

WILLOW FLYCATCHERS IN WARNER VALLEY, PLUMAS COUNTY, CALIFORNIA

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Abstract. Annual surveys for Willow Flycatchers (*Empidonax traillii*) have been conducted since 1996 in the Almanor Ranger District of the Lassen National Forest. Results from surveys in Warner Valley, Plumas County, California, in 1996–1998 suggested a population of as many as 45 breeding pairs. In 1998, we monitored this population to determine the number of territories and obtain preliminary information on their productivity. We mapped 32 territories and recorded 7 additional singing males during some surveys. Ten Willow Flycatcher nests were found; 7 successfully fledged at least one young, and there was no known parasitism by Brown-headed Cowbird (*Molothrus ater*). All of the nests were built in mountain alder (*Alnus incana*) shrubs, and 9 of the nests sites were surrounded by Lemmon's willow (*Salix lemmonii*) shrubs. Shrub cover within 5 m of the nests was comprised entirely of Lemmon's willow and mountain alder.

Key Words: *Empidonax traillii*, montane meadow, nest monitoring, Sierra Nevada, territory mapping, Willow Flycatcher.

The Willow Flycatcher (*Empidonax traillii*) is a neotropical migratory species that breeds throughout much of the United States and portions of southern Canada, and winters from southern Mexico to northern Central America (Sedgwick 2000). Four subspecies are generally recognized, and three breed in California. Historically, Willow Flycatcher was a common breeding species throughout the state (Grinnell and Miller 1944), but severe declines in populations led to the species being listed as Endangered in 1990 under the California Endangered Species Act (California Department of Fish and Game 1991). The subspecies *E. t. extimus*, which breeds in the southern portions of the state and elsewhere in the southwestern United States, is federally listed as Endangered (U.S. Fish and Wildlife Service 1995).

The other subspecies known to breed in California are *E. t. brewsteri* and *E. t. adastus*. The former was once common along California's Pacific Coast (Eliot 1923) and in the Sierra Nevada (Grinnell and Miller 1944). In California, *E. t. brewsteri* is now almost entirely restricted to montane meadows in the western Sierra Nevada and Cascades; a recently discovered breeding pair in Humboldt County is the only known current record from coastal California (R. Hewitt, pers. comm.). Within California, *E. t. adastus* breeds east of the Sierra Nevada and Cascade crestline from the Oregon border to Inyo County. It is not known which subspecies occurs at breeding sites near the crestline of the Sierra Nevada and Cascades, including our study area, and it is possible these birds are hybrids between *brewsteri* and *adastus* (Phillips 1948, Unitt 1987).

In an effort to update the status and distribution of Willow Flycatcher in California, the Cal-

ifornia Department of Fish and Game (CDFG) conducted surveys throughout the Sierra Nevada in 1982 and 1986 (Serena 1982, Harris et al. 1988), primarily on U.S. Forest Service and National Park Service lands, which resulted in an estimate of 150 pairs in the Sierra Nevada. Recent attempts by the Sierra Nevada Framework Project to synthesize Willow Flycatcher survey results led to a similar estimate of 300–400 individuals in the Sierra Nevada (R. Stephani, pers. comm.). In 1982 and 1986, 8 and 11 (respectively) singing males were detected on lands in, and adjacent to, the Almanor Ranger District (ARD) of the Lassen National Forest, at the northern boundary of the Sierra Nevada. In 1996, ARD biologists began annual Willow Flycatcher surveys in Warner Valley, a site not previously surveyed. Results suggested that Warner Valley supported one of the largest populations of breeding Willow Flycatchers in the Sierra Nevada (as many as 49 pairs). However, conclusions were based on single-day surveys conducted early in the breeding season, when migrant individuals are still passing through the area and may contribute to an overestimation of the population size.

The principal objective of the present study was to determine the number of breeding territories present in Warner Valley based on surveys conducted on multiple days throughout the season. Further, we obtained preliminary information on the productivity of the Warner Valley Willow Flycatcher population.

METHODS

Warner Valley is a large (250 ha) montane meadow approximately 2 km long and 100–750 m wide, at approximately 1525 m elevation. It is located in northern Plumas County (Fig. 1) near the crestline of the far northern extent of the Sierra Nevada. Approximately

