

A PRELIMINARY REPORT ON THE BIOLOGY OF  
THE WILLOW FLYCATCHER IN THE CENTRAL SIERRA NEVADA

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ABSTRACT.

Reported are preliminary results of studies being conducted on the willow flycatcher (*Empidonax trailii*) near Dinkey Creek, Fresno County, California. Willow flycatchers were color-banded with unique, coded sequences allowing us to monitor individuals during the 1983 and 1984 breeding seasons. The chronology of migratory and reproductive events, nest success, home range size, site fidelity, and some aspects of reproductive behavior are documented. Results and implications of counts of the brown-headed cowbird, a nest parasite, are presented. Results to date suggest that willow flycatcher production may not be affected by cowbird parasitism, but may be by the activities of range cattle.

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INTRODUCTION

The breeding range of the willow flycatcher (*Empidonax trailii*) includes southern Canada and the continental United States excluding the extreme southeastern United States (A.O.U. 1983). In California, Grinnell and Storer (1924) describe the willow flycatcher as being primarily an inhabitant of meandering, willow-lined stream courses in broad river bottomlands. They consider the species to be a "common summer visitant locally in the Sonoran Zone (chiefly in Yosemite Valley)."

Two factors have been cited as major contributors to declines of nesting willow flycatchers in their previously preferred habitat (Serena 1982): 1) extensive alteration and depletion of large riverine systems in the Central Valley in California, and 2) possibly the proliferation of brown-headed cowbirds (*Molothrus ater*), a nest parasite. In California, the willow flycatcher is largely restricted to montane meadow systems and the riparian floodplain of the Kern River drainage (Serena 1982). During her survey of the Sierra Nevada, Serena (1982) located 72 singing males, which she equated to breeding pairs. The six pairs she found at Dinkey Meadow and the one pair at Long Meadow represent approximately 10% of the population of willow flycatchers located by Serena. As a result of Serena's (1982) survey, the California Department of Fish and Game is currently considering whether the willow flycatcher deserves listing as a threatened or endangered species (Schlorff, pers. comm.).

Dinkey Meadow is scheduled for inundation by the proposed Dinkey Creek Hydroelectric Project, and mitigative habitat work will be conducted at Long Meadow. Considering the status of the willow flycatcher and recognizing that a substantial portion of the known population within the Sierra Nevada and the state may be impacted, the project proponent, the Kings River Conservation District, initiated intensive studies to develop effective mitigation measures.

This document represents a preliminary report of some data collected during the 1983 and 1984 breeding seasons. A study plan, drafted in 1982 and updated in 1984, directs research on willow flycatchers in the Dinkey Project area (KRCDC 1984). Data has been collected on territory size and its vegetative composition, nest site characteristics, breeding ecology, geographic distribution, foraging ecology and cowbird abundance and nest parasitism. A habitat model will be constructed employing information from the literature and the results of our studies in order to direct further research and mitigation activities.

#### ACKNOWLEDGEMENTS

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#### STUDY AREAS

General surveys were located within the Pine Ridge and Kings River ranger districts, Sierra National Forest, Fresno County, California (Figure 1). Dinkey and Long Meadows were studied intensively.

