State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

REPORT TO THE FISH AND GAME COMMISSION:

STATUS REVIEW OF THE WILLOW FLYCATCHER (*Empidonax traillii*) IN CALIFORNIA

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Department Candidate Species Status Report 90-04

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Report to the Fish and Game Commission: Status Review of the Willow Flycatcher (*Empidonax traillii*) in California

EXECUTIVE SUMMARY

This report summarizes a petition prepared by the Department of Fish and Game to list the Willow Flycatcher (*Empidonax traillii*) as an Endangered Species.

On February 5, 1990, pursuant to Section 2074.2 of the Fish and Game Code, the Commission determined that the petitioned action may be warranted and conferred candidate status on the Willow Flycatcher. Pursuant to Section 2074.6 of the Fish and Game Code, the Department undertook a review of the petition. Based on the best scientific information available on the Willow Flycatcher, the Department has evaluated whether the petitioned action should be taken. Information and comments on the petitioned action were solicited from interested parties, management agencies, and scientists.

This report presents the results of the Department's review.

Findings

The Willow Flycatcher (*Empidonax traillii*), a small songbird, was formerly a common summer resident throughout California. Its breeding range extended wherever extensive willow thickets occurred. The species has now been eliminated as a breeding bird from most of its former range in California. Only five populations of significance remain in isolated meadows of the Sierra Nevada and along the Kern, Santa Margarita, San Luis Rey and Santa Ana rivers in southern California. The smallest of these consists of about six pairs and the largest about 44 pairs. The total population estimate for California is about 200 pairs of Willow Flycatchers.

The loss of riparian habitat is the principal reason for the decline of California's Willow Flycatcher population and contraction of the species range. Impacts to habitat and breeding birds associated with livestock grazing have also been implicated in the decline of the species. Nest parasitism by Brown-headed Cowbirds (*Molothrus ater*) may have contributed significantly to population reductions.

More than a decade ago the California Department of Fish and Game designated the Willow Flycatcher a Bird Species of Special Concern, highest priority. This finding prompted several years of Department studies to further assess the status of Willow Flycatchers in California. Reports from the Pacific Coast and Southwest resulted in addition of the Willow Flycatcher to the National Audubon Society's Blue List of declined bird species in 1980 and 1986. 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) based on significant declines in this region. The Southwestern Willow Flycatcher (*E. t. extimus*), with small populations in southern California, is also a U.S. Fish and Wildlife Service candidate species.

Conclusions

The Willow Flycatcher is seriously endangered in a significant portion of its range in California due primarily to habitat loss and degradation as a result of various human activities including livestock grazing. Nest parasitism by Brown-headed Cowbirds also has negative impacts on the species. The Willow Flycatcher qualifies for designation as Endangered pursuant to Section 2062 of the California Fish and Game Code. The Department recommends Endangered status for the Willow Flycatcher based on the scientific information gathered from studies conducted by the Nongame Bird and Mammal Section of the Wildlife Management Division and independent researchers over the past twelve years.

Recommendations

1. The California Fish and Game Commission should find that the petitioned action is warranted for the status of State Endangered.

2. The Commission should publish notice of its intent to amend Title 14 CCR 670.5 to add the Willow Flycatcher (*Empidonax traillii*), to its list of Threatened and Endangered Species.

3. A survey of remaining willow riparian and montane meadow habitat should be conducted to determine the extent within the historic range of the Willow Flycatcher.

4. Periodic breeding population surveys should continue to be conducted in all remaining willow riparian and montane meadow habitats throughout the range of the Willow Flycatcher to determine the number of nesting territories and locations of isolated population fragments.

5. A population viability analysis of the Willow Flycatcher should be conducted.

6. The Department should continue to establish the interagency coordination and cooperation needed to minimize loss and disturbance of Willow Flycatcher habitat.

7. The Department, in cooperation with other agencies and scientists, should evaluate the feasibility of intensive management including the transfer of eggs and/or young between isolated populations to expand the breeding range and size of populations and to facilitate gene flow.

8. The Department should establish a recovery team and a management plan should be developed and implemented.

Public Responses

During the review period, the Department contacted affected and interested parties, invited comment on the petition, and requested submittal of additional scientific information. A copy of the Public Notice and a list of parties contacted appears in Appendix A. Copies of comments received and responses to those portions incorporating biological information are provided in Appendix B. Responses to non-scientific comments were not covered in this analysis but will be addressed as part of the regulatory proceedings should the Commission take action to list the Willow Flycatcher as Endangered.

