

# WILLOW FLYCATCHER SURVEYS IN THE SIERRA NEVADA

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The Willow Flycatcher (*Empidonax traillii*) was formerly a common summer resident in California, breeding in riparian willow thickets. It has been extirpated from most of its California range, and is currently under consideration for state Threatened or Endangered status (R. Schlorff pers. comm.). Most of the remaining populations occur in isolated mountain meadows of the Sierra Nevada and along the Kern, Santa Margarita, and San Luis Rey rivers (Remsen 1978, Serena 1982, Unitt 1987). The California Department of Fish and Game conducted a survey for Willow Flycatchers in six Sierra Nevada national forests and Yosemite National Park in 1982 (Serena 1982). This paper describes the results of the 1986 Willow Flycatcher survey in the Sierra Nevada and summarizes information about the species' status in California. The purposes of our study were to survey sites at which Willow Flycatchers had been previously seen, search for new sites, and attempt to refine our knowledge of the species' habitat requirements.

## METHODS

We conducted our surveys between 23 June and 31 July 1986 in order to minimize the likelihood of counting migrant birds. Studies at Dinkey, Poison, and Long meadows in the Sierra National Forest (Stafford and Valentine 1985) suggest that Willow Flycatchers frequently arrive at their breeding location as late as mid-June, occasionally as late as early July. In the same area, Willow Flycatchers depart at any time from the end of July to late August, with a peak in mid-August. During the 1982 survey some sites were visited in the first week of June. Birds observed at this time could have been migrants.

We conducted our surveys early in the morning, generally from sunrise until 1000. Spontaneous singing declines after 1000 (King 1955, Flett and Sanders 1987), although individuals can be heard at any time of day. A second, less intense, period of singing generally occurs before dusk. At each site, we walked along the perimeter of all willow habitat, listening and playing taped songs and calls of Willow Flycatchers. We recorded the number of singing male Willow Flycatchers at each site and mapped the locations of all Willow Flycatchers on sketched maps of the sites. A significant fraction of the singing males may remain unpaired through the breeding season, as current studies on the Little Truckee River and Shaver Lake area indicate (Flett and Sanders 1987, Stafford and Valentine 1985). The assumption that singing males represent pairs may thus lead to an overestimate of the number of breeding birds. On the other hand, song frequency declines after pairing (Stafford and Valentine 1985); thus successfully paired males may be missed in a song survey.

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During 1982 the Inyo, Sierra, Stanislaus, Tahoe, Plumas, and Lassen national forests were surveyed (Serena 1982). Other areas surveyed included The Nature Conservancy's Kern River Preserve and Yosemite National Park. We visited most of the sites of the 1982 survey, including all locations which had Willow Flycatchers in 1982 or subsequent years. New areas of coverage included portions of the El Dorado, Toiyabe, and Sequoia national forests, Sequoia National Park, and Kings Canyon National Park. We also visited new sites in the Lassen, Plumas, Inyo, Sierra, and Tahoe national forests.

### RESULTS

We visited 125 sites during the 1986 survey, recording 110 singing male Willow Flycatchers at 30 sites. In addition, we have received reports of an additional 6 birds in the Sierra/Cascades region, for a total thus far of 116 singing males. Fifty-six of the sites visited were not surveyed in 1982. These sites were added to the survey on the basis of suggestions by biologists and sightings of Willow Flycatchers between 1982 and 1986. Visits to these new sites resulted in sighting of 11 singing males at 6 of the sites. Areas with more than 2 singing males are shown in Table 1. The Nature Conservancy's Kern River Preserve had the largest number of singing males (39). The preserve contains several miles of riparian cottonwood-willow forest (*Populus fremontii*, *Salix laevigata*, and *S. gooddingii*). The Little Truckee River drainage, which had the largest number of singing males in 1982, had 25 in 1986. This area

**Table 1** Willow Flycatcher Concentrations in the Sierra Nevada 1982-1986\*

Location	1982	1983	1984	1985	1986
Perazzo Meadow (Tahoe N.F.)	11	17	12	8	11
Lacey Valley (Tahoe N.F.)	13	14	10	12	7
Little Truckee R. Total (Tahoe N.F.)	39	—	—	—	25
Kern River Preserve (Nat. Conserv.)	26	—	23	29	39
Shaver Lake Area (Sierra N.F.)	10	—	15	8	9
Beasore Meadow (Sierra N.F.)	2	—	—	—	4
Hodgdon Meadow (Yosemite N.P.)	2	—	—	3	1
Ackerson Meadow (Stanislaus N.F.)	5	—	—	—	2 <sup>b</sup>
Westwood Meadow (Lassen N.F.)	4	—	—	—	6
Gurnsey Meadow (Lassen N.F.)	0	—	—	—	3
Faith, Charity Valleys (Toiyabe N.F.)	—	—	—	—	5
Klamath River (Siskiyou Co.)	—	—	—	3 <sup>c</sup>	—

