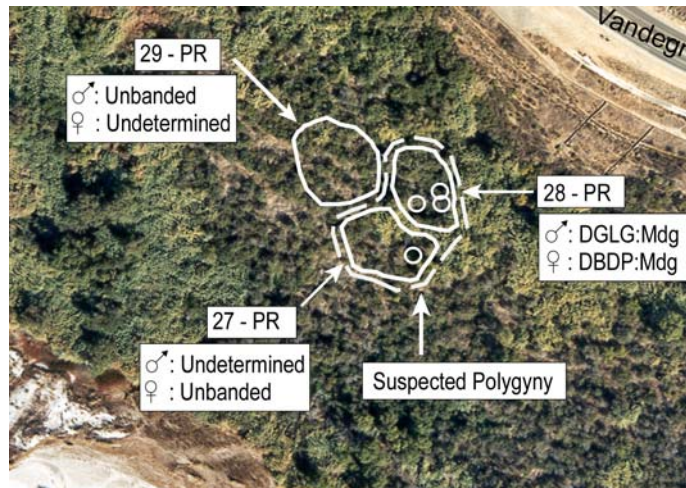




Distribution, Abundance, and Breeding Activities of the Southwestern Willow Flycatcher at Marine Corps Base Camp Pendleton, California

2001 Annual Report



Prepared for:

**Assistant Chief of Staff, Environmental Security
U.S. Marine Corps Base Camp Pendleton**

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
WESTERN ECOLOGICAL RESEARCH CENTER

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By Barbara E. Kus and Kimberley Ferree

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EXECUTIVE SUMMARY

Surveys for the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) were conducted at Marine Corps Base Camp Pendleton, California, between 15 May and 31 August 2001. Twenty-one transient flycatchers of unknown subspecies were detected during surveys. Transients occurred in a range of habitat types including mixed willow riparian, willow-sycamore dominated riparian, willow-oak dominated riparian, and mule fat scrub. The distance from transient locations to the nearest surface water averaged 124 ± 127 m (N = 21).

Nineteen southwestern willow flycatcher breeding territories were located. With the exception of one territory at Lake O'Neill on Fallbrook Creek, all territories were along the lower Santa Margarita River. Ninety-five percent (18/19) of territories were located in mixed willow riparian habitat. Exotic vegetation, particularly poison hemlock (*Conium maculatum*) and giant reed (*Arundo donax*), was present in all but one territory, and was dominant (% cover > 50) in 32% (6/19) of territories. Resident flycatchers exhibited a bimodal distribution with regard to distance to surface water, with 42% within 60 m, and the remainder 150-500 m away from it.

The resident flycatcher population included one unpaired male and 18 pairs (16 males, 18 females). Two males were believed to be polygynous, each mating with two females. Nesting was documented for 17 of the 18 pairs, which produced 1-3 nests each. Fifty-two percent (15/29) of nests were successful, and flycatchers fledged an average of 1.9 young per pair. No instances of cowbird parasitism were observed. Pairs placed nests in seven species of plants, including black willow (*Salix gooddingii*), arroyo willow (*S. lasiolepis*), stinging nettle (*Urtica dioica*), mule fat (*Baccharis glutinosa*), elderberry (*Sambucus mexicana*), poison hemlock, and giant reed.

One resident male and one female were birds banded previously at Camp Pendleton; the male was banded as an adult in 1998, while the female was banded as an adult in 2000. Nine resident males and eight females were captured and color banded in 2001, and 26 nestlings in 12 nests were banded. None of the transients observed during surveys carried bands.

INTRODUCTION

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

Willow flycatchers in southern California co-occur with the least Bell's vireo (*Vireo bellii pusillus*), another riparian obligate endangered by habitat loss and cowbird parasitism. However, unlike the vireo, which has increased six-fold since the mid-1980's in response to management alleviating these threats (USGS Western Ecological Research Center, San Diego Field Station unpubl. data), willow flycatcher numbers have remained low. Currently, the majority of southwestern willow flycatchers in California are concentrated in three sites: the South Fork of the Kern River in Kern County (Whitfield 2002), the Upper San Luis Rey River, including a portion of the Cleveland National Forest in San Diego County (Varanus Biological Services 2001), and Marine Corps Base Camp Pendleton in San Diego County (Kus 2001). Outside of these sites, southwestern willow flycatchers occur as small, isolated populations of one to half a dozen pairs (Kus *et al.* in press). 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.