Report to the Fish and Game Commission:

Status Review of the Willow Flycatcher (*Empidonax traillii*) in California

INTRODUCTION

Petition History

On February 5, 1990, the Fish and Game Commission received a petition prepared by the Department of Fish and Game recommending that the Willow Flycatcher (*Empidonax traillii*) be designated as an Endangered Species. The Commission considered the Department's recommendation and designated the Willow Flycatcher as a Candidate Species, as provided in Section 2074.2 of CESA, pending a review, pursuant to Section 2074.6 of CESA, by the Department of the status of the petitioned species. This report contains the results of the Department's status review and a recommendation, based on the best scientific information available, relative to the petitioned action. It also identifies essential habitats and recommends management and other activities required for recovery of the species.

Department Review

During the review period, the Department contacted affected and interested parties, invited comment on the petition, and requested additional scientific information. A copy of the Public Notice and a list of parties contacted appear in Appendix A. Copies of comments received and responses to those conveying biological information appear in Appendix B. Responses to non-scientific comments are acknowledged but not addressed in this document.

FINDINGS

Life History

Description

The Willow Flycatcher is a small (length is 5 3/4") perching bird with brownish-olive upper parts, a pale olive breast, pale yellow belly, and whitish throat. The bird lacks a conspicuous eye ring. Willow Flycatchers have a habit of flicking the tail upward. The song of this species has a distinctive sneezy *fitz-bew* sound. The birds also make a *wit* call (National Geographic Society 1983). Like all species in the genus *Empidonax*, Willow Flycatchers are best identified by voice, habitat, behavior and subtle differences in size, bill shape, and tail length (National Geographic Society 1983).

Taxonomy

The Willow Flycatcher is a full species of the genus *Empidonax*. Flycatchers of this genus are extremely difficult to identify, all being somewhat drab and nondescript in plumage characteristics. The Willow Flycatcher, however, has a very distinctive territorial song that is like none other in the genus.

There are five recognized subspecies of Willow Flycatchers (Aldrich 1951). In California *E. t. brewsteri* occurs from the coast eastward to the Cascade Range and the Sierra Nevada. The *E. t. adastus* subspecies breeds between the Cascades in California eastward to the Rocky Mountains and *E. t. extimus* is described as breeding in the desert southwest and the southern Great Basin area. In California, all three subspecies have declined drastically with *E. t. extimus* being the most critically endangered throughout its southwestern range as well as its range in the southern part of the State.

Biology

Food Habits. Willow Flycatchers are "sit-and-wait" predators that catch insects on the wing. Their two feeding behaviors are hawking (sallying forth from a perch to capture flying insects) and aerial gleaning (picking insects from vegetation). Sanders and Flett (1989) observed far more hawking than gleaning at their study sites in the Sierra Nevada. Males hawked mostly from perches greater than 10 feet on their territories, particularly while singing. Females were less conspicuous, and perched and foraged in the lower willow branches.

The diet consists primarily of a variety of flies, mosquitoes, and other terrestrial and aquatic insects.

Most foraging Willow Flycatchers fly less than three feet from a perch to hawk insects, although they occasionally pursue insects for up to 30 feet. Frakes and Johnson (1982) reported the average foraging flight distance from a perch to be about 13 feet. Sanders and Flett (1989) noted that Willow Flycatchers shifted their foraging perches every few minutes, and sometimes foraged from perches outside their territories.

Both males and females feed the nestlings and fledglings. The average interval between feedings is about 2.5 minutes (Sanders and Flett 1989).

Reproduction. Willow Flycatchers arrive and breed late compared to other passerines nesting in Sierra Nevada meadows. Willow Flycatchers arrive at their breeding territories in early to mid-June, form pairs, and establish territories by late June. Incubation lasts 12 days and is performed only by the female (King 1955). Two to four eggs are laid, with three to four most common (Bent 1963). The nestling period lasts approximately 14 days (King 1955).

In 1986 Sanders and Flett (1989) found that Willow Flycatchers had paired and established territories by late June at their Sierra Nevada study area. The first Willow Flycatcher eggs were laid around 20 June, and the first fledglings appeared by mid-July. Eggs were still being laid by 22 July, and the last young fledged on 14 August. Territorial defense declined during the week of 28 July, and the last breeding Willow Flycatchers left the study area by the final week of August.

Sanders and Flett (1989) found that the early part of the 1987 breeding season was similar to 1986. The first eggs were laid around the third week of June. The first fledglings appeared on 15 July. Fledglings were last observed on 4 August, and territories had broken down by 10 August. Breakdown of territories was probably accelerated by a July 17 snowstorm which destroyed most of the eggs and young at the study area.