\*For each site the number of singing male Willow Flycatchers is indicated for years in which surveys have been conducted. The table includes all sites that had more than 2 singing male Willow Flycatchers at some time during the study period. Only sites in the Sierra Nevada and Cascade ranges are included. A total is given for the Little Truckee River drainage, which includes Perazzo Meadow and Lacey Valley.

<sup>b</sup>Reports indicate that there may have been 3 singing males (J. Winter pers. comm.).

<sup>c</sup>Reported by M. Robbins.

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includes extensive meadows near Webber Lake, Perazzo Meadow, and additional meadows along the Little Truckee River west of Highway 89. The Shaver Lake area, Sierra National Forest, had 9 singing males. This area includes Dinkey, Long, and Poison meadows. Dinkey Meadow had 6 singing males in 1982 and 3 singing males in 1986. The Little Truckee River, Kern River, and Shaver Lake areas together account for 67% of the Willow Flycatcher sightings in the Sierra during 1986. These three areas accounted for 73% of the Sierra Nevada sightings during 1982.

Roughly the same number of birds was seen at the sites surveyed in both 1986 and 1982 (99 in 1986, 103 in 1982). Seven sites that had Willow Flycatchers in 1982 had none in 1986. Six of these sites had only one bird in 1982. Six additional sites decreased in number. Most important among this group were Lacey Valley (declined from 13 to 7), Little Truckee River (one site declined from 8 to 2), and Dinkey Meadow (declined from 6 to 3). Three sites that had no Willow Flycatchers in 1982 had birds in 1986. In two cases three birds were present in 1986, in the other case two birds were present. Seven additional sites increased in numbers of Willow Flycatchers. Most important among these were Westwood (increased from 4 to 6), Beasore Meadow (increased from 2 to 4), Long Meadow (increased from 1 to 3), and the South Fork of the Kern River (increased from 26 to 39).

The three most numerous Sierran populations have been surveyed during at least 4 of the last 5 years. Perazzo Meadow and Lacey Valley are two Little Truckee River sites that have been consistently surveyed over the last five years. The Perazzo Meadow population has fluctuated, but there were the same number of singing males in 1986 and 1982. The Lacey Valley population appears to be declining, and accounts in part for the overall decline along the Little Truckee River. The Shaver Lake area (9 sites) has been studied intensively since 1983. The population during 1985 and 1986 was smaller than that in 1982. Dinkey Meadow had 6 singing males in 1982 (this may have been an overestimate, B. Valentine pers. comm.), but has had 3 in all subsequent years except 1985, when there were only 2 singing males. Long Meadow, which had only 1 singing male in 1982, has had 3 in every year since 1984. The Kern River population appears to have increased steadily since 1984. The increase is distributed fairly evenly over the area. Grazing has been eliminated in several of the areas of concentration within the preserve since 1981 or 1982. Prince Pond, which has had as many as 13 birds, was acquired by the Nature Conservancy in 1982 and has been ungrazed since 1983. Mariposa Marsh, ungrazed since 1981, has increased from 7 to 12 birds in the last three years. Prince Pond had fewer birds (7) in 1986 than in the last two years, but the birds may have moved to adjoining flooded habitat. Flooded areas west of Prince Pond had at least 6 singing males where none had been sighted previously. These areas are not flooded every year. Willow Flycatcher distribution on the Kern River floodplain may be related to the distribution of flooded areas in a given year. Grazed areas adjoining the preserve, such as Onyx and Bloomfield Ranches, had no birds this year.

Among the new sites visited, 6 sites had Willow Flycatchers. A site on the Feather River near Clio had 1 Willow Flycatcher. Other new sites included one on the Little Truckee River (3 birds), Summit Meadow 2 (Shaver Lake area, 1 bird), Faith Valley and Charity Valley (Toiyabe National Forest, 3

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and 2 birds, respectively), and Troy Meadow (Sequoia N.F., 1 bird; 1 has been seen in previous years). The Faith Valley and Charity Valley sites are only a few miles apart, and there is some apparently suitable habitat nearby in Hope Valley, although we did not locate singing males there during the 1986 survey.

