

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—2022
Data Summary**

Data Report 1173

Cover. Southwestern Willow Flycatcher habitat at Lake Henshaw. Photograph by Scarlett Howell, U.S. Geological Survey, July 25, 2022.

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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)

Datums

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83) and the World Geodetic System of 1984 (WGS 84).

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—2022 Data Summary

By Scarlett L. Howell and Barbara E. Kus

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 2022. Surveys were completed at four locations: three downstream from Lake Henshaw, where surveys occurred from 2015 to 2021 (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 71 territorial flycatchers detected at 3 locations (RRR, CNF, VLH), and 6 transient flycatchers of unknown subspecies detected at VID and VLH. Downstream from Lake Henshaw, four territorial flycatchers, including two males and two females, were detected at RRR and CNF. In total, two territories were established consisting of two pairs at these locations. At VLH, we detected 67 territorial flycatchers, including 30 males, 34 females, and 3 flycatchers of unknown sex. In total, 40 territories were established, containing 35 pairs (24 monogamous pairings and 5 polygynous groups consisting of 4 males each pairing with 2 different females, and 1 male pairing with 3 different females), and 5 flycatchers of undetermined breeding status (3 males and 2 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) oak-sycamore. Of the flycatcher locations, 83 percent were located in habitat characterized as mixed willow riparian, and 92 percent were in habitat with greater than 95-percent native plant cover. Exotic vegetation was not prevalent in the survey area.

There were 22 nests incidentally located during surveys: 5 were successful, 1 was seen with eggs on the last visit, 10 failed, and the outcome of the remaining 6 nests was unknown. Three of these nests were parasitized by cowbirds. There were 13 juveniles detected at VLH; no juveniles were detected at RRR or CNF.

Five banded flycatchers were detected during surveys, three of which were confirmed to be adults that held territories in previous years. In addition, two flycatchers with a single dark blue federal band, indicating that they were banded as nestlings in a previous demographic study downstream from Lake Henshaw (Howell and others, 2022), were resighted during surveys.

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 within the past five 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; 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 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 effort 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).

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.

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 (2016), the majority of flycatchers in California are concentrated at two known sites: (1) the upper San Luis Rey River at Lake Henshaw in San Diego County (Howell and Kus, 2022b) and (2) the Owens River Valley in Inyo County (Greene and others, 2021). Outside of these sites, flycatchers occur as small, isolated populations of five territories or less.

Male flycatchers begin arriving in southern California in early to mid-May, 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 for their wintering grounds in Central America and northern South America.

Flycatcher breeding habitat is characterized by patches of dense riparian vegetation along rivers, streams, and reservoir inflows, interspersed with small openings, open water, or areas of sparse vegetation. Vegetation species composition varies across the range, but most breeding habitats include tree or shrub cover that is at least 3 m tall, with patches of dense vegetation within 3–4 m of the ground. In addition, flycatcher breeding habitat is almost always near or adjacent to areas of standing water or saturated soil (U.S. Fish and Wildlife Service, 2002; Sogge and others, 2010).

The goal of the 2022 effort was to assess the population 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 (Howell and others, 2022; Howell and Kus, 2022b), and the habitat surrounding Lake Henshaw. This report is the annual update to surveys that have been completed since 2015 (Howell and Kus, 2021, 2022a, b). The data contained in this report can be found in the associated data release (Howell and Kus, 2022b).

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 2022. 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 2015–21. One location was upstream from the dam, VID Lake Henshaw (VLH), and was previously surveyed in 2018–21. 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. In most years, spring and summer flows were swift, and slow-moving backwater/marshy habitats were absent. In 2022, however, there was very little water in the San Luis Rey River, and some sections were completely dry. The floodplain 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 Lake Henshaw was dominated by Goodding's black willow (*Salix gooddingii*), with some arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), Fremont cottonwood (*Populus fremontii*), and coast live oak 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 shoreline of the lake.

