

MONTANE RIPARIAN HABITAT AND WILLOW FLYCATCHERS: THREATS TO A SENSITIVE ENVIRONMENT AND SPECIES¹

Susan D. Sanders and Mary Anne Flett²

*Abstract: Mountain meadows provide critical habitat for California's dwindling population of Willow Flycatchers (*Empidonax traillii*) and for many other breeding birds. Most meadows in the western United States are managed for livestock production or other consumptive uses rather than for wildlife. The potential threats to Willow Flycatchers and their habitat are discussed, and suggestions to protect and enhance mountain meadow habitat for this and other riparian species are offered.*

California's montane meadows have received relatively little attention from wildlife biologists and conservationists concerned with riparian habitat protection. For example, only two papers presented at the first California Riparian Systems Conference (Warner and Hendrix 1984) discussed mountain meadows, compared to 24 concerning Central Valley riparian systems. Mountain meadows deserve attention from riparian researchers because these wetlands support rich biological communities, and because they provide valuable scenic and recreational resources to California's expanding human population. Montane meadows also contribute a high proportion of the forage on forest grazing allotments and wilderness areas (Ratliff 1982). Land managers need information about the effects of grazing on biological resources in order to resolve these potentially conflicting uses of mountain meadows.

Montane meadow systems are the stronghold of California's population of Willow Flycatchers, an obligate riparian species whose range and numbers have dramatically diminished. Our particular concern is the status and habitat requirements of Willow Flycatchers in California, and the potential threats to Willow Flycatchers and other inhabitants of montane meadows from livestock grazing and Brown-headed Cowbird (*Molothrus ater*) parasitism. We make management recommendations to protect and enhance habitat for Willow Flycatchers and an assemblage of riparian bird species breeding in Sierra Nevada high elevation meadows in our conclusions.

We define meadows here as open wetlands characterized by hydrophytes, mesophytes, and dry herbland of the subalpine and alpine zone (Ratliff 1984). We focus on wildlife resources rather than floristic distinctions,

and therefore we do not follow the finer meadow classifications delineated by Ratliff (1982) and Benedict (1984).

Perazzo Meadows and Lacey Valley, the sites at which we conducted most of our field research, occur along the Little Truckee River in Sierra County, California, approximately 32 km northwest of Truckee. These sites are at 2010 m on the east slope of the Sierra Nevada in Tahoe National Forest. Perazzo Meadows and Lacey Valley are very large, wet meadows dominated by grasses, rushes (*Juncus* spp.), and sedges (*Carex* spp.). The riparian zone consists of willow shrubs (*Salix lemmonii* and *S. jepsonii*) that parallel streams and old oxbows in the meadow. Lodgepole pine (*Pines contorta* var. *murrayana*) forest surrounds the meadows.

Our discussion of Willow Flycatcher habitat requirements and potential threats to the species is based largely on field work conducted from mid June to late August in 1986 and 1987 at Perazzo Meadows and Lacey Valley. In addition to these studies, we surveyed meadows throughout the Sierra Nevada in June and July of 1986, searching for Willow Flycatchers and correlating their presence with habitat variables. The results of these surveys, discussed in detail by Harris and others (1987), also contribute to our analysis of Willow Flycatcher distribution, status, and habitat affinities.

Status of Willow Flycatchers in California

Willow Flycatchers have been extirpated as breeding birds from most of their former California range (Grinnell and Miller 1944; Flett and Sanders 1987; Harris and others 1987; Serena 1982). A few remaining populations inhabit isolated meadows of the Sierra Nevada. The largest of these mountain meadow populations occurs along the Little Truckee River drainage, which supports approximately 25 singing males. This species also occurs at lower elevations along the Kern, Santa Margarita, and San Luis Rey Rivers (Remsen 1978; Serena 1982; Unitt 1987). Recent surveys indicate a population of approximately 145 singing males in California (Harris and others 1987).

The loss of lowland riparian woodlands is probably the principal reason for the reduction of California's

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² Senior Biologist, PAR & Associates, Sacramento, Calif. and Consulting Biologist, 1751 Delaware Street, Berkeley, Calif.

Willow Flycatcher population and the contraction of its range (Remsen 1978; Serena 1982). Nest parasitism by Brown-headed Cowbirds and livestock grazing may have also contributed significantly to population reduction (Gaines 1977, Serena 1982; Beedy and Granholm 1985; Sharp 1986; Taylor 1986; Taylor and Littlefield 1986). Other factors responsible for Willow Flycatcher declines in the Sierra Nevada may include loss of meadows due to reservoir and hydroelectric development, lodgepole pine encroachment on meadows, and habitat loss on wintering grounds (Serena 1982).

Habitat Requirements

Three features emerge as critical components of Willow Flycatcher habitat: large meadow size, water and willows. In the Sierra Nevada, Willow Flycatchers inhabit broad, flat meadows that are generally larger than 8 hectares, and that contain scattered clumps of willows (Harris and others 1987). They typically shun willow thickets on steep terrain, or narrow bands of willows bordered by conifer forest.