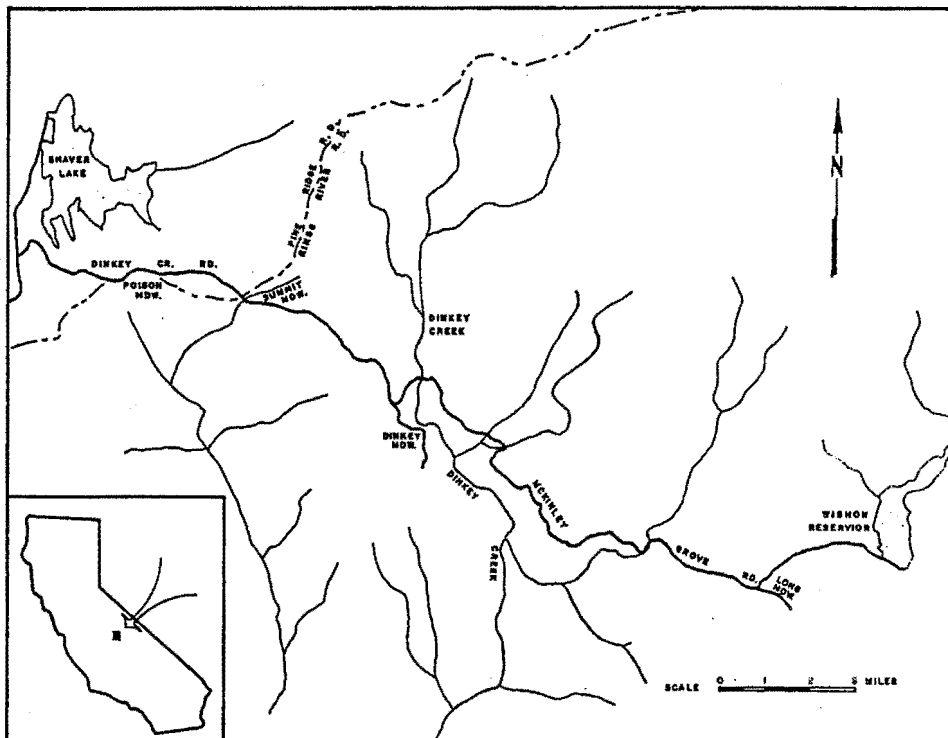


Figure 1. Location of willow flycatcher study sites for 1983 and 1984 investigations.

Dinke Meadow, elevation 1731 m, is an approximately 16-ha meadow surrounded by the mixed conifer habitat type as described by Verner and Boss (1980). A perennial stream drains the meadow. Willow (*Salix* sp.) stands are dense at the boggy lower end, while shrub cover is sparse over the remainder of the meadow. Most of the meadow is grazed lightly by horses during the summer. During 1 to 2 weeks of roundup each spring and fall, the meadow is grazed intensely by cattle.

Long Meadow is a large (approximately 9-ha), relatively dry, meadow with a permanent stream flowing through it. Located at 2097 m elevation, it is surrounded by the red fir habitat type (Verner and Boss 1980) interspersed with lodgepole pine (*Pinus murrayana*) stands. Most of the meadow is heavily grazed by cattle during the summer months. A fenced area of dense willows at the lower end of the meadow is only moderately grazed by horses. Willow clumps are dispersed throughout the meadow.

## METHODS

Willow flycatchers were captured in mist nets and banded with unique sequences of four bands. Each color was assigned a number between zero and nine, resulting in a four-digit designation for each bird. Color-banding permitted individual identification during subsequent mapping activities.

Alpha-numerically labeled lath was erected to denote grid coordinates in Dinkey and Long Meadows. Individual's positions and activities were located in relation to the grids and mapped on data sheets that corresponded to the on-site grid coordinates. Attempts to attract males to territorial boundaries with a recording of willow flycatcher songs (Gunn and Kellogg 1975) were variably successful. Activities were mapped at each site on at least a weekly basis, usually between 0600 and 1000 hrs throughout the breeding season. Visits to the site were more frequent during the peak of breeding.

The home range sizes we report are the maximum polygon encompassed during the period when eggs and young were in the nest. The area was measured using a polar compensating planimeter from maps prepared by compositing the results of daily maps.

For this report, we synonymize home range and territory for males as they exhibited both maintenance and territorial behaviors. Females did not exhibit territorial behaviors.

A concerted effort was made to document arrival dates, reproductive status and stage, and departure dates for each resident willow flycatcher. Most nests were located, and the nesting chronology documented. When unavailable directly from our data, we project fledging dates following the chronology of reproductive events presented by King (1955). Nestlings were banded at 10 days of age in 1983. The only young banded in 1984 were captured as fledglings.

To acquire a measure of brown-headed cowbird abundance, we enumerated male, female and juvenile cowbirds at 2-hr intervals one day per week at three sites of concentrated livestock activity near the Dinkey Meadow study site (Figure 2). Five minutes at each site was usually sufficient to determine the number of cowbirds present.

## RESULTS AND DISCUSSION

### Summary By Study Site

Dinke Meadow 1983 - In 1983, twelve adult willow flycatchers were color banded at Dinkey Meadow. Two males established territories.

Male 3110 initially mated with female 0118. On 20 July, she was incubating a full clutch of three eggs. On 25 July we found the nest tipped over with only one of the original three eggs remaining. New, heavily used, pathways through the willows near the nest suggest that livestock traffic was the cause of the nest upset. Female 0118 was not observed on the site again during 1983.