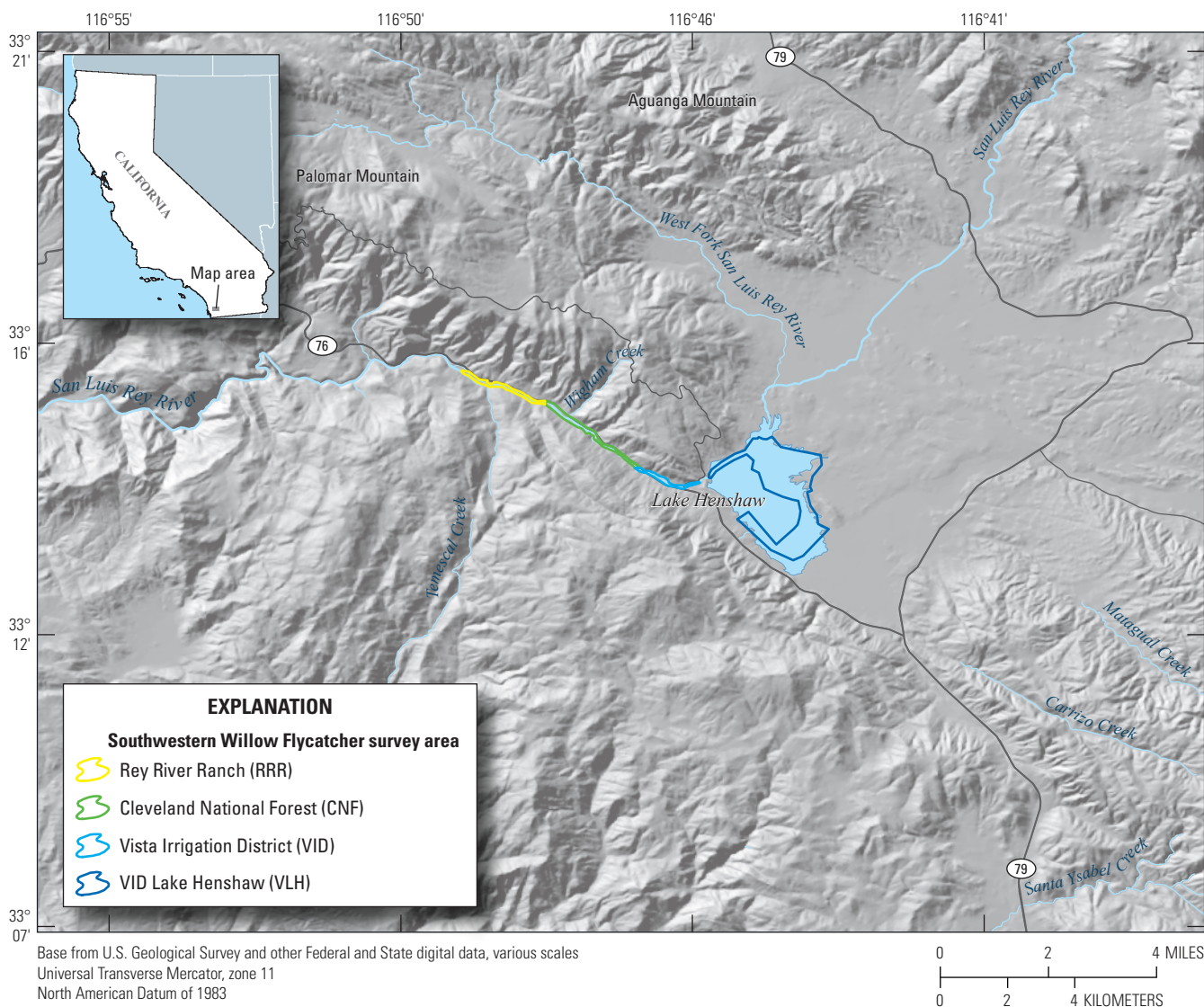


Figure 1. Location of Southwestern Willow Flycatcher (*Empidonax traillii extimus*) survey area on the upper San Luis Rey River, San Diego County, California, 2022.

Surveys

U.S. Geological Survey (USGS) biologists Scarlett Howell, Suellen Lynn, and Devin Taylor completed flycatcher surveys following standard survey techniques for flycatchers (Sogge and others, 2010). Flycatcher surveys were completed under U.S. Fish and Wildlife Service (USFWS) 10(a)1(A) Recovery Permit ESPER0004080_0.1. Four surveys were performed at least 5 days apart during three consecutive survey periods between May 20 and July 28, 2022. Surveys were completed between dawn and early afternoon, avoiding periods of inclement weather such as temperatures below freezing, rain, or strong winds that inhibit detection of flycatchers. Surveys were done by walking next to the river or lake, 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.