### DISCUSSION

The Willow Flycatcher was formerly considered common and widely distributed in the state wherever suitable habitat existed (Grinnell and Miller 1944). Areas where it was most common included the Central Valley, the southern coastal region, and central California in general. Specific areas mentioned in which Willow Flycatchers were common or abundant include the Kings River (Goldman 1908), the vicinity of Buena Vista Lake (Linton 1908), the south coast (Willet 1912, 1933), swampy thickets near Los Angeles and the valley rivers of central California (Belding 1890), the San Francisco Bay region (Barlow 1900), and Yosemite Valley (Grinnell and Storer 1924). Ridgway considered it to be the most abundant and generally distributed *Empidonax* species (cited in Belding 1890). In the Sierra Nevada, Willow Flycatchers were felt to be common along willow-lined streams, especially in broad river bottomlands (Grinnell and Storer 1924, Grinnell et al. 1930, Sumner and Dixon 1953). Nesting sites were found from sea level to about 2500 m (8000 ft) (Grinnell and Miller 1944).

As a breeding species, the Willow Flycatcher has been extirpated from most of its former range, surviving only in mountain meadows of the Sierra Nevada, and along the south fork of the Kern River, the Santa Margarita River, and the San Luis Rey River (Remsen 1978, Garrett and Dunn 1981, Serena 1982, Unitt 1987). As a spring and fall transient, the Willow Flycatcher is still fairly common in riparian willow habitat throughout the state (McCaskie et al. 1979, Garrett and Dunn 1981). Willow Flycatchers no longer breed in the Central Valley (McCaskie et al. 1979), and records from the southern coast and central coast have been sporadic (Stallcup and Greenberg 1974, Garrett and Dunn 1981, Roberson 1985, Unitt 1984). Extensive searches in the Sacramento River Valley (Gaines 1974) have revealed no breeding Willow Flycatchers. Careful search of riparian habitat in southern California in the summer of 1978 revealed only two singing males (Garrett and Dunn 1981), although subsequent surveys have revealed populations on the Santa Margarita and San Luis Rey rivers in San Diego County (L. Salata pers. comm., Unitt 1987). Even in the Sierra Nevada, the species has apparently declined (Gaines 1977, Serena 1982), having become alarmingly scarce in the Yosemite region.

Our survey results indicate that the majority of Sierra Nevada Willow Flycatchers are located in three general areas. Between the Little Truckee River (Tahoe National Forest) and Westwood Meadow (Lassen National Forest), we found 43 singing males, most of which were along the Little Truckee River (Table 1). Nineteen singing males were found in the central Sierra, from Ackerson Meadow (Stanislaus National Forest) to the Shaver Lake area (Sierra National Forest). The south fork of the Kern River had the largest population, with 39 singing males. In addition to these major areas, small numbers of singing males were located on the east side of the Sierra, near Mono Lake

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(3 singing males) and in the vicinity of Carson Pass (5 singing males). There is a large gap in the distribution of sightings between the central Sierra and the Kern River. There have been a few reports in recent years of Willow Flycatchers in the Sequoia and Kings Canyon National Parks (L. Norris pers. comm. to R. Schlorff) but no birds were found during this year's survey, and there seems to be insufficient habitat to support large populations.

Portions of northern California, particularly the area north of Lassen National Forest, from the Nevada border to the coast, should be surveyed in the future. During our survey, a singing male was located along the Feather River, near Clio. This site was visited briefly, and there appears to be more suitable habitat that should be surveyed in the future. Singing males have been reported in recent years from the forks of the Salmon (1), the vicinity of Mt. Shasta (1), and Lower Klamath Lake (3 nests) (M. Robbins pers. comm.). Singing males have been reported from Humboldt County in the vicinity of Garberville (R. LeValley pers. comm.) and from Willow Creek (Serena 1982). These sightings may have been of migrants (R. LeValley pers. comm.). Recent Breeding Bird Surveys have produced a few sightings in the northern tier of counties (S. Droge pers. comm.). There are 29 survey routes in Humboldt, Trinity, Del Norte, Siskiyou, Shasta, and Modoc counties. Seven of these routes have recorded Willow Flycatchers during the period from 1982 to 1985 (4, 3, 3, and 6 birds in the four years). A single male was observed at the Modoc National Wildlife Refuge for the first time in 1985, and a pair fledged a single young there in 1986 (W. Radke pers. comm.). This successful nesting may have resulted from protection of riparian habitat over the last 6 years. Further surveys in northern California will likely produce more sightings, but there is no indication that large populations occur in this region.