In 1986, Sanders and Flett (1989) found that ten pairs of Willow Flycatchers produced a minimum of 31 eggs from 11 nests. The total number of young fledged in 1986 was 14 or 15. Five of 11 nests had complete egg-to-fledgling data. Fourteen eggs from these nests produced five fledglings.

In 1987 ten pairs of Willow Flycatchers produced at least 32 eggs. Only six young survived to fledgling, resulting in an egg-to-fledgling ratio of about 19%.

Nice (1957) reported a 46% egg-to-fledgling success rate for open-cup nesting birds, a significantly higher value than reported in the Sanders and Flett (1989) study. Stafford and Valentine (1985) reported egg-to-fledgling successes of 25% and 38% for Willow Flycatchers during the two years of its study, also substantially lower than reported by Nice (1957). Harris (pers. comm.) found a 24% nesting success for eight pairs of Willow Flycatchers nesting at the Kern River Preserve. The low success rate at the Kern Preserve was largely the result of nest parasitism by Brown-headed Cowbirds.

The net reproductive or replacement rate for Willow Flycatchers in the Sierra Nevada was calculated based on the two years of nesting results (Sanders and Flett 1989) and on studies by Harris (pers. comm.) and the Stafford and Valentine (1985). The net reproductive rate is defined as the average number of female young produced by each female during her entire lifetime (Wilson and Bossert 1971). Conservatively assuming a 50% annual mortality rate for young and adults, the net replacement rate for Willow Flycatchers in the Sierra Nevada is approximately 0.5. A replacement rate less than one indicates a declining population (Wilson and Bossert 1971). This calculation does not include immigration and recruitment from populations outside California, and may be overly pessimistic because it incorporates the catastrophic 1987 nesting season in the Sierra Nevada. Even without the 1987 nesting results from the Sanders and Flett (1989) study, however, the net replacement rate is still less than one. The observed low net replacement rate indicates the extreme vulnerability of the State's remaining Willow Flycatcher populations to local extinction.

Territory. Territories of mated male Willow Flycatchers ranged from 0.145-2.19 acres and averaged 0.84 acres. Much of the willow habitat at study areas in Perazzo Meadows and Lacey Valley was undefended and unoccupied by Willow Flycatchers. Territories rarely overlapped or shared common borders (Sanders and Flett 1989).

Stafford and Valentine (1985) reported an average territory size of 0.48 acre and a range of 0.22-0.94 acres in the southern Sierra. Walkinshaw (1966) calculated an average territory size of 1.74 acres for 73 territories in Michigan.

Although Willow Flycatchers conduct most of their foraging and other activities within their territories, both males and females use adjacent areas, especially when feeding young. Sanders and Flett (1989) found that, throughout the breeding season, males and females regularly use perches outside their defended territory for foraging. These perches ranged from 13-94 feet beyond the boundaries of the territory. The average foraging perch distance from the territory was approximately 62 feet. When parents were feeding nestlings and fledglings, they sometimes foraged as far as 330 feet from their territory (Sanders and Flett 1989).

Male Willow Flycatchers in Washington sang most frequently in the early stages of territory establishment, and that singing diminished throughout the incubation period (Ettinger and Kings, 1980). Singing had decreased to "essentially zero" by the time the young have fledged. In the southern Sierra Nevada, males with females on the nest rarely sang, unless provoked by a tape recording and even then at greatly decreased rates. Stafford and Valentine (1985) reported singing rates of 8-20 songs per minute in the pre-nesting season.

Sanders and Flett (1989) observed that male Willow Flycatchers sing more often early in the season than during the later stages of breeding. However, they found that males sang at any time during the breeding season and sometimes sang intensely even with eggs, young or fledglings on their territories.

Although males sometimes sing spontaneously and intensely when they have active nests, they are much more likely to sing spontaneously early in the season. In late June or early July, before nesting is underway, most or all males sing in the morning. In the late nesting season, an observer might not hear a single Willow Flycatcher song from dawn to dusk.

No consistent pattern accounts for the variation in singing rates for individuals, or for the variation among individuals on different days. The only generalization is that males are less likely to sing spontaneously late in the breeding season than in the early part of the season (Sanders and Flett 1989).

Sources of egg and nestling mortality

Unusually cold and wet weather was the primary known source of egg and nestling mortality in 1987 during the Sanders and Flett (1989) study in the Sierra Nevada. On 17 July, a snowstorm hit the northern Sierra, followed by four days of cold, rainy, and windy weather. According to local residents, a snowstorm of this duration and intensity was a rare event for that area. Sanders and Flett (1989) found eighteen dead nestlings in six nests on 21 July. One nest containing nestlings was upset by heavy winds, but all other young probably died from exposure or starvation. The storm was also responsible for the loss of three of four eggs in two nests. One egg survived the storm and hatched twelve days later, but this nestling subsequently disappeared. Six young Willow Flycatchers from two nests at Perazzo meadows fledged before the storm, and survived the bad weather. Sanders and Flett (1989) observed no adult Willow Flycatcher mortality as a result of the storm.