Upon initiation of the survey, investigators stood quietly for 1–2 minutes, 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 or Android phone and an amplified speaker at the volume of typical 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 Environmental Systems Research Institute (Esri) Field Maps (Environmental Systems Research Institute, 2022) 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, red willow, and sandbar willow (*Salix exigua*), with mule fat (*Baccharis salicifolia*) as a frequent co-dominant.

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.

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

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

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

Breeding Activities

We documented any evidence of breeding (for example, a female with nest material or a completed nest, adults carrying food, or dependent juveniles in the territory) observed during surveys. Incidental nest locations observed during surveys were recorded and the contents observed whenever possible.

Brown-headed Cowbirds

We documented cowbird presence during surveys. Whenever possible, the contents of incidentally located flycatcher nests were observed for 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 from 2015 to 2019 (Howell and others, 2022). 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 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 color-band combination. In 2022, 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 2022, there were 71 territorial flycatchers and 6 transient flycatchers of unknown subspecies observed at the 4 survey locations along the upper San Luis Rey River (fig. 2; tables 1, 2). Of the 71 territorial flycatchers, 32 were males, 36 were females, and 3 were of unknown sex. The flycatcher population at the upper San Luis Rey River decreased by 9 percent from 2021 (78 territorial flycatchers; Howell and Kus, 2022a, b) to 2022 (Howell and Kus, 2022b).

A total of four territorial flycatchers (two males and two females) were detected at CNF and RRR (fig. 2; tables 1, 2). In total, two territories consisting of two pairs were established. No territorial flycatchers were observed at VID, but five transient individuals were detected. The number of territorial flycatchers observed downstream from Lake Henshaw decreased by 20 percent compared to 2021 (5 territorial flycatchers; Howell and Kus, 2022a, b).

A total of 67 territorial flycatchers were detected at VLH (fig. 2; tables 1, 2), including 30 males, 34 females, and 3 flycatchers of unknown sex. There were 40 territories established, containing 35 pairs (24 monogamous pairings and 5 polygynous groups consisting of 4 males each pairing with 2 different females, and 1 male pairing with 3 different females) and 5 flycatchers of undetermined breeding status (3 males and 2 flycatchers of unknown sex). The number of territorial flycatchers observed at VLH decreased by 8 percent compared to 2021 (73 territorial flycatchers; Howell and Kus, 2022a, b). In addition, one transient flycatcher was detected (fig. 2; tables 1, 2).

The distribution of flycatcher territories along the upper San Luis Rey River was similar relative to 2021. In 2022, 95 percent of all territories (40/42) were at VLH, and 5 percent (2/42) were downstream from Lake Henshaw, compared to 2021 when 93 percent of all territories (43/46) were at VLH and 7 percent (3/46) downstream. From 2018 to 2022, the combined population of flycatchers downstream from Lake Henshaw decreased annually, whereas the population at VLH increased from 2018 to 2021 (fig. 3). For the first time since 2018, we observed a slight decrease in the number of flycatcher territories at VLH from 2021 to 2022 (fig. 3).

Flycatchers used five habitat types in the survey area. Of the flycatcher locations, 83 percent (40/48) occurred in habitat characterized as mixed willow riparian, 13 percent (6/48) in willow riparian habitats co-dominated by cottonwood, oak, or ash, and 4 percent (2/48) occurred in oak-sycamore. The most frequently recorded species at flycatcher locations included Goodding's black willow, coast live oak, and Fremont cottonwood. Exotic vegetation was not prevalent in the survey area; 92 percent (44/48) of flycatcher locations occurred in habitat with greater than 95-percent native plant cover (table 3).

Breeding Activities

Nest building was observed during the first survey period in May, and 22 flycatcher nests were incidentally located during surveys. Of the 22 nests, 5 successfully fledged at least one flycatcher young, 1 nest was seen with eggs on the last survey, 10 nests failed, and the outcome of the remaining 6 nests was unknown. A minimum of 13 flycatcher juveniles were seen at VLH during the study period (table 1), including 8 from incidentally found nests and 5 detected during surveys. No juveniles were observed at RRR or CNF.

Brown-headed Cowbirds

Cowbirds were detected at all four survey locations. Three flycatcher nests were observed with cowbird eggs: two nests each contained one cowbird egg, and one nest contained two cowbird eggs. The cowbird egg was removed from one of the parasitized nests, but the nesting attempt failed despite removal. The other two parasitized nests also failed. Flycatchers in two additional territories at VLH were each observed feeding a cowbird fledgling.