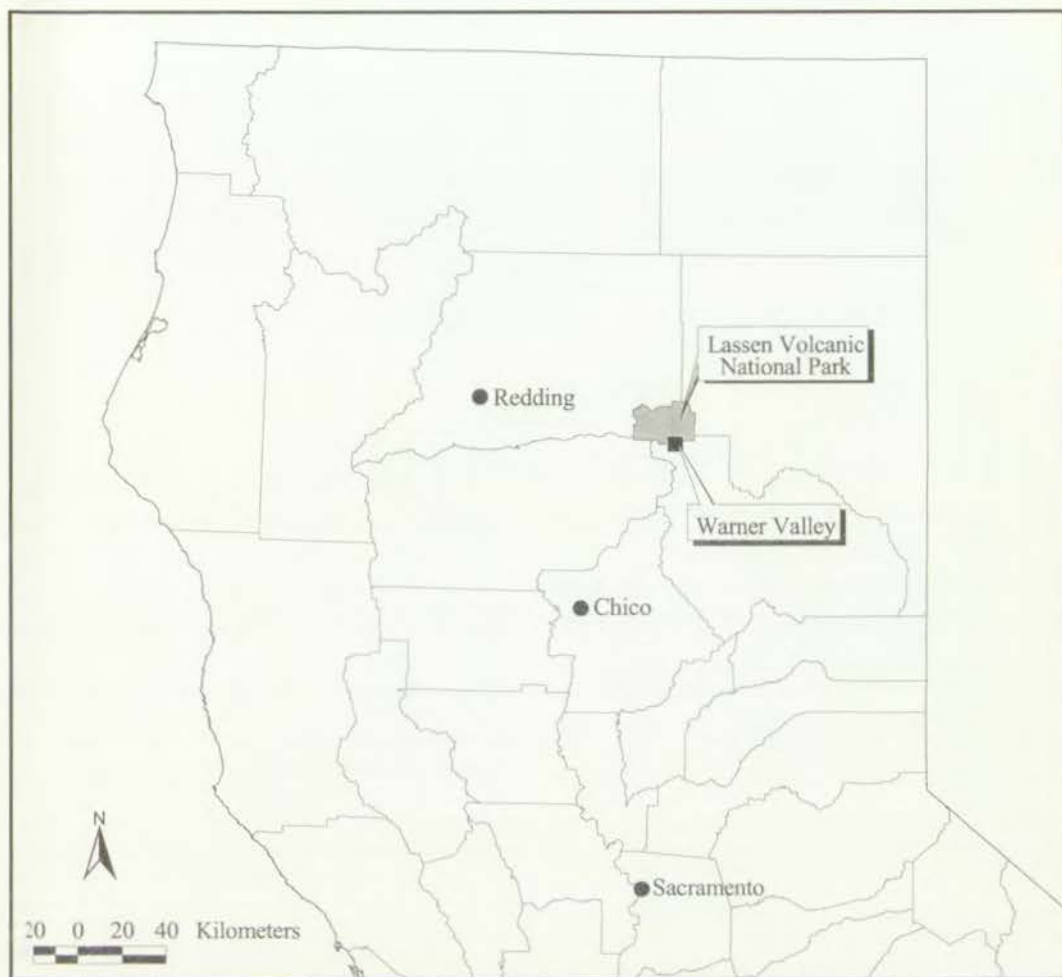


FIGURE 1. Location of Warner Valley, Plumas County, northern California.

90% of Warner Valley is a California Department of Fish and Game (CDFG) Wildlife Area, and the remaining portions are within the ARD and Lassen Volcanic National Park (LVNP). The habitat is primarily comprised of Lemmon's willow (*Salix lemmonii*) and mountain alder (*Alnus incana*) clumps interspersed with open herbaceous areas of grasses and sedges (*Carex* spp.). Mixed coniferous forest, dominated by lodgepole pine (*Pinus contorta*), surrounds the meadow and is present in pockets of higher ground within the meadow. Warner Creek generally flows along the western boundary of the meadow, and several large beaver ponds and numerous small channels of flowing water are present.

In 1998, we surveyed for Willow Flycatchers in Warner Valley 6 times between June 18 and July 20. Surveys began at sunrise and were concluded by noon. The starting point of each survey alternated between the northern and southern ends of the meadow. We slowly walked a meandering route through the meadow stopping periodically for up to ten minutes and

listening for Willow Flycatcher songs and calls (tape playback was not used). Each time a singing individual was encountered, we followed it for at least 10 minutes and mapped its movements on an aerial photograph. Detections of Brown-headed Cowbirds (*Molothrus ater*) were also noted.

Opportunistic nest searching was conducted during surveys: if nesting behavior was observed, up to 15 minutes were spent searching for the nest. Additional nest searching was conducted after morning surveys but was restricted to the most accessible territories and those where nesting behavior had been observed. Nests were monitored every 5–10 days until the outcome was determined, and the cause of failure was recorded when known. Nest searching and monitoring were conducted following Martin and Geupel (1993) to minimize disturbance and observer-influenced predation. Data on vegetation variables were collected at all nest sites soon after completion of the nesting attempt, and generally followed Breeding Biology Research and Monitoring Database guidelines (Martin et al. 1997).

Total shrub cover, cover of each shrub species, and ground cover (i.e., grass/sedge, shrub, forb, log, bare ground, and water) were estimated within a 5-m radius of the nest. Nest dimensions, nest height, number and size of supporting branches, substrate height, and canopy cover at the nest site were measured; dimensions of the nest clump and nest concealment were estimated.

RESULTS

Thirty-two territorial male Willow Flycatchers were detected during multiple surveys throughout the census period. Seven additional singing males were detected during some of the surveys; these were likely migrant individuals that did not breed in the immediate area. The sex of the singing individuals was based on behavioral observations, such as singing locations and interactions with other individuals. The number of territories occupied by a breeding pair was not determined, though pairs were documented in many of the territories. Brown-headed Cowbirds appeared to be very scarce in the area; no more than three male cowbirds were detected during each of the five surveys, and no female cowbirds were detected.