The purpose of this study was to document the status of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in San Diego County, California. Specifically, our goals were to (1) determine the size and composition of the willow flycatcher population at the Base, (2) document nesting activities of resident flycatchers, and (3) characterize habitat used by flycatchers. These data, when combined with data from other years, will inform natural resource managers about the status of this endangered species at Camp Pendleton, and guide modification of land use and management practices as appropriate to ensure the species's continued existence.

This work was funded by the Assistant Chief of Staff, Environmental Security, Resources Management Division, Marine Corps Base Camp Pendleton, California.

STUDY AREAS AND METHODS

Field Surveys

All of Camp Pendleton's major drainages, and several minor ones supporting riparian habitat, were surveyed for flycatchers between 15 May and 31 August 2001. Field work was conducted by Jason Berkley, Kim Ferree, Mike Fugagli, Shelby Howard, David Kisner, Bonnie Peterson, Jay Rourke, Jennifer Turnbull, and Mike Wellik. The specific areas surveyed are as follows:

Santa Margarita River: between Interstate 5 and the confluence with De Luz Creek, including Ysidora Basin and Stagecoach Canyon (Figures 1, 2).

De Luz Creek: between the confluence with the Santa Margarita River and the Base boundary (Figure 1).

Fallbrook Creek: between Lake O'Neill and the Base boundary (Figure 1).

Las Flores Creek: between the Pacific Ocean and a point approximately 75 m upstream of Basilone Road (Figure 5).

Horno Canyon: between Old Highway 101 and the upstream limit of riparian habitat (Figure 5).

Piedra de Lumbre Canyon: between the confluence with Las Flores Creek and the upstream limit of riparian habitat (Figure 5).

French Creek: between the Pacific Ocean and the Edson Range Impact Area (Figure 2).

Aliso Creek: between the Pacific Ocean and the electrical transmission lines (Figure 2).

San Onofre Creek: between the Pacific Ocean and the access road to Range 219 ("south fork"), and between the north/south fork confluence and the confluence with Jardine Canyon ("north fork") (Figures 3 and 4).

San Mateo Creek: between the Pacific Ocean and the Base boundary, including habitat south of the creek, and south and east of the agricultural fields (Figures 3 and 4).

Cristianitos Creek: between the confluence with San Mateo Creek and the Base boundary (Figure 3).

Pilgrim Creek: between the Base boundary and the limit of habitat upstream of Sewage Treatment Plant 1, including two side drainages between Pilgrim Creek and the southern Base boundary (Figure 6).

Drainages were surveyed at least once during each of four consecutive 15-day periods between 15 May and 15 July, except for French Creek, Aliso Creek, Piedra de Lumbre Canyon, and Stagecoach Canyon, which were surveyed during the first three periods, and Cristianitos Creek, which was surveyed during the last three periods.

Investigators followed standard survey protocol (Sogge *et al.* 1997), moving slowly through the riparian habitat while searching and listening for willow flycatchers. Observers walked along the edge(s) of the riparian corridor on the upland and/or river side where habitat was narrow enough to detect a bird on the opposite edge. In wider stands, observers traversed the habitat in a way that permitted detection of all birds throughout its extent. Surveys were conducted between dawn and early afternoon, depending on wind and weather conditions.

For each bird encountered, investigators recorded age (adult or juvenile), sex, breeding status (paired, unpaired or transient), and whether the bird was banded. Flycatcher locations were mapped on 1":12,000" aerial photographs as well as 1":24,000" USGS topographic maps, using a Garmin 12 Global Positioning System (GPS) unit with 1-15 m positioning accuracy to determine geographic coordinates. Distance to the nearest surface water was recorded for each location, and habitat type specified according to the following categories based on dominant vegetation:

Mixed willow riparian: Habitat dominated by one or more willow species including *Salix gooddingii*, *S. lasiolepis*, and *S. laevigata*, with *Baccharis glutinosa* as a frequent co-dominant.

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

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

Sandbar scrub: Dry and/or sandy habitat dominated by *Salix hindsiana*, with few other species.

Mule fat scrub: Habitat dominated by *Baccharis glutinosa*, with few other species.

Mule fat-sycamore: Mule fat scrub in which *Platanus racemosa* is a co-dominant.

Sycamore-oak: Woodlands in which *Platanus racemosa* and *Quercus agrifolia* occur as co-dominants.