Banded Birds

Five banded flycatchers, all banded prior to 2022, were detected on the upper San Luis Rey River in 2022 (tables 4, 5). Banded flycatcher ages ranged from 4 to 7 years old (tables 4, 5).

Three banded flycatchers (two males and one female) with unique color-band combinations were resighted in 2022; all were previously detected as adults on the upper San Luis Rey River in 2021 (table 4). Of the three color-banded flycatchers, one male originally banded as an adult in 2018 was detected in CNF. The remaining two uniquely color-banded adults (one male and one female) were detected at VLH. The female was originally banded as an adult at CNF in 2016, and the male was originally banded as a nestling at CNF in 2017 and recaptured and given a unique color-band combination at RRR in 2018; both moved to VLH in 2021. In 2022, all banded adult flycatchers returned to the same location they occupied in 2021.

Two natal flycatchers (two males) banded as nestlings were detected on the upper San Luis Rey River in 2022 at VLH (table 5). Of the two natal birds, one was originally banded in 2016 and the second in 2018 (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 6.8 km (maximum).

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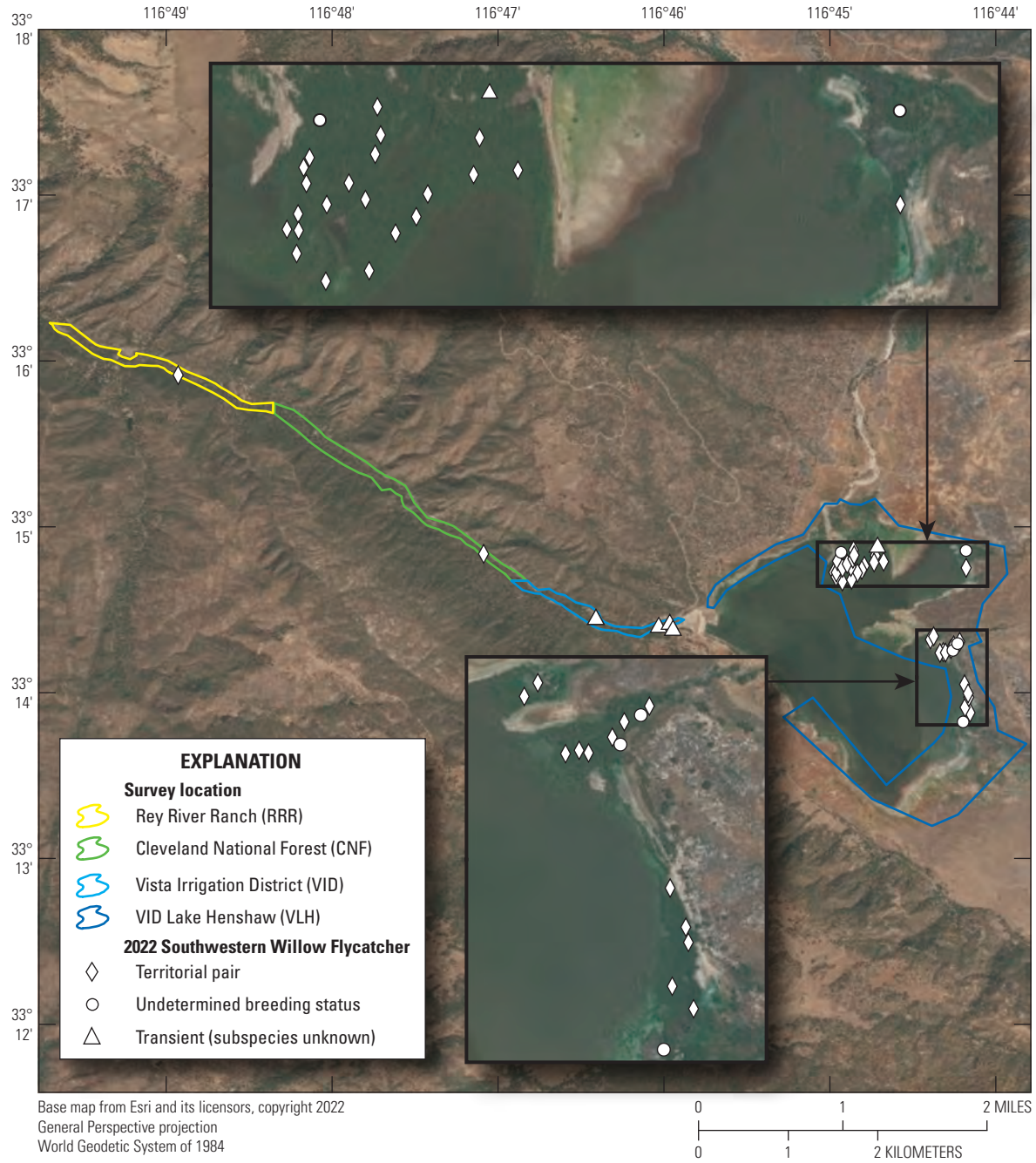