Essential Habitat

Breeding - Sierra Nevada Populations. Several studies have documented the habitat requirements of Willow Flycatchers breeding in California (Serena 1982, Flett and Sanders 1987, Harris et al. 1988, Sanders and Flett 1989). These studies consistently describe water and willows as essential elements on Willow Flycatcher territories. Some of these studies have also documented the need for large meadow size or clearings in the vicinity of territories.

Willow Flycatcher territories always include standing or running water or saturated soils. Twenty out of 22 territories (91%) along the Little Truckee River contained standing or running water, and all had saturated soils during the early stages of breeding and pair formation (Sanders and Flett 1989).

Kings River Conservation District biologists (Stafford and Valentine 1985) also noted that free water is required for Willow Flycatcher breeding territories. Harris et al. (1988) found that Willow Flycatchers were twice as frequent at sites where the meadows were at least 40% wet than at sites where wetness was less than 40%. Serena (1982) noted that within meadows with substantial dry areas, Willow Flycatchers were invariably found in the wettest sites.

In Sierra Nevada meadows, breeding Willow Flycatchers are riparian obligate species and are only found where willow thickets are present. This species uses willows for nesting, cover, insect gleaning, and as perches from which they sing and forage aerially. Willow Flycatchers prefer to use willows with dense foliage for nesting and cover (Whitmore 1977, Stafford and Valentine 1985, Flett and Sanders 1987). Because nests are usually placed about one meter (3 feet) above the ground in willows and need some foliage cover above the nest, willows on territories must be at least five feet tall (Sanders and Flett 1989).

Several authors have suggested that Willow Flycatchers prefer meadows in which the willow cover is divided into clumps separated by openings, rather than solid masses of willows (Grinnell and Storer 1924, King 1955, Serena 1982, Sanders and Flett 1989).

Serena (1982) and Harris et al. (1987, 1988) found most Willow Flycatchers in the Sierra Nevada occur in meadows larger than 26 acres. The majority of sites with more than one singing male were larger than 40 acres (Harris et al. 1987, 1988). On the other hand, Stafford and Valentine (1985) found that a pair of Willow Flycatchers bred successfully for several years in a meadow only 26,874 square feet (slightly more than 1/2 acre). Serena (1982) and Harris et al. (1987, 1988) noted that the absence of Willow Flycatchers from small meadows may actually reflect a transient state in a colonization-extinction process rather than an actual preference for them.

Willow Flycatchers do not require trees on their territories, but if trees or snags are present they are often used for singing and foraging perches. Tree cover that is too dense (greater than 50% canopy cover) creates unsuitable conditions for Willow Flycatchers.

Willow Flycatchers breed from sea level to about 8000 feet in elevation (Grinnell and Miller 1944, Garrett and Dunn 1981).

Breeding: Foothill and Lowland California. The preceding description of habitat requirements for breeding Willow Flycatchers is based chiefly on studies conducted at relatively high elevation meadows in the Sierra Nevada. California's foothill and lowland populations of Willow Flycatchers differ somewhat from mountain meadow populations in their habitat affinities. These habitat requirements have been well-described by early ornithologists. Dawson (1923, p.885) describes the Willow Flycatcher as: "a lover of the half-open situations, bushy rather than timbered, of clearings, low thickets, and river banks. Above all it is wedded to the lesser willows, *Salix flavescens, S. lasiolepis, S. sessifolia*, and the rest." Grinnell and Miller (1944, p.257) found Willow Flycatchers to be "strikingly restricted to thickets of willows, whether along streams in broad valleys, in canyon bottoms, around mountainside seepages, or at the margins of ponds or lakes."

As with high elevation populations of Willow Flycatchers, willows and water are the dominant habitat theme for lowland birds. Unlike Willow Flycatcher territories in montane meadows, arborescent willows and other riparian woodland species can be included on their breeding grounds. The nests may be placed in willow shrubs but are also found in elderberry bushes, roses, nettles, grapevines, and blackberry (Dawson 1923, Unitt 1987). The elevation of the nest is also considerably more variable than for montane meadow Willow Flycatchers, ranging from 2 feet to 18 feet above ground level (Unitt 1987).