The subspecific identity of California Willow Flycatcher populations provides further reason for concern about the species status in the state. Three subspecies occur in California (Unitt 1987). *Empidonax traillii brewsteri* breeds from Fresno County north, from the coast to the Sierra Nevada crest. *Empidonax traillii adastus* breeds east of the Sierra/Cascade axis. The type locality for this taxon is in southern Oregon, and it is known to range into Modoc County (Phillips 1948) and perhaps south to northern Inyo county (Unitt 1987). Willow Flycatchers in northern California may represent a zone of intergradation between *E. t. brewsteri* and *E. t. adastus* (Phillips 1948). Southern California populations of Willow Flycatchers have recently been shown (Unitt 1987) to belong to the subspecies *E. t. extimus* Phillips (1948). The northern limits of breeding for this taxon are Independence in the Owens Valley, the south fork of the Kern River, and the Los Angeles basin. It has also suffered serious declines in the portions of its range outside of California (Unitt 1987). Thus the small number of breeding Willow Flycatchers in California is further divided among three subspecies, each of which has declined to very low numbers within the state.

Remsen (1978) listed the Willow Flycatcher as a species of highest priority, facing extirpation if current trends continue. In 1980, reports from the Pacific coast and southwest regions led to the species being added to the Audubon Blue List (Arbib 1979). The Blue List for 1981 included Utah, Arizona, and New Mexico as areas of concern (Tate 1981). In 1983, the Kings River Conservation District began studies of Willow Flycatchers at Dinkey Meadow and

other nearby meadows in the vicinity of Shaver Lake (Stafford and Valentine 1985). Dinkey Meadow, known to harbor breeding Willow Flycatchers, is due to be inundated by the Dinkey Creek Hydroelectric Project. In 1984, the Willow Flycatcher was added to the U.S. Forest Service Region 5 Sensitive Species list. The U.S. Fish and Wildlife Service has also designated the Willow Flycatcher as a Sensitive Species for Region 1 (Washington, Idaho, Oregon, California, and Nevada) on the basis of significant declines in this region (Sharp 1986). The Willow Flycatcher is currently under review for possible listing as a state Threatened or Endangered Species (R. Schlorff pers. comm.).

Many authors agree that alteration and loss of riparian habitat, especially in the Central Valley, had a role in the decline of Willow Flycatchers (Remsen 1978, Garrett and Dunn 1981). However, the absence of Willow Flycatchers in apparently suitable habitat suggests that other factors are also at work. Brown-headed Cowbird (*Molothrus ater*) nest parasitism has been suggested as a cause of the Willow Flycatcher's decline (Gaines 1974). Studies at low elevations in southern California suggested that the Willow Flycatcher is susceptible to cowbird parasitism (Hanna 1928, Rowley 1930). Friedmann (1963) reported 150 instances of Brown-headed Cowbird parasitism of Willow Flycatchers, 41 of which were reports from southern California. Gaines (1974) concluded that 9 of 12 species (including the Willow Flycatcher) known to have declined along the Sacramento River are highly susceptible to cowbird parasitism. Decline of Willow Flycatchers in central and coastal California coincides with the spread of cowbirds in the 1920s and 1930s (Gaines 1974, Garrett and Dunn 1981). The lack of overlap in breeding seasons between Brown-headed Cowbirds and Willow Flycatchers in the Shaver Lake area and the lack of observed parasitism (Stafford and Valentine 1985) suggest that cowbird parasitism may be less important in the Sierra Nevada than at lower elevations (but see Flett and Sanders 1987).

Grazing in riparian habitats has been suggested as a possible factor in decline of the Willow Flycatcher in the Sierra Nevada and elsewhere (Serena 1982, Stafford and Valentine 1985, Taylor 1986, Flett and Sanders 1987). Cattle can adversely affect Willow Flycatchers by disturbing nests (Stafford and Valentine 1985, Flett and Sanders 1987) and by changing the structural features of riparian habitat such as meadow wetness (drying of meadows by soil compaction and gullyng), willow foliage height, and willow foliage volume (Serena 1982, Taylor 1986). At the Malheur Wildlife Refuge in Oregon, ungrazed transects had higher willow foliage density and volume and had more Willow Flycatchers than grazed transects (Taylor and Littlefield 1986). These authors also present data indicating a correlation between increases in Willow Flycatcher numbers and decreases in grazing. Other factors that might be involved in the decline of Willow Flycatchers in the Sierra Nevada include loss of meadow habitat due to reservoir and hydroelectric development, fires set by grazers, Lodgepole Pine (*Pinus contorta*) encroachment on meadows, and events on the wintering grounds (Serena 1982).