Figure 2. Southwestern Willow Flycatcher (*Empidonax traillii extimus*) detections and breeding status on the upper San Luis Rey River, San Diego County, California, 2022.

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, 2022.

[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 flycatchers	Territorial flycatchers	Males	Females	Unk. sex	Juv.	Territories	Pair(s)	Undetermined
RRR	0	2	1	1	0	0	1	1	0
CNF	0	2	1	1	0	0	1	1	0
VID	5	0	0	0	0	0	0	0	0
VLH	1	67	30	34	3	13	40	35	5
Total	6	71	32	36	3	13	42	37	5

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, 2022.

[Survey location: CNF, Cleveland National Forest; RRR, Rey River Ranch; 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: Y, yes; U, unknown; N, no. Other abbreviations: ID, identification; &, and; —, no additional comment]

Survey location	Bird ID	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	U	Did not resight female.
VID	VID01F	1	T	U	N	—
VID	VID02F	1	T	U	U	—
VID	VID03F	1	T	U	N	—
VID	VID04Fa	1	T	U	N	—
VID	VID04Fb	1	T	U	N	—
VLH	LHW01F	2	P	M & F	Y	Male banded.
VLH	LHW02F	2	P	M & F	N	Polygynous male (LHW02/04F).
VLH	LHW03F	2	P	M & F	N	—
VLH	LHW04F	1	P	F	Y	Female banded. Second female of LHW02F.
VLH	LHW05F	2	P	M & F	N	—
VLH	LHW06F	2	P	M & F	N	—
VLH	LHW07F	2	P	M & F	U	Did not resight male.
VLH	LHW08F	2	P	M & F	N	—
VLH	LHW09F	2	P	M & F	U	Did not resight male.
VLH	LHW10F	2	P	M & F	N	—
VLH	LHW11F	2	P	M & F	N	—
VLH	LHW12F	2	P	M & F	N	—
VLH	LHW13F	2	P	M & F	N	Polygynous male (LHW13/23F).
VLH	LHW14F	2	P	M & F	Y	—
VLH	LHW15F	2	P	M & F	N	—
VLH	LHW16F	1	T	M	N	—
VLH	LHW17F	2	P	M & F	N	—
VLH	LHW19F	2	P	M & F	N	Polygynous male (LHW19/27F).
VLH	LHW21F	2	P	M & F	N	—
VLH	LHW23F	1	P	F	N	Second female of LHW13F.

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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, 2022.—Continued

[Survey location: CNF, Cleveland National Forest; RRR, Rey River Ranch; 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: Y, yes; U, unknown; N, no. Other abbreviations: ID, identification; &, and; —, no additional comment]

Survey location	Bird ID	Number of adults	Breeding status	Sex	Banded bird(s) present	Comments
VLH	LHW25F	2	P	M & F	Y	Male banded.
VLH	LHW27F	1	P	F	N	Second female of LHW19F.
VLH	LHW29F	1	U	M	N	—
VLH	MLH01F	2	P	M & F	U	Did not resight female.
VLH	MLH02F	1	U	M	N	—
VLH	VLH01F	2	P	M & F	U	Did not resight female.
VLH	VLH02F	2	P	M & F	N	—
VLH	VLH03F	2	P	M & F	N	—
VLH	VLH04F	2	P	M & F	N	Polygynous male (VLH04/13/16F).
VLH	VLH05F	2	P	M & F	N	—
VLH	VLH06F	1	U	U	N	—
VLH	VLH07F	2	P	M & F	N	—
VLH	VLH08F	2	P	M & F	N	Polygynous male (VLH8/11F).
VLH	VLH09F	2	P	M & F	N	—
VLH	VLH10F	1	U	M	N	—
VLH	VLH11F	1	P	F	U	Did not resight female. Second female of VLH08F.
VLH	VLH12F	1	P	U	N	Likely second female of VLH09F.
VLH	VLH13F	1	P	F	N	Third female of VLH04F.
VLH	VLH14F	1	U	U	N	—
VLH	VLH15F	1	P	F	N	Likely second female of VLH05F.
VLH	VLH16F	1	P	F	N	Second female of VLH04F.