In summary, the habitat requirements for breeding Willow Flycatchers in California include water and shrubby, dense clumps of willows. In the Sierra Nevada this species prefers large, flat, wet meadows that contain patches of willow clumps. At lower elevation sites, Willow Flycatchers require riparian woodland that includes water and low thickets of willows.

Migration. Willow Flycatchers are less selective about their choice of habitats while in migration in California. According to Grinnell and Miller (1944, p.257): "In migration, other kinds of woody plants, especially those growing on damp ground, are frequented as well as willows, just so they show the same habit of growth." During spring and fall migration, Willow Flycatchers are frequently observed in riparian woodland throughout coastal and lowland California.

Wintering. Willow Flycatchers winter in Central American south to Columbia (Grinnell and Miller 1944). Relatively little information is available about Willow Flycatcher habitat preferences on its winter range. Gorski (1969) observed a singing Willow Flycatcher defending a foraging territory about 2,300 feet from the Chagres River at Gamboa, Canal Zone, Panama. The vegetation in this area was transitional from a wet, grassy field at the edge of the river to low-lying shrubs interspersed with tall grass. As the dry season progressed, Willow Flycatchers were found only in areas containing open water or saturated soils. Based on this study it seems likely that Willow Flycatchers have an affinity for wet sites on both breeding and wintering grounds.

Distribution and Abundance

Historical and Current Distribution

The Willow Flycatcher was formerly found as a breeding species throughout California wherever its habitat, riparian willow thickets, could be found (Fig. 1) (Grinnell and Miller 1944). It nested at all elevations from sea level to about 8000 feet, and was apparently absent as a breeding species only from the hot deserts, the northwest coastal forest (though present locally along some rivers and streams) and the higher elevations above 8000 feet in the Sierra Nevada, Cascades, and Klamath Mountains (Grinnell and Miller 1944). Ridgeway referred to the Willow Flycatcher as the most abundant and widely distributed *Empidonax* flycatcher in the State of California (in Belding 1890).

The historic breeding distribution of Willow Flycatchers in California probably included representatives of three subspecies (Phillips 1948, Unitt 1987). *Empidonax traillii extimus* (the southwestern subspecies) occurred in southern California (Fig. 1) with its northern limits represented by specimens from Independence (Inyo Co.), the south fork of the Kern River near Weldon (Kern Co.) and the San Fernando Valley (Los Angeles Co.). This subspecies has

