

## THE DISTRIBUTION AND ABUNDANCE OF SOUTHWESTERN WILLOW FLYCATCHERS ON THE LOWER SANTA YNEZ RIVER, CALIFORNIA

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**Abstract.** We examined the distribution and abundance of Southwestern Willow Flycatchers (*Empidonax traillii extimus*) on the lower Santa Ynez River, California, from 1995–2000. The lower Santa Ynez River population is one of the largest remaining populations in California, and the northernmost coastal one. We detected from 8–39 territorial flycatchers each year, using a wide range of riparian habitats. There was a slight increase in the population from 1998 to 2000. We detected 17 nests and 39 total reproductive events. Six nests produced fledglings or independent juveniles (35%), four were depredated (24%), and seven were abandoned (41%); two abandoned nests were parasitized by Brown-headed Cowbirds (*Molothrus ater*).

**Key Words:** Brown-headed Cowbirds; *Empidonax traillii extimus*; habitat impacts; *Molothrus ater*; reproductive success; Santa Ynez River; Southwestern Willow Flycatcher; Vandenberg Air Force Base.

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) is a small, federally endangered, neotropical migrant (U.S. Fish and Wildlife Service [USFWS] 1995). It breeds in southern California, Arizona, New Mexico, southwestern Colorado, the extreme southern portions of Nevada and Utah, and possibly western Texas (Unitt 1987, USFWS 2001). There were approximately 900 confirmed territories, and an overall estimate of 1100–1200 territories across the entire subspecies' range in 1999 (USFWS 2001). Although the current range of the flycatcher is not much different than its historical range, habitat loss and other factors have dramatically reduced its abundance, and led to its listing as an endangered species (USFWS 1995, Marshall 2000).

The largest Southwestern Willow Flycatcher populations in California occur along the Kern, San Luis Rey, Santa Margarita, and the Santa Ynez rivers (Marshall 2000, USFWS 2001, Kus et al. *this volume*). The Kern River, Kern County, population has decreased from 44 territories in 1989 to 23 in 1999 (Whitfield et al. 1999a), and only 12–13 pairs remained in 2000 (M. Whitfield, unpubl. data). The population along the San Luis Rey River, San Diego County, has increased from 12 territories in the late 1980s to over 40 in 1999. This coincided with expanded survey efforts and improvements in the riparian habitat, primarily due to reduced grazing (Kus et al. 1999; W. Haas, unpubl. data). The flycatchers along the Santa Margarita River, San Diego County, have had a relatively constant population of 24 territories (or less) for the last twenty years (USFWS 2001).

Our study focused on the lower Santa Ynez River, the remaining large California population, from 1995–2000. The first modern surveys of the Santa Ynez River targeting flycatchers found

a small population in the Buellton region in 1986 (Lehman 1994; Fig. 1). Lehman and Holmgren continued to survey the lower Santa Ynez opportunistically until our more extensive studies began in 1995. This earlier work (Table 1) indicated the occurrence of a stable, moderate sized population near Buellton, a small population on Vandenberg Air Force Base, and sporadic occurrences in the Lompoc and Santa Rosa areas (Table 1; Fig. 1). However the majority of the river from Buellton to the Pacific Ocean was not surveyed from 1986–1994.

Vandenberg Air Force Base (VAFB) initiated this study to determine the distribution, abundance, and reproductive success of the Southwestern Willow Flycatcher on-base. The flycatcher's high mobility and metapopulation structure, combined with the ephemeral nature of suitable on-base habitats, meant that the only way to fully understand the status of their population on VAFB was to determine the regional distribution and abundance of flycatchers in parts of the Santa Ynez River upstream from the base. We also sought to determine flycatcher reproductive success.