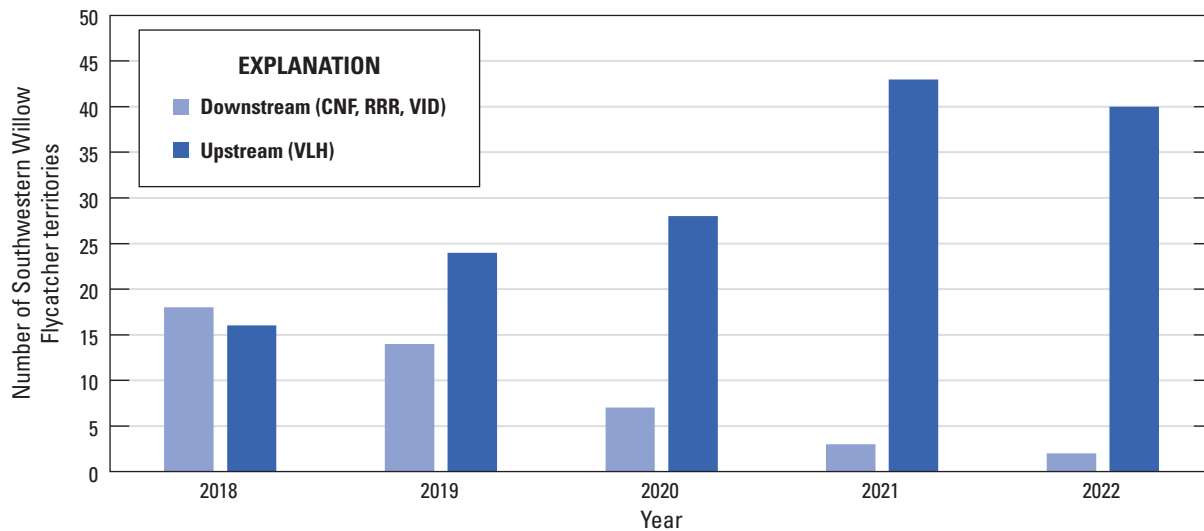


Figure 3. Distribution of Southwestern Willow Flycatcher (*Empidonax traillii extimus*) territories on the upper San Luis Rey River, San Diego County, California, 2018–22. [CNF, Cleveland National Forest; RRR, Rey River Ranch; VID, Vista Irrigation District; VLH, VID Lake Henshaw]

Table 3. Habitat characteristics of Willow Flycatcher (*Empidonax traillii*) locations on the upper San Luis Rey River, San Diego County, California, 2022.

[**Survey location:** CNF, Cleveland National Forest; RRR, Rey River Ranch; VID, Vista Irrigation District; VLH, VID Lake Henshaw. **Mixed willow riparian:** Habitat dominated by one or more willow species, including Goodding's black willow, arroyo willow, red willow, and sandbar willow, with mule fat as frequent co-dominant. **Oak-sycamore:** Woodlands in which coast live oak and California sycamore 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. **Other abbreviations:** ID, identification; >, greater than; —, no data]

Survey location	Bird ID	Habitat type	Dominant species	Percent native cover	Dominant exotic species
CNF	CNF01F	Willow-ash	Velvet ash	>95	—
RRR	RRR01F	Oak-sycamore	Coast live oak	50–95	Black mustard (<i>Brassica nigra</i>)
VID	VID01F	Willow-oak	Red or Arroyo willow	>95	—
VID	VID02F	Willow-oak	Coast live oak	>95	—
VID	VID03F	Oak-sycamore	Coast live oak	>95	—
VID	VID04Fa	Mixed willow	Sandbar willow	>95	—
VID	VID04Fb	Mixed willow	Sandbar willow	>95	—
VLH	LHW01F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW02F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW03F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW04F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW05F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW06F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW07F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW08F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW09F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW10F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW11F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW12F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW13F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW14F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW15F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW16F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW17F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW19F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW21F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW23F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW25F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW27F	Mixed willow	Goodding's black willow	>95	—
VLH	LHW29F	Mixed willow	Goodding's black willow	>95	—
VLH	MLH01F	Mixed willow	Goodding's black willow	>95	—
VLH	MLH02F	Mixed willow	Goodding's black willow	50–95	Tamarisk
VLH	VLH01F	Mixed willow	Goodding's black willow	>95	—
VLH	VLH02F	Mixed willow	Goodding's black willow	>95	—
VLH	VLH03F	Mixed willow	Goodding's black willow	>95	—
VLH	VLH04F	Mixed willow	Goodding's black willow	>95	—
VLH	VLH05F	Mixed willow	Goodding's black willow	>95	—