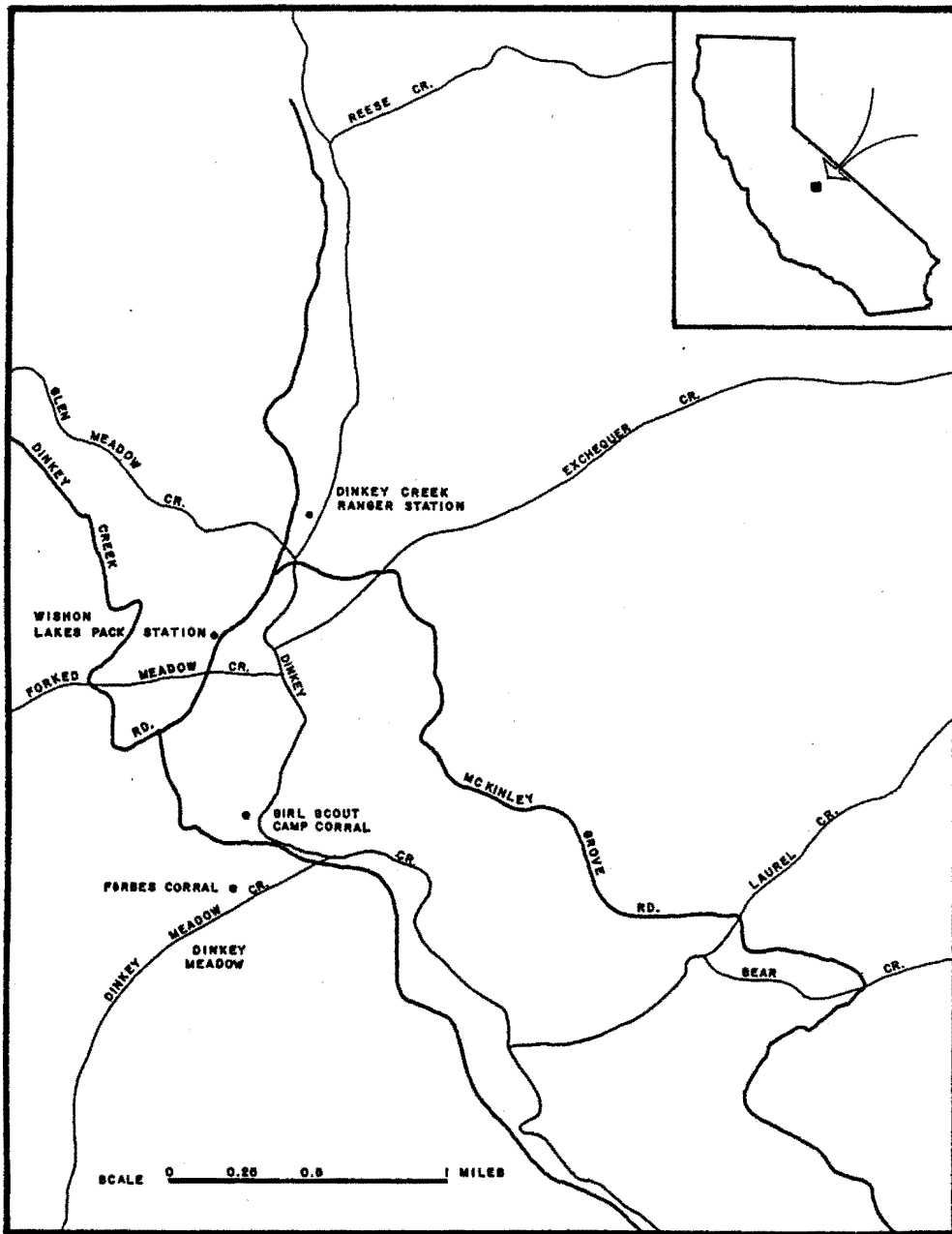


Figure 2. Location of Forbes Corral, Wishon Lakes Pack Station, and the Girl Scout Camp Corral, site of brown-headed cowbird counts in 1984.

Female 2110 was observed building a nest in the territory of male 3110 on 28 July, three days after 0118 lost her nest. By 3 August, three eggs were present in her nest, which resulted in three young that probably fledged. The nest was knocked loose from the supporting limbs by cattle approximately 18 days after the nestlings fledged.

A male we banded with only an aluminum band paired and mated with female 0119. The nest contained two nestlings and one unhatched egg until the morning of 16 August, the estimated fledging date. Cattle trespassed into the area on 15 August. The evening of 16 August the nest was found tipped over; whether the two nestlings fledged is unknown.

The reproductive chronology for territory holders at Dinkey Meadow in 1983 is depicted in Figure 3.