Water is an essential element on Willow Flycatcher territories. Twenty out of 22 territories at our study sites encompassed old oxbows, small secondary channels, or the Little Truckee River (Sanders and Flett 1988). All territories included areas with saturated soils, at least early in the season. Serena (1982) found that the portions of the meadows used by Willow Flycatchers were at least 40 percent wet. She also found that within meadows that contained dry areas, Willow Flycatchers occurred in the wettest sites.

In the Sierra Nevada, Willow Flycatchers are found only in meadows that contain willows (Harris and others 1987). All 22 Willow Flycatcher territories in our study site consisted of willow clumps separated by clearings. Willow cover on these territories averaged approximately 40 percent.

Willow Flycatchers build their nests in willows, and use these shrubs for foraging and singing perches, leaf and twig gleaning, and for cover. To provide suitable nesting habitat the willows should be at least 2 m in height, with a foliage density of approximately 50-70 percent. Nests generally are built at approximately 1 m in height, with about 1 m of willow cover above the nests (Sanders and Flett 1988).

Livestock Grazing

Direct Effects. Cattle can directly disturb Willow Flycatchers and other species nesting in montane meadows by knocking over nests in willow thickets or by

crushing the eggs of ground-nesting birds. Stafford and Valentine (1985) and Valentine (1987) report that 4 of 20 nests monitored over a 4 year period were destroyed by cattle. Livestock also destroyed four nests shortly after the young fledged.

Cattle did not destroy any Willow Flycatcher nests in our study sites, although Perazzo Meadows contained approximately 150 cattle in 1986, and up to 360 in 1987. However, our data show that Willow Flycatchers invariably place their nests near the edge of willow clumps or along livestock trails, making them potentially vulnerable to disturbance by cattle (Flett and Sanders 1987).

In addition to Willow Flycatchers, at least 16 other bird species breeding in mountain meadows could be directly affected by cattle. Willow-nesting species include Yellow and Wilson's Warble (*Dendroica petechia* and *Wilsonia pusilla*), White-crowned Sparrow (*Zonotrichia leucophrys*), Song Sparrow (*Melospiza melodia*), and Red-winged Blackbirds (*Agelaius phoeniceus*). Ground nesting birds in mountain meadows are particularly vulnerable to trampling by livestock. These species include Canada Goose (*Branca canadensis*), Mallard (*Anas platyrhynchos*), Cinnamon Teal (*A. cyanoptera*), Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), Killdeer (*Charadrius vociferus*), Spotted Sandpiper (*Actitis macularia*), Common Snipe (*Gallinago gallinago*), Wilson's Phalarope, (*Phalaropus tricolor*), Savannah Sparrow (*Passerculus sandwichensis*), and Lincoln's Sparrow (*Melospiza lincolni*).

The potential for livestock to trample or upset bird nests depends on the overlap between the nesting season and presence of the livestock. Most species are incubating eggs or nestlings by late June, and are therefore particularly vulnerable to livestock disturbance from then until early July. Willow Flycatchers, however, are unusually late breeders. At our study sites they established territories around mid to late June. The first eggs were not laid until the second or third week of June. The latest of the young fledged by mid-August; most species fledged two weeks to one month earlier.

Indirect effects. Livestock indirectly affect Willow Flycatchers and other species nesting in willows by altering the vegetation and hydrology of montane meadows. Cattle and sheep consume the lower branches and shrub layers of streamside vegetation and consume or trample young riparian plants (Taylor 1986). Even grazing for only a few days or weeks has been observed to adversely affect regeneration of woody vegetation (Crumpacker 1984). Obligate riparian species are more affected by grazing than other bird species (Mosconi and Hutto 1982). Duff (1979) reports a large increase in the number of passerine birds after excluding cattle from a riparian

area. This increase was due to the reestablishment of the middle story of willows.

Livestock grazing can also reduce water quality, compact soils, and accelerate streambank erosion (Thomas and others 1979; Platts 1984). Streambank erosion due to overgrazing can eventually result in incising and gullying of streambeds (Ratliff 1984). Gullying can lower the water table of formerly moist meadows (Van Haveren and Jackson 1986), thus drying the soils and altering the meadow's vegetative composition.

Taylor and Littlefield (1986) documented the adverse effects of cattle grazing on Willow Flycatchers and Yellow Warblers at Malheur National Wildlife Refuge in Oregon. They censused these two species along riparian transects with different grazing histories. Taylor and Littlefield found that transects that had been ungrazed for forty years supported significantly more Willow Flycatchers and Yellow Warblers than grazed transects. Willow foliage volume and density was significantly higher in the ungrazed transects. Heavily grazed transects had very few willows and no Willow Flycatchers or Yellow Warblers. Taylor and Littlefield also presented 12 years of U.S. Fish and Wildlife Service Breeding Bird Survey data, indicating a significant relationship between increased Willow Flycatcher numbers and decreased grazing intensity.