Table 3. Habitat characteristics of Willow Flycatcher (*Empidonax traillii*) locations on the upper San Luis Rey River, San Diego County, California, 2022.—Continued

[Survey location: CNF, Cleveland National Forest; RRR, Rey River Ranch; VID, Vista Irrigation District; VLH, VID Lake Henshaw. **Mixed willow riparian:** Habitat dominated by one or more willow species, including Goodding’s black willow, arroyo willow, red willow, and sandbar willow, with mule fat as frequent co-dominant. **Oak-sycamore:** Woodlands in which coast live oak and California sycamore 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. **Other abbreviations:** ID, identification; >, greater than; —, no data]

Survey location	Bird ID	Habitat type	Dominant species	Percent native cover	Dominant exotic species
VLH	VLH06F	Mixed willow	Goodding's black willow	>95	—
VLH	VLH07F	Willow-cottonwood	Fremont cottonwood	>95	—
VLH	VLH08F	Mixed willow	Goodding's black willow	>95	—
VLH	VLH09F	Mixed willow	Goodding's black willow	>95	—
VLH	VLH10F	Willow-cottonwood	Fremont cottonwood	>95	—
VLH	VLH11F	Mixed willow	Goodding's black willow	>95	—
VLH	VLH12F	Mixed willow	Goodding's black willow	50–95	White sweetclover (<i>Melilotus albus</i>)
VLH	VLH13F	Mixed willow	Goodding's black willow	>95	—
VLH	VLH14F	Mixed willow	Goodding's black willow	50–95	White sweetclover (<i>Melilotus albus</i>)
VLH	VLH15F	Willow-cottonwood	Fremont cottonwood	>95	—
VLH	VLH16F	Mixed willow	Goodding's black willow	>95	—

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, 2022.

[2022 Location/territory: CNF, Cleveland National Forest; 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; VLH, VID Lake Henshaw. Other abbreviations: km, kilometer]

2022 Location/territory	Sex	Minimum age in 2022 (years)	Age originally banded	Year/location originally banded	Year/location previously seen	Distance moved (km)
CNF/CNF01F	M	5	A	2018/CNF	2021/CNF	0
VLH/LHW04F	F	7	A	2016/CNF	2021/VLH	0
VLH/LHW14F	M	5	N	2017/CNF	2021/VLH	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, 2022.

[2022 Location/territory: VLH, VID Lake Henshaw. Sex: M, male. 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. Other abbreviations: km, kilometer; —, no data]

2022 Location/territory	Sex	Minimum age in 2022 (years)	Year originally banded	Distance moved (km)	
				Minimum	Maximum
VLH/LHW25F	M	4	2018	—	6.8
VLH/LHW01F	M	6	2016 or 2018	2.3	6.7

Summary

In 2022, the overall population of Southwestern Willow Flycatchers on the upper San Luis Rey River near Lake Henshaw declined slightly compared to 2021 (9 percent; from 78 territorial flycatchers to 71 territorial flycatchers). The distribution of birds in the study area was similar to that seen in 2021, with the majority of territories at Lake Henshaw. The number of territories downstream from Lake Henshaw decreased by 33 percent from 2021 (3) to 2022 (2), whereas the number of territories observed at Lake Henshaw decreased by 7 percent from 2021 (43) to 2022 (40). This is the first year since the Lake Henshaw population was discovered that a decline was documented.

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, 2022), and the Kern River (M.J. Whitfield, Southern Sierra Research Station, written commun., 2020) have steeply declined or have been extirpated in recent years. As of 2022, the population along the upper San Luis Rey River near Lake Henshaw is the largest recorded Southwestern Willow Flycatcher population in southern California, making it central to understanding the conditions that favor and promote flycatchers and their habitat.

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