Non-native: Sites vegetated exclusively with non-native species such as *Arundo donax* and *Tamarix* sp..

Percent cover of exotic vegetation at each location was estimated using cover categories of <5%, 5-50%, and > 50%, and the dominant exotic species recorded.

Nest Monitoring

Pairs were observed for evidence of nesting, and nests located and monitored following standard protocol (Rourke *et al.* 1999). Nests were visited as infrequently as possible to minimize the chances of leading predators or brown-headed cowbirds (*Molothrus ater*) to nest sites; typically, the first visit was timed to determine the number of eggs laid, the second to determine hatching, and the third to band nestlings. Characteristics of nests, including height, host species, and host height were recorded following abandonment or fledging of nests.

Banding

Nestlings were banded at 7-10 days of age. Each bird received a unique color combination including an anodized bronze-colored aluminum federal numbered band on one leg and a single celluloid color band on the right. Unbanded adults were captured in mist nets within their territories, and were banded with a unique combination of a numbered federal band (anodized dark green) on one leg and a single celluloid color band on the other.

RESULTS

Population Size and Distribution

Transients

Twenty-one transient willow flycatchers of unknown sub-species were observed during Base-wide surveys (Figures 7-12). All transients were detected between 15 May and 8 June with the exception of one bird on the Santa Margarita River at the base of Pueblitos Canyon, which was observed on 18 June. Transients occurred on drainages throughout the Base, including the Santa Margarita River (9), Aliso (1), Las Flores (2), San Mateo (7), and San Onofre (1) Creeks, and Horno Canyon (1).

Territorial Birds

Eighteen females and at least 17 males established territories and remained throughout the breeding season (Figures 7-8, 13-21). Of the males, one was single, and 16 were confirmed as paired. Two of the males (4, 28; Figures 15, 17) appeared to be polygynous, each interacting with two nesting females in separate habitat patches; collectively these are treated as four territories/pairs throughout this report. Breeding territories were limited to the Santa Margarita River downstream of Basilone Road, and to the mouth of Fallbrook Creek where it enters Lake O'Neill, where a pair of flycatchers occurred.

Habitat Characteristics

Eighty percent (32/40) of all the flycatcher sightings occurred in habitat classified as mixed willow riparian (Table 1), with a dense understory of blackberry (*Rubus ursinus*), stinging nettles (*Urtica dioica*), or poison hemlock (*Conium maculatum*) often present. Ten percent (4/40) of the locations were in willow-sycamore dominated habitat along San Mateo, San Onofre, and Aliso Creeks. An additional 8% (3/40) of sites were in mule fat scrub, and 3% (1/40) were in willow-oak dominated habitat. While transients used all four habitat types, breeding flycatchers were found almost exclusively in mixed willow riparian, with 95% of territories established in this habitat.

Exotic vegetation was recorded in 83% (33/40) of flycatcher locations, and was the dominant vegetation (% cover of exotics > 50; Table 1) in 28% (11/40) of sites. The most common exotic plants in habitat used by flycatchers were poison hemlock and giant reed (*Arundo donax*).

Flycatcher locations differed widely in their proximity to surface water (Table 1). Both transient and breeding flycatchers exhibited bimodal distributions with regard to distance to the nearest surface water, with 57% of transients and 42% of residents within 60 m, and the rest greater than 150 m away. On average, breeding birds were nearly twice as far from surface water as were transients (breeders: $\bar{x} = 215 \pm 187$ m, transients: $\bar{x} = 124 \pm 127$ m).

Breeding Activities

Nesting was observed for 17 of the 18 pairs (Table 2). The first clutch was laid on 25 May, and all pairs had initiated nesting by 23 June. All pairs unsuccessful in their first attempt re-nested at least once; three pairs made three nesting attempts. None of the pairs successful on their first attempt re-nested with the exception of Pair 43, which fledged a total of five young from two nests. Nesting continued through August, with the last young fledged on 18 August. Seventy-eight percent of pairs (14/18) fledged at least one young by the end of the season.

A total of 29 nests were produced; of these, 25 were located and monitored. Fifteen nests (52%) were successful, fledging 1-3 young each. Fourteen nests (48%) failed to fledge young. One nest was inactive by the time it was located and the cause of failure thus unknown, eight were depredated, two contained infertile or inviable eggs, and three failed when the plants supporting the nests collapsed; in one instance, the result of a willow tree falling onto the host plant. All of the latter nests were placed in poison hemlock, the stems of which became increasingly dry and fragile as the season progressed.