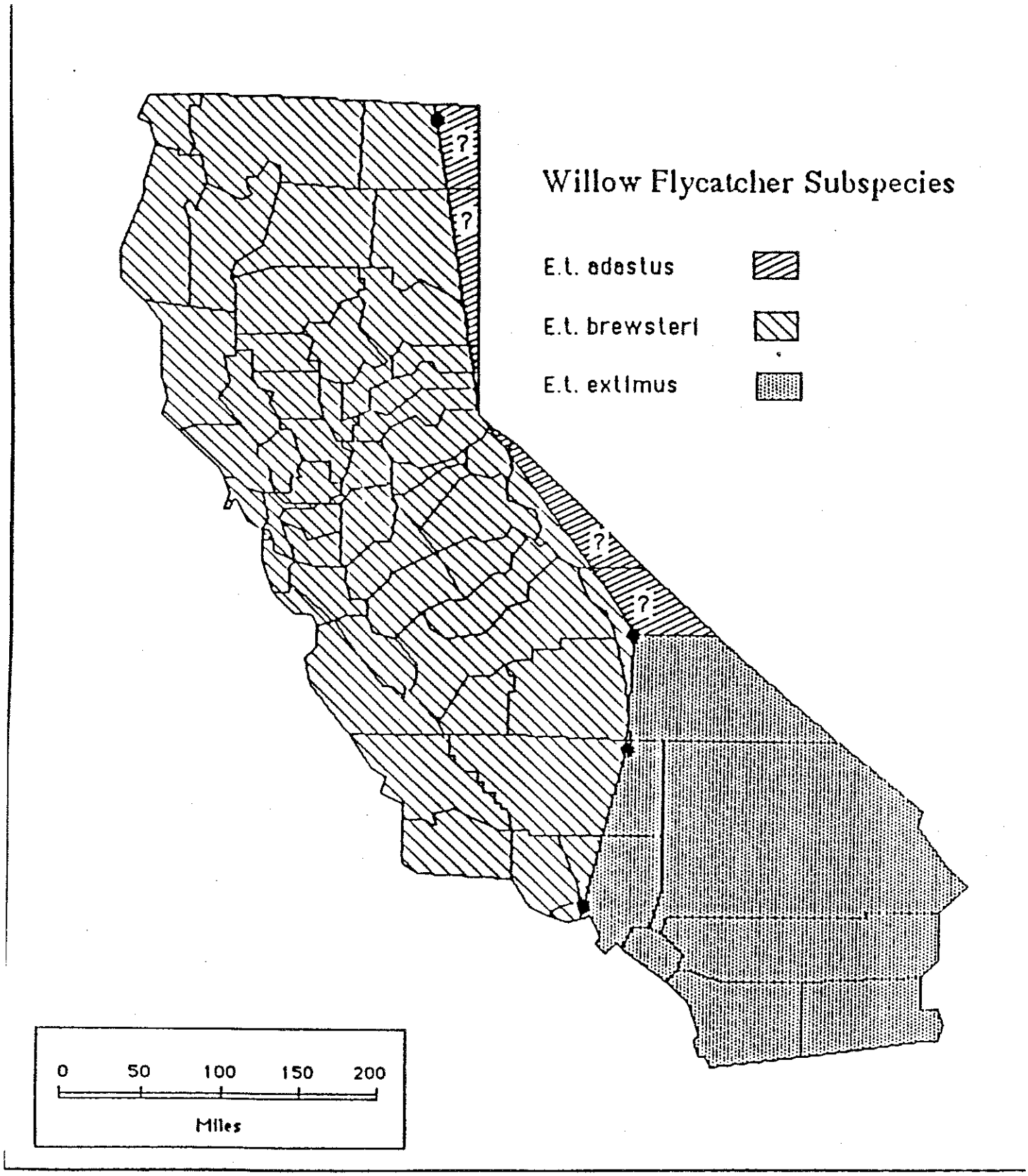

Figure 1. Historic distribution of subspecies of *Empidonax traillii* in California.

suffered severe declines throughout its range, and the Kern River population in California is the largest remaining population (Unitt 1987). The majority of the remainder of the State was occupied by *E. t. brewsteri* (coastal subspecies extending to British Columbia). One specimen of *E. t. adastus* (Great Basin subspecies) is known from Goose Lake (Modoc Co.), and Phillips (1948) thought that portions of northern California might be a zone of intergradation between *brewsteri* and *adastus*. The taxonomic status of populations east of the Sierra/Cascade crest between Goose Lake and Independence is unclear, though they are likely to be *E. t. adastus* (Unitt 1987).

The current distribution of this species consists of a small number of isolated populations (Fig. 2), with a somewhat larger number of sites at which one or two individuals have been sighted during the 1980s (Remsen 1978, Serena 1982, Harris et al. 1987, 1988, Unitt 1987) (Fig. 3). Willow Flycatchers have disappeared as a breeding species from the Central Valley, central coast, and most of the south coast regions (Gaines 1974, Stallcup and Greenberg 1974, McCaskie et al. 1979, Garrett and Dunn 1981, Unitt 1984, Roberson 1985). The current distribution map includes all known records during this period. Most of the sites with one or two birds have not been occupied consistently throughout this period. The majority of populations are in isolated mountains in the Sierra Nevada, Cascade, Klamath, and Siskiyou Mountain regions. These populations are all marginal because they are at high elevations relative to the species' historical breeding range, and they are geographically at the edge or far from the areas in which the species was most abundant. All of these populations, because of their marginal habitat, small size, and isolated nature, are subject to local extirpation. The principal populations within this general area are the McCloud River (Siskiyou Co., 6 singing males in 1987), Westwood Meadow (Lassen Co., 6 singing males in 1986), the Little Truckee River (about 25 singing males), and several meadows in the Shaver Lake area (total of about 10 singing males).

The remaining populations of significance are within the range of *E. t. extimus*. These include the largest remaining population in California, along the south fork of the Kern River (Kern Co., 35-44 singing males). Two additional populations occur in San Diego Co., along the Santa Margarita River (about 15 singing males) and along the San Luis Rey River (about 12 singing males). As in northern California, there are a few additional locations in which singing males have been found in recent years, but most of these have not been consistently occupied and none have had more than 4 singing males. These three populations occur within the area in which Willow Flycatchers were historically abundant. The sites thus represent the prime habitat types for this species. However, such lowland sites are more vulnerable to Brown-headed Cowbird parasitism, as historic records (Hanna 1928, Rowley 1930, Gaines 1974) and current studies (Harris in prep.) (Whitfield in prep.) suggest. The Santa Margarita River population is somewhat protected because Brown-headed Cowbirds are being trapped and removed as part of efforts to recover Least Bell's Vireo (*Vireo bellii pusillus*) populations.