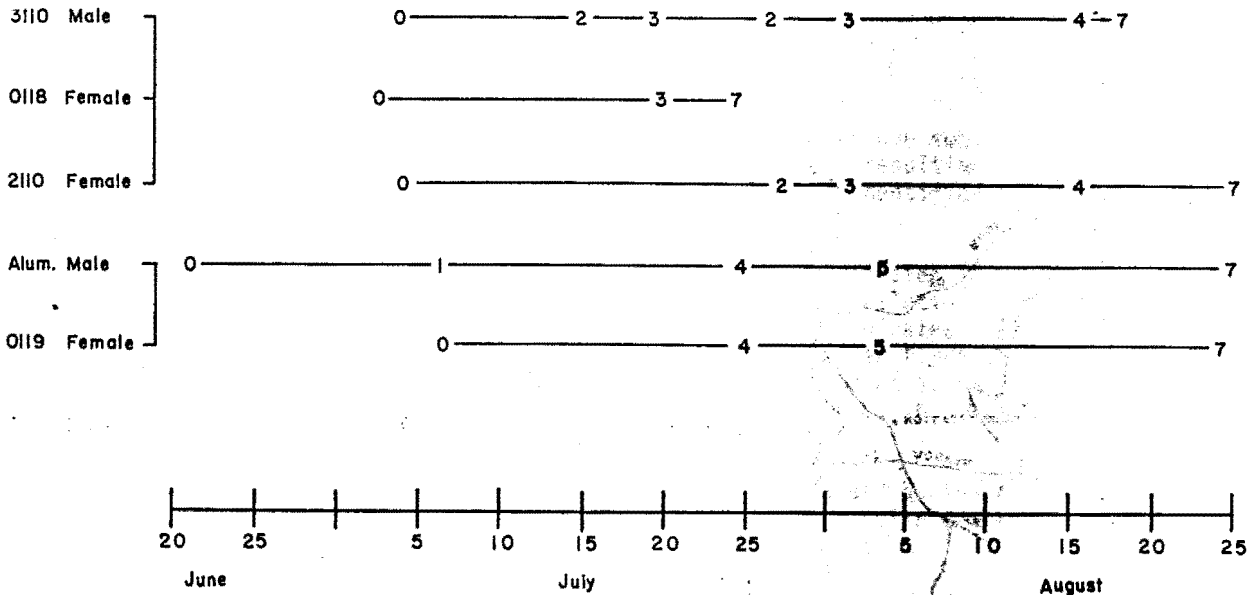


Figure 3. Arrival dates and reproductive chronology for territory holding willow flycatchers at Dinkey Meadow in 1983. 0 = first observation, 1 = paired, 2 = besting, 3 = eggs, 4 = hatch, 5 = fledge, 6 = last record for season.

Dinkey Meadow 1984 -- In 1984 three males held territories in Dinkey Meadow. Two of these males did not hold territories in 1983, nor did they acquire a mate during the 1984 breeding season. Male 3110 returned to the same territory he had held in 1983 and paired again with female 0118, who was first observed on 4 June. On 12 June the nest was being constructed; two days later it was lined. Three eggs were present on 18 June, four on 19 June. On 12 July, approximately 4 days prior to fledging, three nestlings and one egg were present. Predation occurred during the night; no sign of the young or eggs were present the following morning. A long-tailed weasel (*Mustella frenata*) was in the vicinity of the nest that morning. Female 0118 built another nest but left the site before laying any eggs.

The reproductive chronology for willow flycatchers at Dinkey Meadow in 1984 is depicted in Figure 4.

Long Meadow 1984 -- Long Meadow was added as a study site in 1984. The following three pairs of willow flycatchers held territories during the season: Male 0126 with female 0131, male 0125 with female 0129, and male 0133 with female 4110.

When the nest of male 0126 and female 0131 was located on 31 July, two eggs were present. Two nestlings were present on 16 August, but the nest was empty by 23 August, at least