Ten Willow Flycatcher nests were found. Monitoring observations provided some estimates of nest timing; dates of clutch initiation ranged from June 25 to July 19, hatching dates from July 10 to August 3, and fledging dates from July 22 to August 17. Clutch size was determined for six nests: four had a clutch size of four, and two nests had three-egg clutches. Seven of the 10 nests fledged at least one young; two of the failed nests were abandoned (one during building and one with eggs that may have been infertile), and the third was either abandoned during laying or partially depredated and subsequently abandoned. No cowbird eggs or young were found in any nest.

All 10 nests were built in mountain alder shrubs; nine were entirely surrounded by Lemmon's willow. Mean nest height was 1.3 m ($SD = 0.31$; range 0.9–1.9 m), and mean height of nest substrates was 2.8 m ($SD = 0.9$; range 1.8–5.0 m; Table 1). Shrub cover within 5 m ranged from 35% to 100% (mean = 56%; $SD = 21.2$) and was entirely comprised of Lemmon's willow and mountain alder (Table 1). Grasses and sedges accounted for an average of 96% of the ground cover within 5 m, with forbs and open water accounting for the remaining 4%. Although open water was a small portion of the total ground cover, the soil at all nest sites was completely saturated throughout the breeding season, and, in many cases, the herbaceous cover was growing in standing water.

TABLE 1. VEGETATION PARAMETERS FOR WILLOW FLYCATCHER NESTS FOUND IN WARNER VALLEY, PLUMAS COUNTY, CALIFORNIA, IN 1998 ($N = 10$)

Vegetation variable	Mean \pm SD	Range
Nest height (m)	1.3 \pm 0.31	0.9–1.9
Substrate height (m)	2.8 \pm 0.92	1.8–5.0
Total shrub cover (%)	56.0 \pm 21.2	35.0–100
Willow cover (%)	57.3 \pm 26.5	32.5–98.3
Alder cover (%)	42.6 \pm 26.4	1.8–71.3
Green ground cover (%)	98.5 \pm 2.2	95.0–100

DISCUSSION

Historically, Willow Flycatchers were widespread and abundant in montane meadows of the Sierra Nevada, including the Lassen region (Grinnell et al. 1930, Grinnell and Miller 1944). However, surveys conducted in 1982 and 1986 indicated dramatic declines and extirpation from many historical sites in this area (Serena 1982, Harris et al. 1988). After the species was listed as Endangered in California, many agencies and land managers began annual surveys of appropriate habitat on their lands to assess and monitor the status of the species. Warner Valley, first surveyed in 1996, was found to support a relatively large population of Willow Flycatchers.

Single-day surveys conducted by ARD biologists in 1996–1998 led to a population estimate of approximately 45 breeding pairs, but subsequent to our study, ARD surveys in 2000 and 2001 detected 35 and 29 singing individuals, respectively. Although these differences between years may have been a result of annual variation in population size, survey dates and seasonal conditions are likely contributing factors. Surveys in earlier years were conducted in early June, while in later years surveys were conducted in mid to late June. Although the 1998 ARD survey was conducted on June 17, it was a very heavy snow year, and migrants unable to continue to higher elevations may have been present in Warner Valley at the time of the survey.

We suggest that results of our study and ARD surveys in 2000 and 2001 may provide a more accurate estimate of the Warner Valley breeding population than earlier ARD surveys. Therefore, in 1998–2001 Warner Valley probably supported a breeding population of 30–35 territorial males, and perhaps as many breeding pairs. Although the flycatcher population in Warner Valley may not be as large as originally suspected, it is the largest known population at a single meadow

and accounts for approximately 20% of known Willow Flycatchers in the Sierra Nevada.

Warner Valley Willow Flycatcher nest success (70%) in 1998 was higher than values reported for central Sierra Nevada sites: 60% in 1997 ($N = 25$), 48% in 1998 ($N = 65$), and 26% in 1999 ($N = 69$) (Bombay et al. 1999, Morrison et al. 1999a). However, small sample size and single-season data warrant additional data collection before concluding this population truly has higher nest success. The apparently high nest success in Warner Valley may be related to low nest predation and low cowbird parasitism rates. The use of mountain alder as a nest substrate was unexpected. Other studies in the Sierra Nevada have found Willow Flycatcher nests predominantly in willows (Bombay 1999). The sturdy structure of mountain alder stems may provide a more solid nest substrate, while the thicker foliage of Lemmon's willow may provide better cover for nest concealment.

Our results indicate Warner Valley supports a significant Willow Flycatcher population, apparently with relatively high nest success. Expanded study of this population could provide valu-

able demographic information on productivity, survival, and site fidelity. Future monitoring should investigate the potential importance of mountain alder and other features of the vegetation and physical environment of the meadow as a whole, and of individual territories and nest sites. This information would improve understanding of Willow Flycatchers habitat requirements in the Sierra Nevada and help guide management efforts to ensure the appropriate vegetation and hydrological characteristics are maintained at Warner Valley.

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