In summary, the current range of the Willow Flycatcher consists of isolated sites which are largely in marginal habitats. The majority of sites are in isolated meadow systems in the Sierra Nevada and Cascade mountains and at two locations in San Diego County. The species has been virtually extirpated from the heart of its former breeding range in central California.

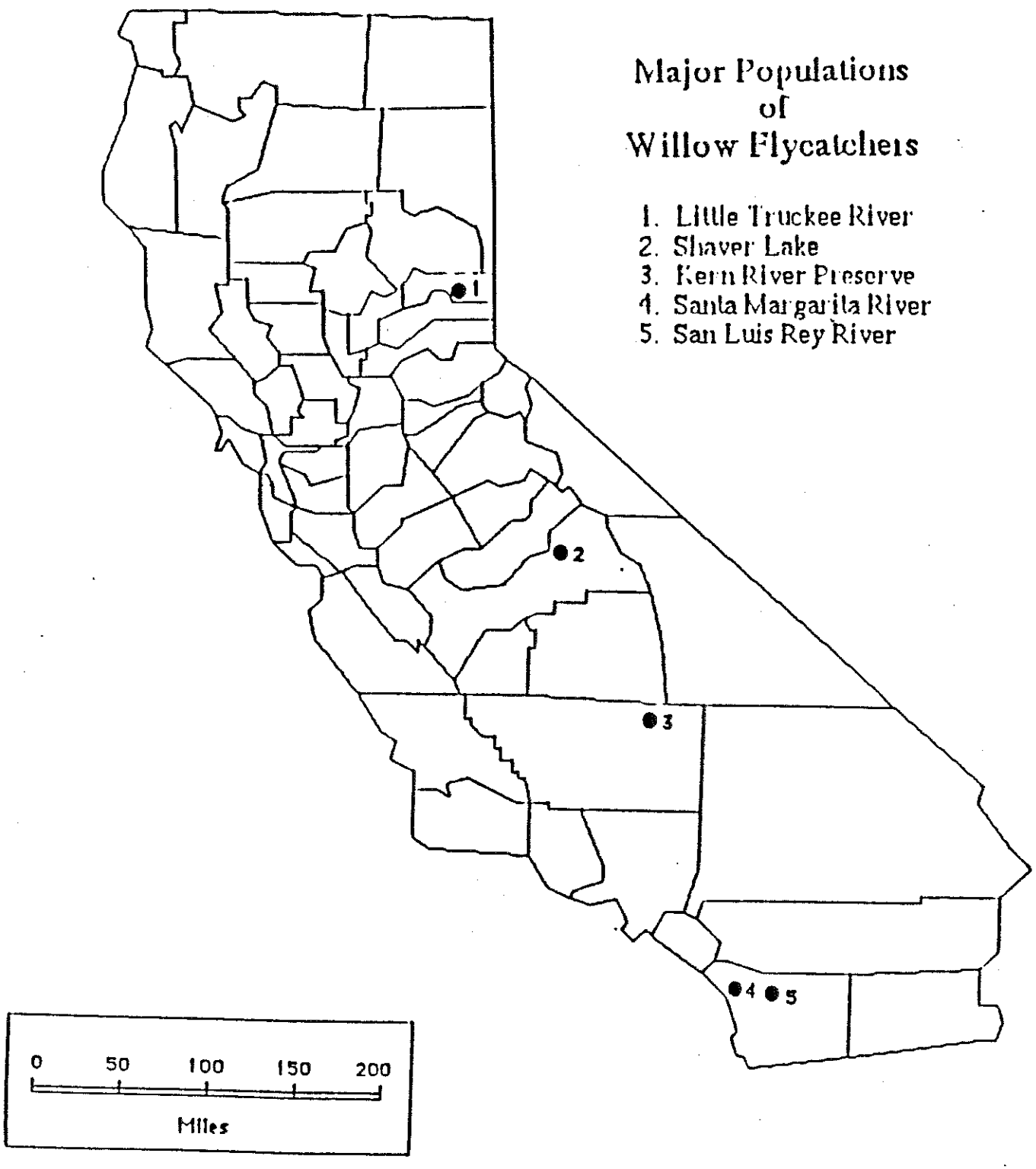

Figure 2. Major populations of Willow Flycatchers in California (from Harris et al. 1988)