Clutch size, estimated from 21 nests containing full clutches, averaged 3.2 ± 0.7 eggs. Thirty-four fledglings were produced, yielding an estimate of seasonal productivity of 1.9 young per pair (34 young/18 pairs).

Table 1. Habitat characteristics of willow flycatcher locations at Marine Corps Base Camp Pendleton in 2001.

ID	Drainage	Status ^a	Habitat Type	% Cover Exotics ^b	Dominant Exotic ^c	Distance to Surface Water (m)
SMAT1	San Mateo	T	Willow-sycamore	1	Annual grasses	10
SMAT2	San Mateo	T	Mixed willow	2	TAM	15
SMAT3	San Mateo	T	Mixed willow	1	TAM	15
SMAT4	San Mateo	T	Willow-oak	1	Annual grasses	20
SMAT5	San Mateo	T	Willow-sycamore	1	Annual grasses	40
SMAT6	San Mateo	T	Mule fat scrub	1	---	0
SMATL	San Mateo	T	Mixed willow	1	TAM	15
LFU	Las Flores	T	Mule fat scrub	3	CON	15
LFL	Las Flores	T	Mixed willow	3	CON	20
HORNO1	Horno	T	Mixed willow	3	CON	60
SOS	San Onofre	T	Willow-sycamore	2	CON/BRA	20
ALISO	Aliso	T	Willow-sycamore	1	---	300
59	Santa Margarita	T	Mixed willow	3	CON	40
BELL	Santa Margarita	T	Mixed willow	2	CON	180
PUEB2	Santa Margarita	T	Mixed willow	3	EUC	380
KF5	Santa Margarita	T	Mixed willow	2	CON	300
100	Santa Margarita	T	Mixed willow	1	---	250
101	Santa Margarita	T	Mixed willow	1	---	230
102	Santa Margarita	T	Mixed willow	1	---	230
103	Santa Margarita	T	Mixed willow	1	---	220
104	Santa Margarita	T	Mixed willow	1	ARU	250
2	Santa Margarita	P	Mixed willow	3	ARU	150
4	Santa Margarita	P	Mixed willow	1	---	250
5	Santa Margarita	P	Mixed willow	3	ARU	200
27	Santa Margarita	P	Mixed willow	3	CON	60
28	Santa Margarita	P	Mixed willow	2	CON	0
29	Santa Margarita	P	Mixed willow	2	CON	0
34	Santa Margarita	S	Mixed willow	3	ARU/CON	50
40	Santa Margarita	P	Mixed willow	3	CON	440
42	Santa Margarita	P	Mule fat Scrub	2	CON	425
43	Santa Margarita	P	Mixed willow	2	CON	400
PT10	Santa Margarita	P	Mixed willow	1	CON	420
SYC	Santa Margarita	P	Mixed willow	2	CON	210
N2	Santa Margarita	P	Mixed willow	3	CON	500
N4	Santa Margarita	P	Mixed willow	2	CON	450
N10	Santa Margarita	P	Mixed willow	2	CON	400
PO	Santa Margarita	P	Mixed willow	1	CON	40
EUC1	Santa Margarita	P	Mixed willow	2	ARU	30
EUC2	Santa Margarita	P	Mixed willow	2	CON	60
LO	Fallbrook	P	Mixed willow	2	TAM	0

^aT = transient, P = breeding pair, S = single resident male.

^b1 = <5%, 2 = 5-50%, 3 = >50%.

^cTAM = *Tamarix* sp., CON = *Conium maculatum*, BRA = *Brassica nigra*, EUC = *Eucalyptus* sp., ARU = *Arundo donax*.

Table 2. Nesting activity of southwestern willow flycatcher pairs at Marine Corps Base Camp Pendleton in 2001.