Cowbird Parasitism

Brown headed Cowbird nest parasitism has been suggested as a cause of the Willow Flycatcher's decline in California (Remsen 1978). Their decline in central and coastal California coincides roughly with the spread of cowbirds in the 1920's and 1930's (Gaines 1977, Garrett and Dunn 1981). Friedmann (1963) reported 150 instances of Brown-headed Cowbird parasitism of Willow Flycatchers, 41 of which were reports from southern California.

Studies by Harris (in prep.) in 1987, at The Nature Conservancy Kern River Preserve, revealed intense parasitism by Brown-headed Cowbirds on Willow Flycatcher nests. The Kern River Preserve is a willow-cottonwood riparian woodland at an altitude of 750 m. At least 13 and possibly 16 of 19 Willow Flycatcher nests at the Kern River Preserve were parasitized by cowbirds. The losses due to parasitism resulted in a low egg-to-fledgling success rate of 24 percent.

While cowbird parasitism seems to be a major contributor to nesting failures of lowland populations of Willow Flycatchers, there is less evidence of cowbird parasitism in the higher elevations of the Sierra Nevada. One out of 22 Willow Flycatcher nests at our study sites

was parasitized by a Brown-headed Cowbird. The single cowbird fledged successfully, but its three Willow Flycatcher nestmates did not survive. The only other record of Willow Flycatcher nest parasitism in the mid to high elevation Sierra Nevada was from the Lake Tahoe region in 1960 (Gaines 1977).

Stafford and Valentine (1985) suggest that the peak of Willow Flycatcher egg-laying in the high-elevation Sierra Nevada often occurs after the peak of the cowbird breeding season. King (1954), studying parasitism in the state of Washington, also noted that the peak of egg deposition by Willow Flycatchers occurred after the height of the cowbird egg-laying season passed. He found only 2 of 44 Willow Flycatcher nests parasitized. On the other hand, studies of Willow Flycatcher populations living at high elevation (2,500 m) sites in northcentral Colorado documented high parasitism rates (Sedgewick and Knopf 1988). At least 40 percent (11 out of 27) of the Willow Flycatcher nests found during that study were parasitized by Brown-headed Cowbirds.

Cowbird parasitism on Willow Flycatcher nests is a potential threat at high elevations and clearly is a serious problem at lower elevations in California. Laymon (1987) suggests that reducing or eliminating livestock grazing in mountain meadows could increase the reproductive success of Willow Flycatchers. Elimination of grazing allows grass to grow too tall to be suitable cowbird foraging habitat and removes the large grazers with which cowbirds associate.

Conclusions and Management Recommendations

Wet meadows of the Sierra Nevada are critical resources for the rare Willow Flycatcher and for many other breeding birds. These meadows are typically managed for livestock production, often to the detriment of wildlife. The following recommendations provide guidelines for protecting and enhancing mountain meadows that support Willow Flycatchers. These management recommendations would also confer benefits to a diverse array of riparian birds breeding in montane meadows.

- **Eliminate or Delay Grazing** — To avoid the direct and indirect impacts associated with livestock, grazing should be reduced or eliminated in meadows and riparian areas that support Willow Flycatchers. One alternative to eliminating grazing entirely is to delay putting cattle on high elevation meadows until mid-August, after Willow Flycatchers have fledged. Another alternative is to exclude cattle from the vicinity of streams and riparian vegetation by fencing, providing an alternative source of water for livestock by means of stocktanks. These recommendations have

the added benefit of protecting nests and habitat for at least 16 other species of birds that breed in mountain meadows.

- **Acquire Habitat** — Montane meadows and riparian areas that support Willow Flycatchers should be protected and managed as a primary resource on public lands. Occupied and potential sites on private lands should be protected by conservation easements with landowners or by land purchases. In particular, efforts should be made to permanently protect the meadow system along the Little Truckee River. These meadows support the second largest known Willow Flycatcher population in the state, and the largest Sierra Nevada population.
- **Avoid Developments Adjacent to Montane Meadows** — Cowbirds frequently feed in disturbed areas where high energy foods are concentrated, including residential housing with bird feeders, campgrounds, corrals, and garbage dumps (Airola 1986). Such developments should be kept away from riparian areas to minimize the impacts of the cowbirds on Willow Flycatchers and other species nesting in willow thickets of mountain meadows. Excluding residential and housing developments near meadows would also reduce the potential for disturbance from humans, dogs, cats, and off-road vehicles, all of which could have significant impacts on birds breeding in mountain meadows.
- **Revegetate and Restore Montane Meadows** — The response of Willow Flycatchers to revegetation and meadow restoration should be explored as part of a comprehensive plan of habitat protection and enhancement. Restoration of Willow Creek in Modoc County provides a promising model of such efforts (Clay 1984). In addition, Valentine (1987) makes some specific suggestions for restoring meadows that support Willow Flycatchers.

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