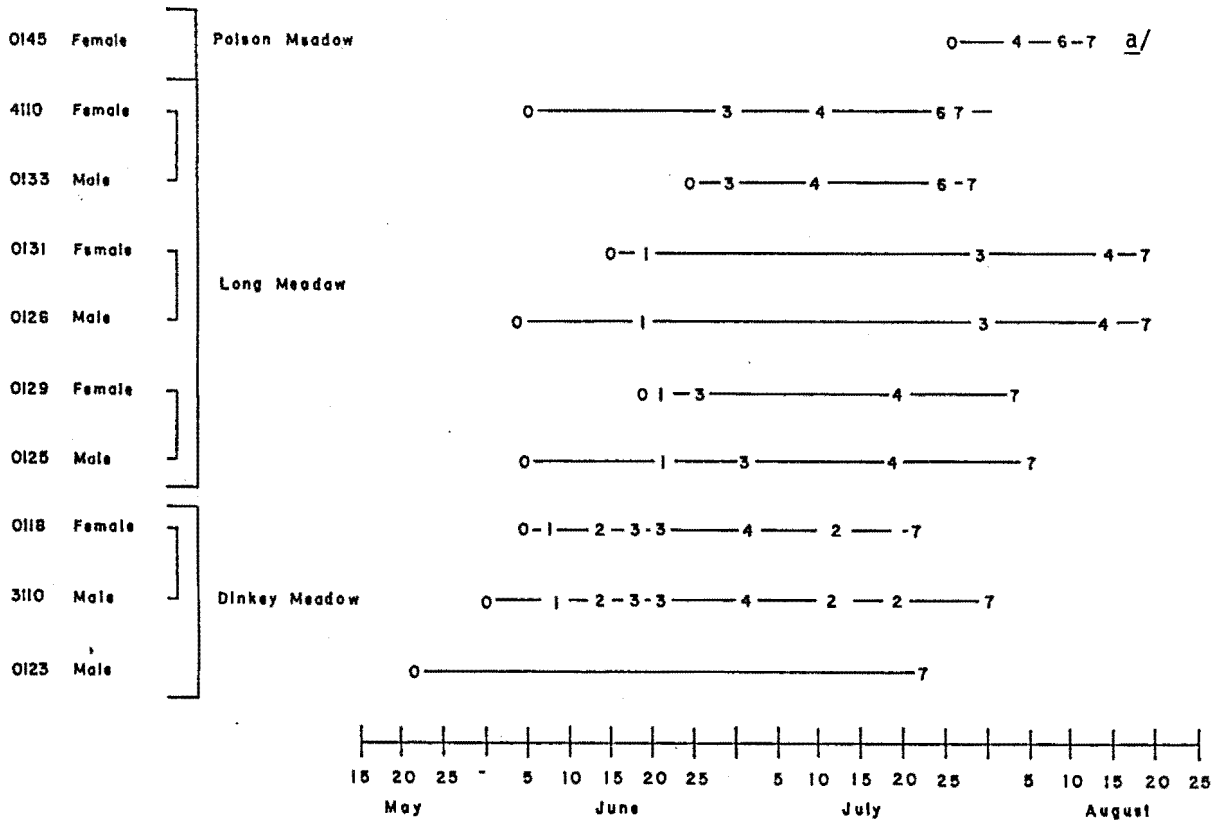


Figure 4. Arrival dates and reproductive chronology for territory holders at three sites in 1984. 0 = first record, 1 = paired, 2 = nesting, 3 = eggs, 4 = hatch, 5 = fledglings, 6 = last record. Some dates are estimated based as described in the text. a/ Nesting dates estimated based upon behavior, may be inexact.

three days prior to the estimated fledging date. The nest was not in disrepair, and no adults or young were subsequently seen on site, implicating predation as the most likely outcome. Observation during territory mapping activities indicated that male 0125 and female 0129 were nesting. However, their nest was not found until 5 September, well after the breeding season. Two dead nestlings, estimated to be 7 days old according to development characteristics reported by King (1955), were found in the nest. The adults were never observed feeding young, so we assume that no additional young were present.

Female 4110 was sighted on her territory on 5 June. Male 0133 was not verified as her mate until his capture on 27 June. Observation during territory mapping indicated that the pair was nesting during the second and third weeks of June, but the nest was never located. On 24 July female 4110 was feeding four fledglings.

Poison Meadow 1984 -- At Poison Meadow, an unbanded male mated with female 0145 and produced at least two fledglings. The nest, found after the breeding season, contained one unhatched egg that had two small holes in one side. These holes were very much like those made by house wrens (*Troglodytes aedon*) when they encounter the eggs of other birds (Kendeigh 1941, pers. obs.). House wrens were present in the area during the time willow flycatchers were breeding. The nest was destroyed by cattle three days after the nestlings fledged.

### Arrival and Departure Dates

Arrival on breeding grounds -- Arrival of willow flycatchers was delayed in 1983, relative to 1984 by one month (Figures 3, 4). We believe this was due to the harsh conditions brought on by one of the wettest winters on record.

In 1983 the earliest detection at Dinkey Meadow was a singing male on 22 June. By the first week of July, all males and most females had arrived.

In 1984 a singing male was first encountered at Dinkey Meadow on 21 May. By 5 June, two additional males were present. By 10 June, the males paired with their females.

At Long Meadow in 1984 two singing males were present on 22 May. An exact arrival date could not be determined because this was the first survey. The flycatchers had paired by June 10.

In addition to the established study sites, initial surveys at Poison Meadow on 11 June and at Summit Creek on 24 May detected singing willow flycatchers.

Our data concurs with the general knowledge that the willow flycatcher is a relatively late arriving migrant (Dawson 1923). Early records of Grinnell and Storer (1924) indicate flycatchers are present in Yosemite Valley on 17 May 1919 and in Riverdale, Fresno County, 23 May 1915 (Tyler 1916).

Departure from the breeding grounds -- Willow flycatchers departed from the study sites from mid-August to early September 1983 (Figure 3) and 1 - 5 August (for non-breeders) and 10 - 20 August (for breeders) in 1984 (Figure 4).

Relative to other passerines, willow flycatchers are early fall migrants (Serena 1982, Garrett and Dunn 1981). Grinnell (1944) considered departure during early September to be the general rule and described a late date of 11 October, for Minkler, Fresno County. Departure dates of 17 September 1915 for Williams Butte, and 11 September 1920 for Yosemite are noted by Grinnell and Storer (1924).

### Home Range Size

The home ranges of females at Dinkey Meadow in 1983 were larger than those of their mates (Table 1). Females foraged in lodgepole pines located just beyond the male's territorial boundaries during the time young were in the nest. Females in Long Meadow used smaller areas than did their mates (Table 1).