### METHODS

#### STUDY REGION

VAFB supports large, contiguous areas of native habitats and vegetation that were once much more common in the region (Schmalzer et al. 1988, Ferren and Collins 1999), including riparian forests and palustrine marshes that are preferred Willow Flycatcher habitats (Sogge and Marshall 2000). We surveyed the five perennial watersheds and all wetlands with emergent vegetation on VAFB. The dominant riparian vegetation on-base consists of arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), and black cottonwood (*Populus trichocarpa*), with an understory of blackberry (*Rubus ursinus*), poison oak (*Toxicoden-*

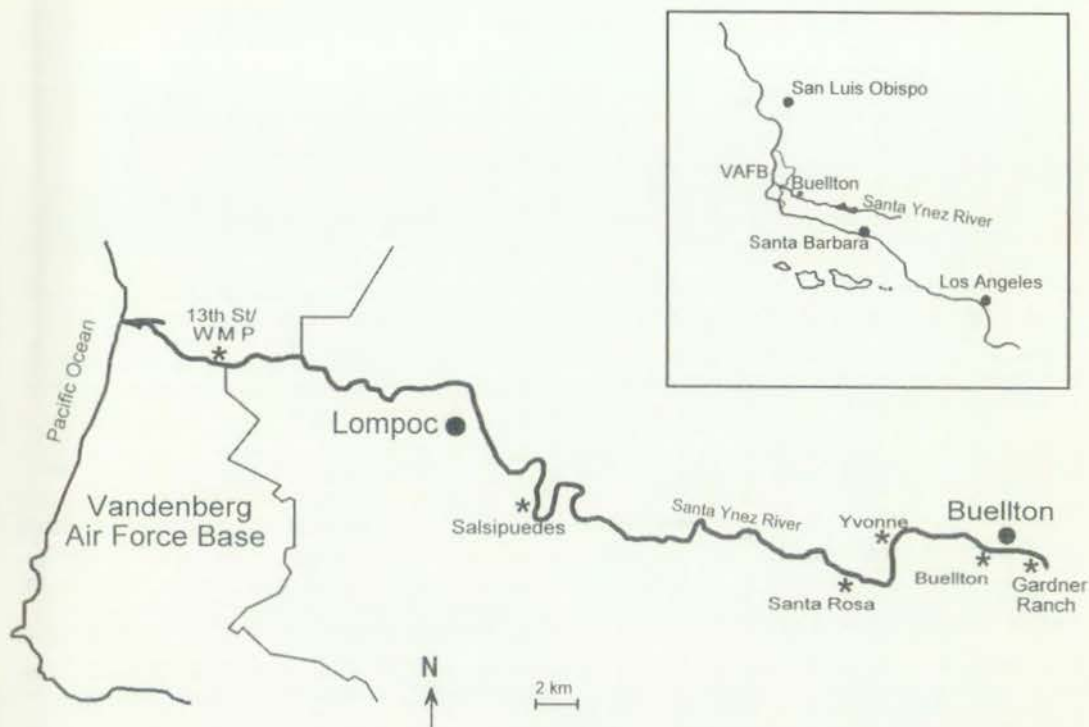


FIGURE 1. General locations of Southwestern Willow Flycatcher sub-populations along the lower Santa Ynez River, 1995–2000. The six sub-populations are indicated by an asterisk (\*).

TABLE 1. THE NUMBER OF SOUTHWESTERN WILLOW FLYCATCHERS DETECTED AT SIX SITES ALONG THE LOWER SANTA YNEZ RIVER, 1986–2000<sup>a</sup>

Year	Lower Santa Ynez River <sup>b</sup>	13th St/ WMP	Santa Rosa	Buellton	Yvonne	Salsipuedes	Gardner Ranch	TOTAL
1986	5–6							5–6
1987	4							4
1988	4							4
1989	—							—
1990	1							1
1991	15							15
1992	12	4						16
1993	13							13
1994	9		16					27
1995		2 (1) <sup>c</sup>	0	6–7		0		8–9
1996		5–6 (2)	9–11 (3–4)	7 (3)	11–15 (5)	1		33–39
1997		3 (1)	6 (1)	5 (3) <sup>d</sup>	12–14 (4)	0		26–28
1998		5 (2)	2 (1)	13–15 (6)	2 (1)	0		21–23
1999		3		12–14 (4)	1	0		17–19
2000		1	6 (2)	16–17	2	0	3–4	28–30

Notes: Survey effort and area varied among years. Site locations are shown in Fig. 1.

