for flycatchers whose exact natal locations were unknown; min, minimum distance calculated between the closest successful nest in the bird's natal year to the first adult location; max, maximum distance calculated between the farthest successful nest in the bird's natal year to the first adult location. Abbreviation: km, kilometer]

2021 Location/territory	Sex	Minimum age in 2021 (years)	Year originally banded	Distance moved (km)	
				Minimum	Maximum
VLH/LHW05F	M	3	2016 or 2018	2.4	7.0
VLH/LHW19F	U	3	2016 or 2018	2.3	6.9
VLH/MLH02F	F	4	2017	3.6	8.1

## Summary

In 2021, the population of Southwestern Willow Flycatchers on the upper San Luis Rey River near Lake Henshaw (78 territorial flycatchers) increased by 26 percent from 2020 (62). In addition, the distribution of birds in the study area differed compared to 2020. The number of territories downstream from Lake Henshaw decreased by 57 percent from 2020 (seven) to 2021 (three). In contrast, the number of territories observed at VID Lake Henshaw (VLH) increased by 54 percent from 2020 (28) to 2021 (43). Our banding studies provided supporting evidence of this shift in distribution because all of the natal flycatchers located during surveys held territories at VLH. Additionally, adult flycatchers that previously held territories downstream dispersed to VLH in 2021. It remains unclear what is driving this shift in distribution; however, anecdotal observations of dead and dying oaks (possibly from goldspotted oak borer; *Agrilus auroguttatus*) downstream, in recent years, may offer a plausible reason for the shift.

The Southwestern Willow Flycatcher population in California appears to be experiencing a statewide decline that is not isolated to the upper San Luis Rey River near Lake Henshaw. Populations on the lower San Luis Rey River (Houston and others, 2021), the Santa Margarita River on Marine Corps Base Camp Pendleton (B.E. Kus, U.S. Geological Survey, unpub. data 2021), and the Kern River (M.J. Whitfield, Southern Sierra Research Station, written commun. 2020) have steeply declined or have been extirpated in recent years. The population along the upper San Luis Rey River near Lake Henshaw is currently the largest recorded Southwestern Willow Flycatcher population in California, making it central to understanding the conditions that favor and promote flycatchers and their habitat.

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