Table 1. Territory size for willow flycatchers at Dinkey Meadow in 1983 and 1984 and Long Meadow in 1984. Male - female breeding associations are grouped together.

Location	Number	Sex	Breeding Status	Territory Size (m <sup>2</sup> )
1983 Dinkey Meadow	3110	M	Paired	3825
	0118	F	Paired	3586
	2110	F	Paired	4131
	Aluminum	M	Paired	1060
	0119	F	Paired	2709
1984 Dinkey Meadow	3110	M	Paired	1863
	0118	F	Paired	1377
	unbanded	M	Unpaired	1755
	0123	M	Unpaired	1764

Table 1 (continued)

Location	Number	Sex	Breeding Status	Territory Size (m <sup>2</sup> )
1984 Long Meadow	0133	M	Paired	1950
	4110	F	Paired	1925
	0126	M	Paired	1350
	0131	F	Paired	650
	0125	M	Paired	925
	0129	F	Paired	675

### Reproductive Success

During the two study seasons eight willow flycatcher nests were located and monitored (Table 2). The reproductive success is summarized as: 18 of at least 24 eggs hatched (75% egg to nestling success), 6 nestlings are known to have fledged and another 3 probably fledged (33 to 50% nesting to fledgling success)(Table 2). This yields an egg to fledgling value between 25% and 38%. Only three of the eight (38%) nests are likely to have fledged young, representing relatively low success per nest, particularly during the nestling stage. Production ranged between 0.75 and 1.13 fledglings per nest.

Table 2. Summary of willow flycatcher reproductive effort at three sites in the Sierra National Forest during 1983 and 1984.

	Dinkey 1983	Dinkey 1984	Long 1984	Poison 1984	Total 1983 & 1984
Nests	3	1	3	1	8
Eggs	9	4	8	3	24
Nestlings	5	3	8	2	18
Fledglings					
- possible (maximum no.)	3	0	4	2	9
- certain (minimum no.)	0	0	4	2	6

In Walkinshaw's (1966) extensive study of the willow flycatcher in southern Michigan, approximately 65% of the eggs laid eventually yielded fledged young. In Washington, King (1955) noted 21 of 25 (84%) eggs hatched in one year, and 42 of 43 (98%) hatched in a second year. In the second year, 21 of 47 (45%) nestlings fledged (we assume the additional five nestlings derive from nests discovered after the eggs had hatched). Nice (1947: 143) indicated that the egg to fledgling rate of typical, open nesting passerines is 45%.



### Nest Site Fidelity

A pair of willow flycatchers demonstrated remarkable nest site fidelity. Male 3110 and his initial mate (female 0118), returned and nested on the same territory in 1984. The 1984 nest was located less than 15 m from the 1983 nest site. Of twelve adults and four nestlings banded in 1983, only four were detected in Dinkey Meadow in 1984. Of these, only male 3110 and his mate 0118 nested.

Female 4110 did not exhibit the fidelity that others did. She was banded in Dinkey Meadow in 1983 where she temporarily occupied a territory. In 1984 she successfully nested at the Long Meadow study site, a distance of approximately 14.5 km (9 air miles) from Dinkey Meadow.

### Brown-headed Cowbird Surveys

The brown-headed cowbird has been implicated as a factor contributing to declines in willow flycatcher nesting in Southern California (Garrett and Dunn 1981) as well as other parts of their range (Serena 1982).

Brown-headed cowbirds roost and breed extensively in Dinkey Meadow and other nearby meadows (Verner and Ritter 1983). Pack stations and other areas of livestock concentration attract cowbirds at some times. Verner and Ritter (1983) suggest that pack stations have supplemented cowbird food resources and have facilitated their colonization and successful breeding in the Sierra Nevada.

Results of brown-headed cowbird counts conducted in 1984 are presented in Figure 5. Cowbirds were first observed in Dinkey Meadow on 9 May 1984. Cattle were moved into a corral at Dinkey Meadow for two days during the week of 15-20 May when cowbird numbers increased.

Horses were first present at the Wishon Lakes Pack Station on 24 May 1984. On the 30 May count, cowbirds were first observed at the station. Peak numbers occurred during the second week of July corresponding to declines at Forbes Corral in Dinkey Meadow.

Peak numbers of cowbirds were observed at the Girl Scout Camp Corral on 25 June, the day horses were trucked in. Low counts were recorded at Forbes Corral and Wishon Lakes Pack Station that day, suggesting the three sites were attractive to the same group of cowbirds.

Juvenile cowbirds were first observed on 10 July; numbers peaked on the 16 July count. Back-calculations based on the timing of various stages of the nesting cycle (Verner and Ritter 1983) project that eggs were laid during the period 20-30 May. This period preceded the arrival of most willow flycatchers at all sites (Figure 5).