ID	Lay Date	# Eggs	# Nestlings	# Fledglings	Comments
2	10 June	3	3	3	
4	29 May	4	4	0	Depredated.
	2 July	3	2	0	Depredated.
5	19 June ^a	3 ^c	3 ^c	3 ^c	Nest not located.
27	23 June ^a	2 ^c	2 ^c	2 ^c	Nest not located.
28	1 June ^{a,b}	?	?	0	Cause of failure unknown.
	14 June ^a	4	0	0	Nest host plant hit by falling tree.
	8 July	2	2	2	
29					No nesting observed.
40	17 June ^a	4	0	0	Eggs infertile.
	12 July	2	0	0	Eggs infertile.
42	5 June	2	2	2	
43	9 June	3	3	2	1 nestling gone.
	5 July	3	3	3	
PT10	Before 18 June	?	?	0	Contents not observed. Depredated.
	23 June	4	3	0	Depredated.
	21 July	2	1	1	1 egg did not hatch.
SYC	10 June ^a	?	?	0	Contents not observed. Depredated.
	24 June	3	1	0	Depredated.
N2	25 May	3	0	0	Depredated.
	17 June	3	3	3	
N4	17 June	3	3	3	
N10	2 June	4	2	2	2 eggs or nestlings gone.
PO	20 June	3	3	2	1 7-day-old nestling dead in nest.
EUC1	5 June	3	3	0	Nest host plant collapsed.
	10 July ^a	2 ^c	2 ^c	2 ^c	Nest not located.
EUC2	30 May	4	3	0	Nest host plant collapsed.
	23 June	4	0	0	Depredated.
	24 July	2	1	1	1 egg did not hatch.
LO	Before 11 June	3 ^c	3+	3 ^c	Nest not located.

^aDate estimated.

^bNest inactive when found; eggs not seen.

^cMinimum number, based on number of fledglings observed.

Nest Site Characteristics

Flycatchers placed nests in seven species of plants (Table 3), including black willow (*Salix gooddingii*), arroyo willow (*S. lasiolepis*), stinging nettle, mule fat, elderberry (*Sambucus mexicana*), poison hemlock, and giant reed. One nest constructed in arroyo willow was used for two successive nest attempts (EUC2 nests 2 and 3). Over half the nests were placed in exotic species; 44% (11/25) in poison hemlock, and 12% (3/25) in giant reed. Nest height averaged 2.0 ± 0.7 m (N = 24), while host height averaged 4.0 ± 2.5 m (N = 24).

Table 3. Nest site characteristics of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in 2001.

ID	Host Species	Host Height (m)	Nest Height (m)
2	<i>Urtica dioica</i>	4.2	1.2
4	<i>Conium maculatum</i>	2.0	1.1
4	<i>Arundo donax</i>	7.0	3.4
27	<i>Urtica dioica/salix lasiolepis</i>	2.1	1.3
28	<i>Conium maculatum</i>	2.9	1.8
28	<i>Urtica dioica</i>	1.0	1.0
28	<i>Salix gooddingii</i>	13.0	2.5
40	<i>Conium maculatum</i>	3.0	2.1
40	<i>Conium maculatum</i>	2.1	1.7
42	<i>Baccharis glutinosa</i>	2.4	2.0
43	<i>Conium maculatum</i>	3.1	2.3
43	<i>Conium maculatum</i>	3.1	2.0
PT10	<i>Urtica dioica</i>	4.1	1.6
PT10	<i>Urtica dioica</i>	3.0	1.1
PT10	<i>Arundo donax</i>	6.0	3.6
SYC	<i>Conium maculatum</i>	3.5	1.9
SYC	<i>Arundo donax</i>	3.8	1.9
N2	<i>Conium maculatum</i>	3.5	1.9
N2	<i>Conium maculatum</i>	3.2	2.8
N4	<i>Sambucus mexicana</i>	NA	NA
N10	<i>Urtica dioica</i>	4.1	2.7
PO	<i>Salix lasiolepis</i>	3.4	2.7
EUC1	<i>Conium maculatum</i>	2.9	1.7
EUC2	<i>Conium maculatum</i>	3.3	2.2
EUC2	<i>Salix lasiolepis</i>	8.8	2.0 ^a

^aNest re-used for subsequent nesting attempt.

Cowbird Parasitism

No instances of cowbird parasitism of southwestern willow flycatcher nests were observed in this study.

Banded Birds

All of the resident males, and 16 of the 18 females, were observed closely enough to determine with confidence whether they were banded (Table 4). Of these, one male and one female were returning banded birds banded in previous years; the male was banded in 1998 as part of a range-wide genetics study (J. Owens, pers. comm.), and the female was banded in 2000 in Territory N9/10 (Kus 2001). Both of these individuals shifted territories between 2000 and 2001. The female moved a short distance to Territory N4 (Figure 18) and paired with an unbanded male; her previous mate from 2000 who was banded in Territory N9/10 that year did

Table 4. Band status of southwestern willow flycatchers at Marine Corps Base Camp Pendleton in 2001.