<sup>a</sup> Additional data from Lehman (1994, pers. obs.) and Holmgren (1995, pers. obs.).

<sup>b</sup> The precise location along the river was not specified in these years.

<sup>c</sup> The number of confirmed pairs at each site is shown in parentheses.

<sup>d</sup> There was definitive evidence of successful reproduction in three distinct territories; so although only five birds were observed, it was assumed that there were three pairs.



*dron diversilobum*), stinging nettles (*Urtica dioica*), and mulefat (*Baccharis salicifolia*; Farmer 1998).

Only the Santa Ynez River contains significant off-base riparian habitat. We surveyed the river from the Pacific Ocean to 62 km upstream (3 km east of Buellton, Santa Barbara County; Fig. 1). We focused our off-base field effort on sites known to have flycatchers from the previous years' work, but other parts of the river were also surveyed. Most of this region is private land, which made obtaining access for surveys difficult, particularly in 2000. Because of the access difficulty, field personnel conducted surveys from the river channel, so population estimates for these sites in 2000 should be viewed as minimum estimates.

The off-base riparian forest tends to be more heterogeneous and drier than on VAFB, with the amount of water highly variable among years and locations. Arroyo willow and red willow are the primary forest components, but boxelder (*Acer negundo*), black walnut (*Juglans californica*), black cottonwood, western sycamore (*Platanus racemosa*), and eucalyptus (*Eucalyptus* spp.) are also present. The understory is composed of blackberry, poison oak, stinging nettles, coyote bush (*Baccharis pilularis*), black mustard (*Brassica nigra*), western water hemlock (*Cicuta douglasii*), and fennel (*Foeniculum vulgare*).

#### FIELD SURVEYS

Due to annual differences in project funding and objectives, our field effort varied greatly from 1995–2000. We conducted a pilot study in 1995 that focused on eight different species on VAFB, with only limited surveys off-base (Holmgren and Collins 1995, Farmer et al. 2001). In 1996, we inventoried all riparian and palustrine systems on the lower Santa Ynez River and other VAFB drainages in order to locate all flycatchers and determine the suitability of the riparian habitat along the entire river course. During 1997, we monitored the productivity of breeding flycatchers through repeated field surveys at sites where flycatchers were found in 1995 and 1996. In 1998, we concentrated on determining reproductive productivity and habitat associations, and so focused on areas known to have had flycatchers in the past. During 1999, we monitored for flycatcher occurrence and breeding only on VAFB. In 2000, we intensively surveyed all regions along the river where flycatchers had been previously detected, monitored breeding status when possible, and surveyed the majority of the remaining river once. Overall, a complete survey of the entire 62 km lower river was only performed in 1996, thereby precluding quantitative comparisons and analyses among years.

We conducted field surveys by walking through riparian habitat, usually along the bank or in the waterway. We broadcast Southwestern Willow Flycatcher vocalizations approximately every 50 m to detect individuals, and discontinued the playback once flycatchers were detected, except in special circumstances (e.g., trying to detect paired individuals or nesting locations). In 1995–1997, we visited some sites of known or suspected occupation only once. After 1997 we surveyed all targeted sites once during each of three protocol periods: 15–31 May, 1–21 June, and 22 June–10 July (per Sogge et al. 1997a). All surveys were separated by at least five days, and were con-

ducted between dawn to 09:00 PST. In 2000, we surveyed until 17 July per USFWS (2000). We employed standard nest finding techniques and precautions to locate the nest once we detected a pair of flycatchers (Martin and Geupel 1993, Ralph et al. 1993).

#### OTHER DATA SOURCES

In addition to our surveys, we obtained data from several additional projects including: (1) a 1995–1996 study of the Santa Ynez River estuary and palustrine habitats on VAFB (Holmgren and Collins 1999); (2) a 1995–1998 study of Brown-headed Cowbirds (*Molothrus ater*; Farmer 1998, 1999a); (3) a 1997 study of VAFB riparian breeding bird communities (Gallo et al. 2000); and (4) a 2000 avian census of the lower Santa Ynez River for the United States Bureau of Reclamation (D. Compton, unpubl. data).