Verner and Ritter (1983) suggest cowbirds may exhibit a preference for tree nesting host species in the Central Sierra. No cowbird parasitism of willow flycatcher nests was noted during our studies. Thus, preliminary information suggests that brown-headed cowbirds may not be an important factor reducing willow flycatcher nest success in the Dinkey area.

### Other Observations

Non-breeders -- In addition to the breeding birds, non-breeding willow flycatchers were present during the breeding season. At Dinkey Meadow in 1983, twelve adult flycatchers were banded of which only four participated in early nesting activities. Five may have been in migration since they were not again observed on the study area, three were sighted periodically throughout the season. Furthermore, when female 0118 deserted the site after losing her nest, female 2110 immediately used the remains of the previous nest to construct her own. In only eight days eggs appeared in her nest.

At Long Meadow 14 adult willow flycatchers were banded in 1984. Of these, only six (3 pairs) held territories, although four nonbreeders were observed periodically during the breeding season. In one situation the two newly fledged young of 4110 and 0133 were fed by two other color-banded adults (Stafford, in prep.). One of these individuals had been sighted consistently in the vicinity of the territory of 4110 and 0133.

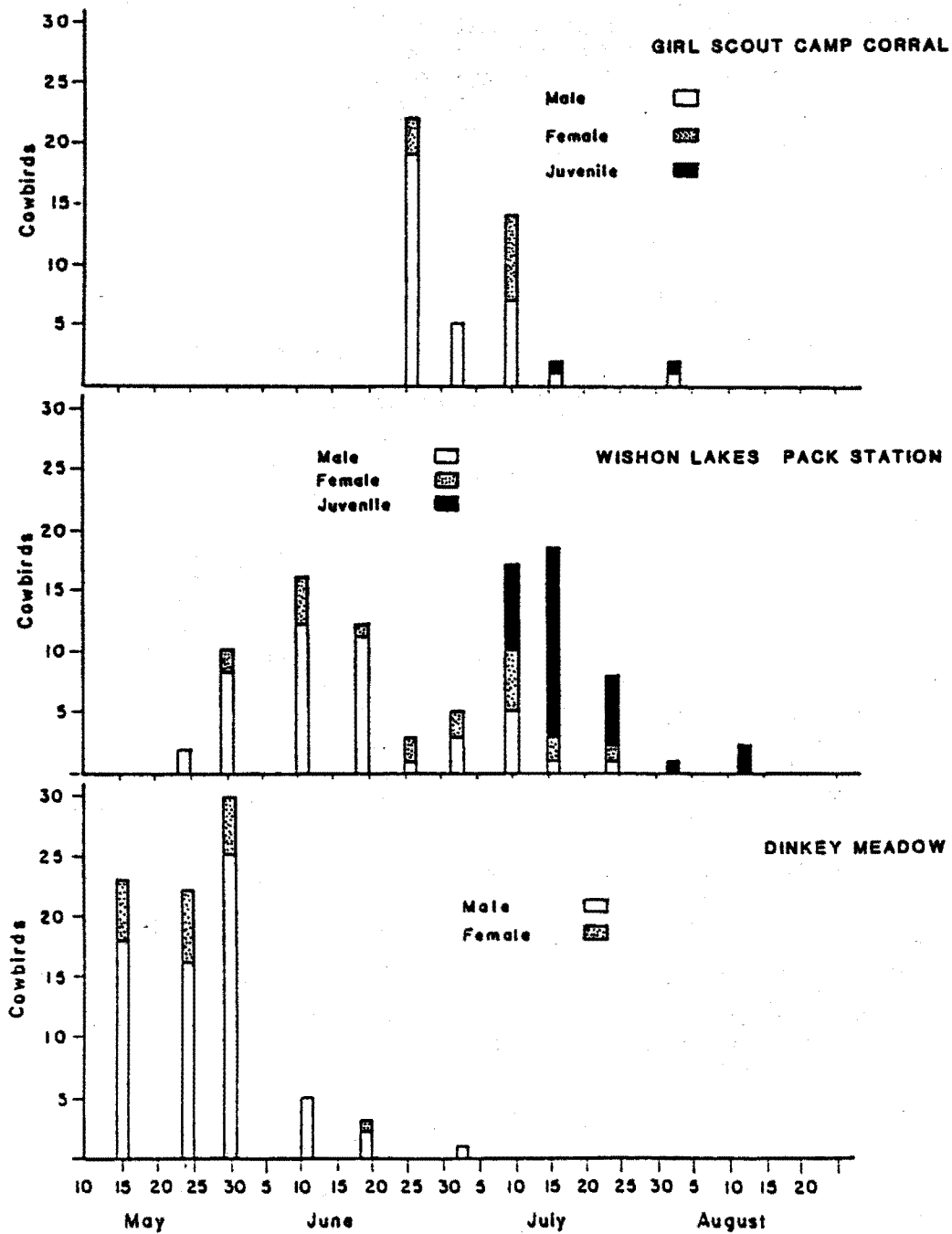


Figure 5. Number of brown-headed cowbirds at three locales, 1984. Maximum number encountered on a given day as presented.