The habitat relationships of Willow Flycatchers in the Sierra Nevada were studied by Serena (1982). Complete analysis of our habitat data will be reported elsewhere (Harris et al. 1987), but we present here a few brief comments on the habitat preferences of Willow Flycatchers. In agreement with Serena (1982), we found that most birds (104 of 110) were in meadows larger

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than 8 ha. Broad, flat areas seem to be preferred, as suggested by Grinnell and Storer (1924) and Gaines (1977). Serena reported no association between occurrence of Willow Flycatchers and the wetness of meadows. During our survey, Willow Flycatchers appeared to prefer wet meadows (see also Flett and Sanders 1987; Stafford and Valentine pers. comm.). Virtually all of the sites with more than one singing male had standing water. Willow Flycatchers were only found where the willow cover was at least 2 m high. The total amount of willow cover, obviously correlated with meadow size and percent cover of willow, is also important, though the percentage cover of willow alone may show no association with Willow Flycatcher presence or absence (Serena 1982). Most of the sites with Willow Flycatchers had high foliage density. Meadows in which the willows were very arborescent, or in which willows had been severely "high-lined" by cattle, generally did not support Willow Flycatchers. Meadows with clumps of willow separated by openings were preferred over solid masses of willow, as suggested by Serena (1982), although Willow Flycatchers were sometimes found at the edge of such masses of willow.

## SUMMARY AND MANAGEMENT RECOMMENDATIONS

The 1982 survey resulted in the observation of 103 singing males in the Sierra Nevada. Nineteen sightings were reported in addition, giving a statewide total of 122 singing males for 1982. Our surveys resulted in sightings of 110 singing males. We have also received reports of an additional 6 birds in the Sierra/Cascades region, for a total thus far of 116 singing males. Unitt (1987) and L. Salata (pers. comm.) suggest breeding populations of about 15 pairs on the Santa Margarita River and about 12 pairs on the San Luis Rey River (both in San Diego County). This gives a statewide total for 1986 of about 143 singing males. It appears that in California the species has been reduced to a small number of marginal populations. These belong to three subspecies, one of which (*E. t. extimus*) has declined dramatically in most of its range. Three relatively small areas account for about two thirds of the known Sierra Nevada population. With the two San Diego County populations, these account for 70 percent of the known statewide population of Willow Flycatchers.

We believe that our results and the results of past surveys justify the following management recommendations:

- 1.** The Willow Flycatcher should receive Threatened or Endangered status because of its small population size, evidence of severe decline in numbers, and the concentration of the majority of the state's breeding Willow Flycatchers in five areas. This situation is critical because the Little Truckee River population appears to be declining, the Shaver Lake population is threatened by hydroelectric development, and two dams, which would flood much of the existing riparian habitat, have been proposed for the Santa Margarita River. Management planning should recognize the plight of all three of the recognized subspecies of Willow Flycatcher occurring in California and should address the preservation of genetic variation in this species.
- 2.** Future surveys should attempt to clarify the status of the species in areas not previously surveyed, including north coastal California, the Klamath Moun-

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tains and Cascades, and northeastern California in general. Areas of concentration should continue to be surveyed.

**3.** Existing meadow sites should be protected from habitat loss (as from hydroelectric projects or housing developments). Acquisition of private parcels or purchase of conservation easements by public agencies or conservation organizations may be appropriate in some situations.

**4.** Planning for the species should recognize that a site that is unoccupied during a given year should not be considered to be unsuitable, as it may be reoccupied. This is likely to be important especially for small sites.

**5.** Riparian vegetation should be protected from grazing wherever possible, particularly where grazing is reducing foliage density or drying meadow sites by soil compaction and gulying. Furthermore, grazing in riparian zones should be curtailed during June and July, when Willow Flycatchers are breeding. More studies are needed to clarify the effects of grazing on riparian birds.

**6.** Further studies are needed on the responses of Willow Flycatchers to Brown-headed Cowbird nest parasitism, particularly at lower elevations. Experiments in cowbird removal would provide useful data and might enhance Willow Flycatcher populations.

**7.** Response of Willow Flycatchers to revegetation and meadow restoration should studied, as a possible means of increasing the amount of available habitat and of attracting Willow Flycatchers to otherwise suitable meadows. Restoration of Willow Creek, Modoc County, provides an encouraging model for meadow restoration (Clay 1984).

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Sketch by Keith Hansen