#### RESULTS

We detected from 8–39 flycatchers along the lower Santa Ynez River (Table 1), distributed among six sites along the lower river (Fig. 1): Gardner Ranch, Buellton, Yvonne, Santa Rosa, Salsipuedes, and 13th St./Waterfowl Management Ponds (WMP). Because of our wide variation in survey effort, it is impossible to statistically analyze changes in the overall regional flycatcher population.

We detected 17 nests in the egg-laying stage and 49 total reproductive events from 1995–2000 (Table 2). Of the 17 nests discovered at, or before, egg-laying and followed to completion, 35% were successful, 24% were depredated, and 41% were abandoned. The rate of cowbird parasitism was 12%.

Breeding sites were primarily a red willow-cottonwood canopy, with scattered sycamores. The understory was usually a mixture of stinging nettle, poison oak, coyote bush, blackberry, black mustard, western water hemlock, and young red and arroyo willows. The understory ranged from nearly impenetrable vegetation to bare dirt. It is difficult to reach specific conclusions about the flycatcher's preferred habitat along the lower river because of variation among and within the six sites, as well as changing conditions across the six years of the study. Breeding habitat ranged from highly degraded areas with only scattered willows and cottonwoods (e.g., Santa Rosa site) to sites with more dense and complex canopy and understory (e.g., Salsipuedes site). Some nests were located directly over the flowing river (e.g., Yvonne), while other nests were up to 700 m removed from the river's flow, (although they were within 50 m of standing water, e.g., 13th St/WMP). Despite intensive survey effort, breeding flycatchers were not found at numerous apparently suitable sites in extensive tracts of riparian forest with what visually appeared to be a denser can-

TABLE 2. SUMMARY OF SOUTHWESTERN WILLOW FLYCATCHER REPRODUCTIVE EVENTS ON THE LOWER SANTA YNEZ RIVER, 1995–2000

Outcome	All events <sup>a</sup> (%)	Egg-laying <sup>b</sup> (%)
Successful events		
Independent juveniles	12 (30.8)	5 (29.4)
Fledglings	8 (20.5)	1 (5.9)
Depredated/destroyed	8 (20.5)	4 (23.5)
Cowbird fledglings (no flycatcher chicks)	2 (5.1)	— (—)
Abandoned		
Without cowbird eggs	7 (17.5)	5 (29.4)
With cowbird eggs	2 (5.1)	2 (11.8)
Total <sup>c</sup>	39	17

<sup>a</sup> All events detected 1995–2000.

<sup>b</sup> Only those reproductive events detected at, or before, the egg-laying stage.

<sup>c</sup> 10 events with unknown outcome are not included in the total, including one parasitized nest.

opy, subcanopy, and shrub layers and more mesic conditions than occupied sites.

## DISCUSSION

The Southwestern Willow Flycatcher appears to be distributed as a series of metapopulations with high dispersal among the regional populations, which are in turn composed of smaller sub-populations (Busch et al. 2000, Marshall 2000, Stoleson et al. 2000b). Because metapopulations rely upon multiple smaller populations for long-term existence, each population and its component sub-populations contribute to the stability of the entire subspecies. As part of one of the largest regional populations in California, the lower Santa Ynez River flycatchers may play an important role in regional metapopulation dynamics and stability of the taxon. However, given the apparent low nest success rate, this region could also be a sink for flycatchers. Further study is needed to determine how the lower Santa Ynez River population contributes to the overall subspecies' persistence.

Another aspect of metapopulation ecology is that each population can serve as a "stepping stone", allowing movement among the remaining populations. The loss of any population may further isolate the remaining ones and could disrupt regional and subspecies-wide stability (Marshall 2000). Even if a sink population, the Santa Ynez River flycatchers could still function as a crucial "stepping-stone" in the possible colonization of the widespread coastal riparian habitat to the north.