ID	Status ^a	Male Banded? ^b	Female Banded? ^b	Nestlings Banded?	Comments
2	P	No	ORPU:M _{dg}	3	Male believed polygynous w/Territory 4 female. Female banded in 2001.
4	P	No	LGWH:M _{dg}	2	Nestlings depredated before fledging. Female banded in 2001.
5	P	No	No		
27	P	Unknown	No		Male believed polygynous w/Territory 28 female.
28	P	DGLG:M _{dg}	DBDP:M _{dg}	2	Male and female banded in 2001.
29	P	No	Unknown		
34	S	No	NA	NA	
40	P	BLK:M _{dg}	DKBL:M _{dg}		Male and female banded in 2001.
42	P	WHI:M _{dg}	DPDB:M _{dg}	2	Male and female banded in 2001.
43	P	DKPI:M _{dg}	No	5	Nestlings from two successful nests. Male banded in 2001.
PT10	P	LGWH:m	PUR:M _{dg}	1	Male and female banded in 2001.
SYC	P	YEL:M _{dg}	No		Male banded in 2001.
N2	P	PUWH:m	BWST:M _{dg}	3	Male banded as adult near Air Station in 1998. Female banded in 2001.
N4	P	No	M _{dg} :LGWH	3	Female banded as adult in Territory N10 in 2000.
N10	P	M _{dg} :DPDB	M _{dg} :DPWH	2	Male and female banded in 2001.
PO	P	BKYE:M _{dg}	No	2	Male banded in 2001.
EUC1	P	No	No		
EUC2	P	No	No	1	
LO	P	BLBK:M _{dg}	No		Male banded in 2001.

^aP = pair, S = single male.

^bBand combinations: left leg:right leg; m = federal aluminum band, M_{dg} = anodized green federal band, BLK = black, WHI = white, DKPI = dark pink, DKBL = dark blue, YEL = yellow, DGLG = dark green-light green split, LGWH = light green-white split, PUWH = purple-white split, DPDB = dark pink-dark blue split, BKYE = black=yellow split, BLBK = light blue-black split, ORPU = orange-purple slit, DBDP = dark blue-dark pink split, DPWH = dark pink-white split, BWST = dark blue-white striped.

not return in 2001. The male, originally banded in habitat along Rifle Range Road south of the Air Station in 1998, occupied territories in that vicinity during 1999 and 2000, then moved approximately 1.5 km downstream and established a new territory (N2) near the Ysidora ponds in 2001 (Figure 18). The two returning banded birds represent 25% of the banded adults present in 2000 (N = 8; two females and six males).

A third banded bird, a female, carried a single federal metal band on her left leg and no bands on her right leg. Attempts to capture this bird and determine her band number were unsuccessful, and the identity and origin of this bird are thus unknown. It is possible that she was banded at a MAPS (Monitoring Avian Productivity and Survival) station at the Ysidora

Ponds in either 1998 or 2000, when several willow flycatchers were banded with just a single federal band rather than color bands (Kus and Beck 1998, 2001).

None of the six flycatchers banded as nestlings in 2000 returned to Camp Pendleton in 2001.

None of the transients observed well enough to detect bands (10/21) were banded.

Ten resident males and eight females were netted in 2001 and color banded (Table 4). Four of these birds were captured incidentally during operation of a MAPS (Monitoring Avian Productivity and Survival) station at the Ysidora ponds (Kus and Sharp 2002), including the pair in Territory N10, the female in Territory N2, and a male who settled in Territory PT10.

Twenty-six nestlings in 12 nests were banded. Of these, two nestlings were depredated before fledging, and the rest fledged (Table 4). By the end of the season, 71% of the fledglings produced (24/34) were banded.

DISCUSSION AND RECOMMENDATIONS

Camp Pendleton continues to provide habitat for migrating and breeding willow flycatchers. The number of transients detected during surveys in 2001 (21) increased relative to 2000, when 11 transients were noted in the Basewide survey and two were caught at MAPS stations (Kus 2001). The results of the 2001 surveys combined with those from previous years indicate that migrating flycatchers use habitat on virtually every drainage at Camp Pendleton. Transients use a broad range of habitat types as well, and are less restricted to mixed willow riparian vegetation than are resident birds. Moreover, transients in 2001 exhibited more variability in their proximity to surface water than that measured in 2000, when nearly all transients were within 50 m of surface water.