The preliminary indication is that a surplus population of breeding aged birds exists at both study areas.

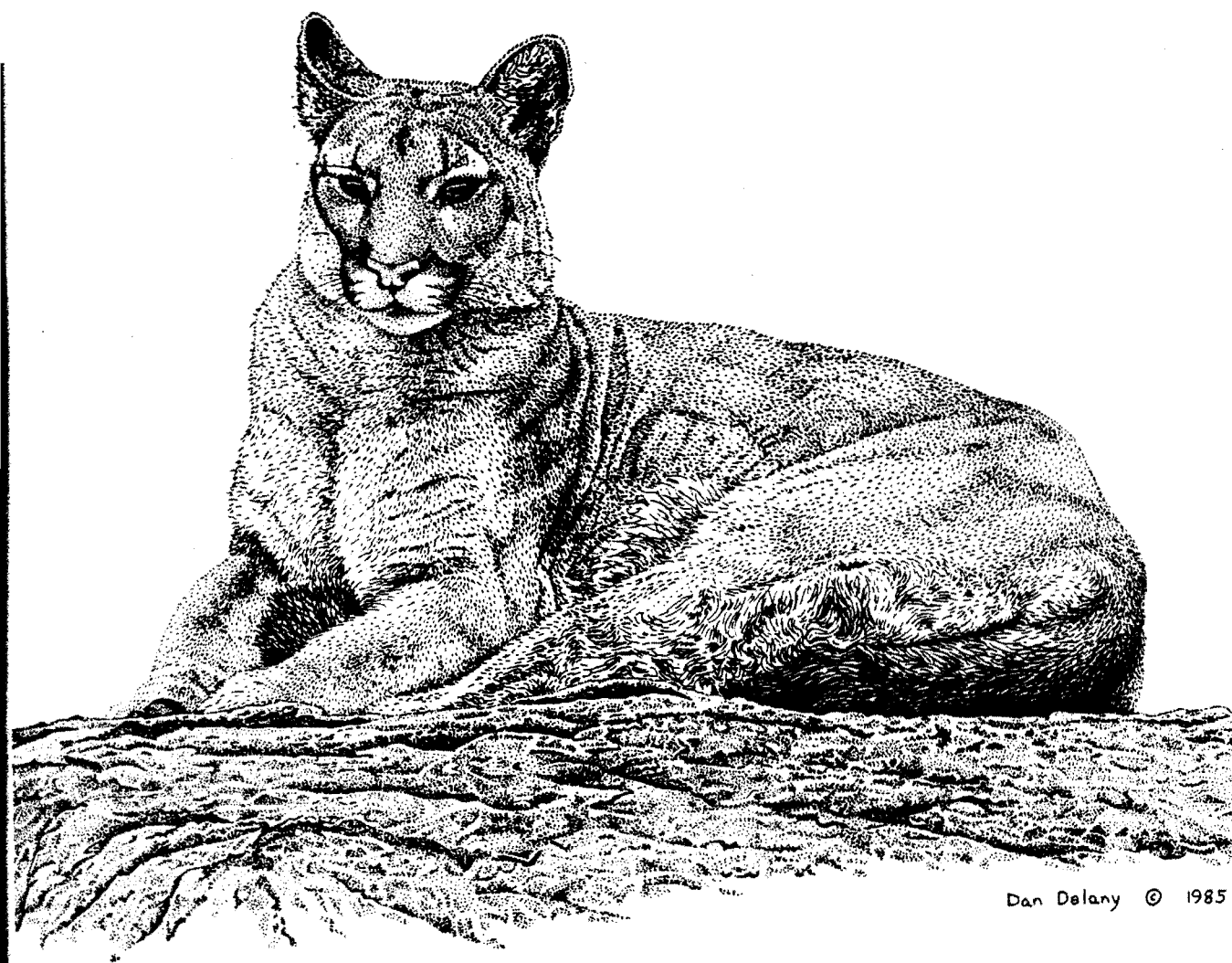
Song -- King (1955) details willow flycatcher song structure. In Washington, he noted a change in song structure from three syllables prior to nesting to two syllables during the nesting season. On our study areas, instead of a change in song structure, the rate at which males sang was reduced. During pre-nesting periods, as well as in non-paired males, males sang 8-20 times per minute during the mornings. Males with females on the nest seldom sang (0-8 songs per minute). Even when provoked by a tape recording, song rate was greatly decreased. This observation is important when one attempts to document breeding population size from song surveys. Information will be collected in 1985 to evaluate this indication in more quantitative terms.

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