## REPRODUCTIVE EFFORT

We detected flycatchers dispersed over a large area of the lower Santa Ynez River, making monitoring of the regional reproductive success difficult, and off-base data collection more opportunistic. The Santa Ynez flycatcher nest suc-

cess rate of 35% is slightly low for a small, cup-nesting passerine, which generally ranges from 38–70%, with a median of 52% (Martin 1993). It is also in the lower half of values (16–66%) reported for Willow Flycatchers elsewhere in the Southwest (Harris 1991, Griffith and Griffith 1995, Skaggs 1996, Sferra et al. 1997). The nest predation rate for this population (24%) was in the lower range of those reported in other flycatcher populations (14–60%; Stoleson et al. 2000b), and also lower than other open-cup nesting passerines (30–60%; Marshall and Stoleson 2000). The relatively low rate of cowbird parasitism (12%) is below that of many other flycatcher populations studied in Arizona (3–48%), California (29–66%), and New Mexico (18–40%; Whitfield and Sogge 1999), including the Kern River where there was an active cowbird trapping program (Whitfield et al. 1999b). The low parasitism rate may be related to the paucity of cowbirds in this region (Farmer 1999a,b).

The greatest source of nest failure was desertion of unparasitized nests (29%; Table 2). McCabe (1991), working on a different subspecies, found a substantially lower rate of nest failures due to desertion of unparasitized nests (8%; 16/193 nests). The desertion rate of parasitized nests (12%) along the lower Santa Ynez River is much lower than the 35–57% desertion rate of parasitized nests in other flycatcher populations (Sedgwick and Knopf 1988, Harris 1991, Paradzick et al. 1999, Stoleson and Finch 1999a). Although Sedgwick and Iko (1999) found no clear survivorship cost to adults or eventual young from desertion of parasitized nests, the high overall desertion rate for nests along the Santa Ynez River could explain the low overall nest success rate for this flycatcher population.



#### HABITAT PREFERENCES

Historically, flycatchers likely nested in heterogeneous riparian forests, using willows, buttonbush (*Ceanothus occidentalis*), and mulefat (Grinnell and Miller 1944, Unitt 1987). Flycatchers still nest in native vegetation where available, but they also commonly breed in saltcedar (*Tamarix* spp.) and Russian olive (*Elaeagnus angustifolia*)—two highly successful exotic species (Sogge and Marshall 2000). We detected flycatchers primarily using willow-cottonwood habitats, and at some sites sycamore, boxelder, black walnut, and elderberry.

We are unclear as to the reasons for the flycatcher's current pattern of local habitat usage. As an endangered subspecies, the Southwestern Willow Flycatcher is unlikely to have a large enough population to fill all potential suitable habitat. However, flycatchers do not appear to be selecting only the "best" breeding habitat. There are numerous unoccupied sites in the region that appear more suitable for flycatcher breeding, and that more closely resemble the mesic habitat typical in other regions of the bird's range (Sogge and Marshall 2000). If the definition of suitable habitat were expanded to include such dry and open sites as the occupied 13th/WMP and Santa Rosa sites, then the majority of habitat along all drainages in this region could be considered suitable. There may be some subtle vegetative or landscape factors that make the occupied sites favored over the rest of the unoccupied riparian habitat. Additionally, flycatchers may display strong site fidelity, which would result in the continued occupation of sites that have been degraded over time. A more quantitative comparison of occupied versus unoccupied sites is necessary to elucidate the factors influencing the current use of sites, which would enable proactive management to encourage an increase in the flycatcher population in this region. Understanding the factors underlying flycatcher distribution in the Central Coast of California may also prove important in maximizing the chances of a region-wide increase in the Southwestern Willow Flycatcher.

#### LARGE-SCALE POPULATION IMPACTS

The flycatchers have likely been negatively impacted by habitat loss and degradation through factors such as flood control activities, overdrafting of ground water, conversion of riparian habitat to human use, and cattle grazing. Three dams along the Santa Ynez River have significantly altered the natural flow of water in the river, reducing the flooding and scouring necessary for riparian regeneration (Middleton 1999, Periman and Kelly 2000, USFWS 2001).