In contrast, the resident southwestern willow flycatcher population at the Base continues to be limited in size and distribution. The number of flycatcher territories in 2001 was larger by one than the 18 territories documented in 2000, but breeding flycatchers remained confined to the lower Santa Margarita River and Fallbrook Creek at Lake O'Neill. Although breeding territories were predominantly in habitat characterized as mixed willow riparian, they were situated as far as 500 m from surface water, suggesting that close proximity to water is not a strong requirement limiting flycatcher distribution at Camp Pendleton.

Despite their affinity for willow riparian habitat, breeding flycatchers appear to tolerate, and perhaps even selectively use, exotic vegetation within their territories. Poison hemlock, an herbaceous biennial reaching heights of over 2 m, was recorded as the dominant exotic species in

74% (14/19) of territories, and as the dominant vegetation of any type (native or exotic) in half of these. Dense stands of poison hemlock may provide foliage cover important for nest concealment similar to stinging nettles, a native herb in which 24% of flycatcher nests were placed in 2001. Poison hemlock was not only present in most flycatcher territories, it was used as a nest host for 44% of nests, making it the most commonly used species for nest placement. Giant reed, another widespread exotic on the lower Santa Margarita River, was the dominant exotic in 21% of territories, and the dominant vegetation of any type in three-quarters of these; 12% of flycatcher nests were constructed in this species. Only one territory was established in an area where salt cedar (*Tamarix* sp.) was the dominant exotic (Lake O'Neill). The nest host species used by this pair was not known since the nest was not located. Clearly, current and future management to control invasive exotic vegetation at the Base through clearing and foliar application of herbicides should consider the use of exotics by southwestern willow flycatchers and design approaches that avoid impacts to nesting birds. Research evaluating habitat use relative to habitat availability with regard to vegetation composition and structure will help identify whether flycatcher use of exotic vegetation is selective or random.

Flycatcher nesting effort and success in 2001 differed from that in previous years. Although clutch size (3.2 ± 0.7 eggs per nest) was slightly larger than the average of 3.0 documented in 2000 (Kus 2001) and 1999 (Griffith Wildlife Biology 2000), nesting success was lower, and pairs fledged fewer young by the end of the 2001 season than in previous years (2000: 2.3 young per pair, Kus 2001; 1999: 2.0 young per pair, Griffith Wildlife Biology 2000). While the majority of nest failures in 2001 were attributable to predation, 36% of unsuccessful nests failed for other reasons, including host plant collapse, and infertile/inviable eggs. Host plant collapse was limited to nests placed in poison hemlock, and may represent a negative aspect of the use of this species to support nests. The occurrence of infertile/inviable eggs in southwestern willow flycatcher nests has been analyzed by Whitfield (2002), who suggests that declining "hatchability" over the last five years may be responsible for the recent decline in the Kern River population, formerly the largest in California. Whitfield (2002) hypothesizes that the cause of reduced hatchability may be pesticides encountered during migration and/or on the wintering grounds, which could thus affect birds breeding in populations other than the one she studied. Further monitoring of this component of flycatcher reproduction at Camp Pendleton is thus warranted.

Return rates of color banded birds in 2001 provide preliminary data with which to evaluate the contribution of annual survival and dispersal to flycatcher abundance and distribution at Camp Pendleton. The low return rate of adults, at 25% of those present in 2000, coupled with a complete lack of recruitment of young produced in 2000, suggest that over-wintering survival may limit flycatcher numbers even when productivity is sufficient to produce population growth, as it was in 2000 (2.3 young per pair; Kus 2001). However, it should be noted that these estimates are based on very small numbers of banded birds, and caution should be exercised when attempting to draw conclusions from them. Color banding also revealed movement between years by territorial birds that would have been undetectable otherwise. One male and one female changed territory locations between 2000 and 2001, possibly in response to

the failure of the mate from the previous year to return. The extent of between-year movement by territorial birds and the factors influencing such movement will be useful in understanding flycatcher distribution and habitat use. The effort devoted to individually marking adults and young in 2001 will produce larger sample sizes from which more robust conclusions can be drawn in future years as birds are monitored over the course of their lifetimes.

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