Overdrafting of groundwater along the river further exacerbates the lack of regeneration (Briggs 1996, USFWS 2001). Though hard to quantify, overdrafting affects large amounts of riparian habitat in the area (Holmgren 1995, Farmer et al. 2001). Currently, California landowners have "the correlative right to extract as much groundwater as they can put to beneficial use" (California Department of Water Resources 1996: 1). This right has been further defined and restricted in some areas of the state, but this has not occurred on the Santa Ynez River (California Department of Water Resources 1996).

Potentially suitable habitat for flycatchers along the river has been destroyed and degraded by the conversion of riparian forest to agriculture and suburbs, and subsequent increased water use. These uses also fragment the habitat, disrupting potential movement corridors and increasing the proportion of edge and concomitant nest predation risk (Freemark et al. 1995, Robinson et al. 1995b, Donovan et al. 1997). We observed such fragmentation occurring in the region, including bulldozing previously occupied flycatcher habitat adjacent to the Buellton site in 1996, 1999, and 2000. These actions removed some of the native willows, altered the runoff through construction of berms, increased the sediment load and changed the hydrology of the river, eliminating water flow in channels previously used by flycatchers (M. Holmgren, pers. obs.).

Grazing has a similar suite of effects as agriculture, but with additional negative impacts such as compaction of soil, reducing infiltration, and increasing runoff (Kauffman and Krueger 1984, Belsky et al. 1999b). Cattle also cause direct habitat degradation through breaking the vegetation and churning up the soil. On VAFB some sites with apparently suitable overstories of willows and cottonwoods have understories that have been heavily damaged by cattle (Farmer et al. 2001).

The impact of exotic vegetation in the region is minor so far, but both giant reed (*Arundo donax*) and saltcedar are present on the lower Santa Ynez River (Holmgren 1995, Rothstein et al. 1999). Both are well represented on the upper stretches of the river, above 107 km east of the Pacific Ocean, so the lower river is constantly being subjected to propagules. These species have explosive growth potential (Bell 1997, Everitt 1998, USFWS 2001), and so could be a larger problem in the future.

Regional planning for housing or other hard-scaped developments seldom incorporates an assessment of actions that directly or indirectly affect flycatchers. This problem is exacerbated by the Buellton General Plan's incorrect statement

that, "There are no rare or endangered wildlife species identified in the Buellton area" (Buellton Planning Department 1993: 110). Continued conversion of a large portion of upland to asphalt and concrete will likely cause significant impacts to the hydrology of the river (and subsequently to flycatchers).

By degrading or destroying the habitat, the above factors may limit potential flycatcher population growth and range expansion. They are large-scale, landscape factors that occurred prior to the initiation of this study, so it is difficult to determine the extent of their influence upon the riparian habitat and flycatchers. They are also indirect, occurring over a temporal and spatial scale that prevents short term population surveys from elucidating their influence. Further research on the lower Santa Ynez River is necessary to determine the regional impact of these factors.

#### STATEWIDE MONITORING

California is the only state without a coordinated Southwestern Willow Flycatcher monitoring program (Marshall 2000, USFWS 2001). The lower Santa Ynez River flycatcher population is probably the third largest in the state, but the lack of local and state-wide surveys makes it difficult to compare among California populations. It is also difficult to determine any overall trends because of variation in field effort and study emphasis among localities, including the Santa Ynez River. A comprehensive state plan

would aid all parties by encouraging monitoring and management of the subspecies throughout Southern California, not just local populations. Additional, more rigorous and standardized study of the lower Santa Ynez River flycatcher population will help in more completely understanding the factors limiting this bird's range and numbers. Our work, focused on VAFB, could direct only limited field effort to the other, larger sub-populations off-base where more research is clearly needed. Further neglect of one of the larger California populations can only hinder recovery efforts for this subspecies.

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