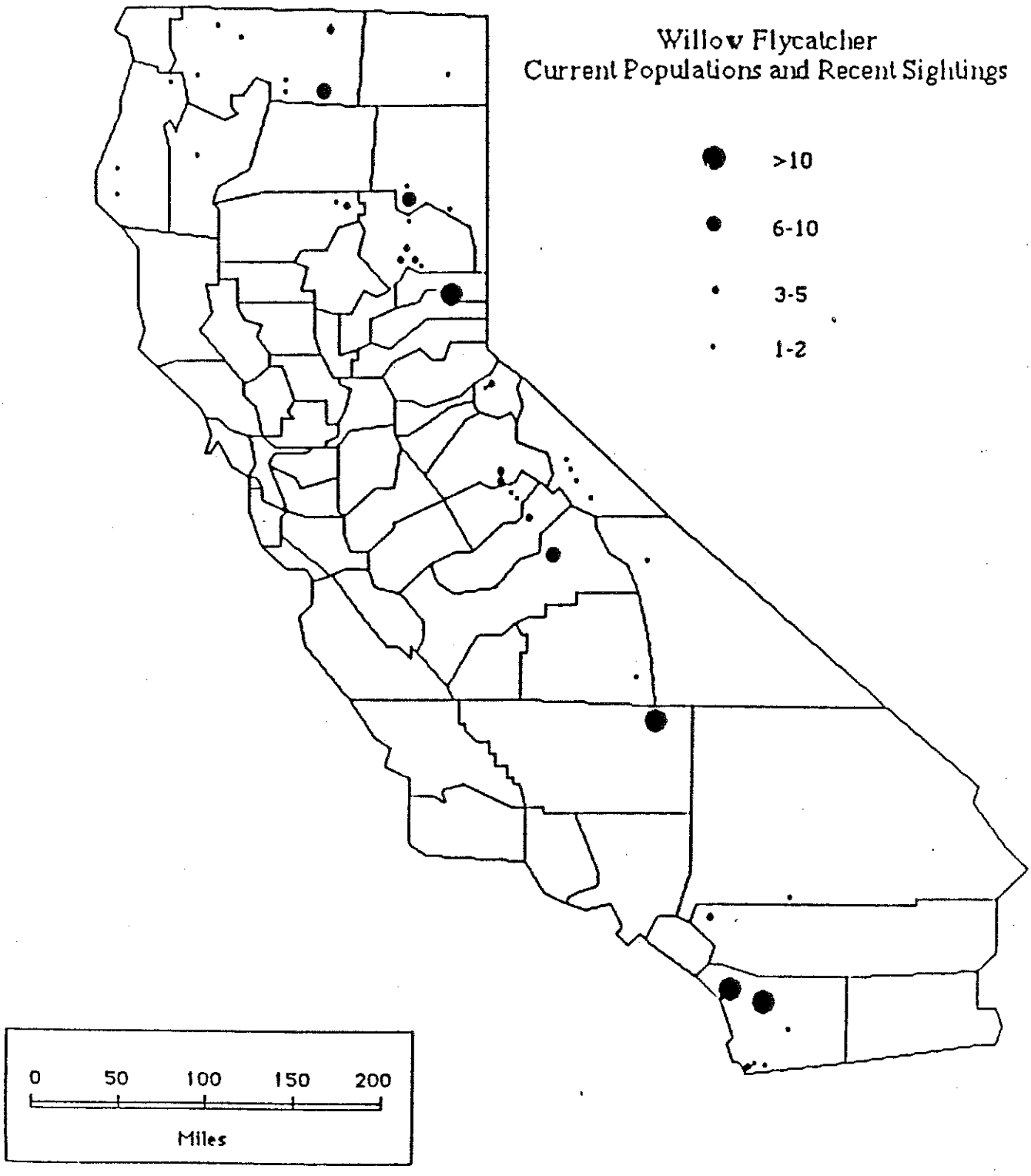

Figure 3. Current populations and recent sightings of Willow Flycatchers in California. This figure is based on field surveys and literature reviews conducted in 1986.

Historical and Current Abundance. The Willow Flycatcher was formerly considered common in the State wherever riparian thickets existed (Grinnell and Miller 1944). Although it is not possible to determine the historic population number, Ridgeway considered it to be the most abundant *Empidonax* species in California (cited in Belding 1890). Areas where it was most abundant included the Central Valley and the southern and central coastal region (Fig. 1). 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 and central coast in general (Willett 1912, 1933), the swampy thickets near Los Angeles (Belding 1890), the valley rivers of central California (Belding 1890), the San Francisco Bay region (Barlow 1900), and the Colorado River (references in Unitt 1987). In the Sierra Nevada, Willow Flycatchers were common along willow-lined streams, especially in broad river bottomlands such as Yosemite Valley (Grinnell and Storer 1924, Grinnell et al. 1930, Sumner and Dixon 1953). Based on these reports and current sightings, Willow Flycatchers were probably fairly common, though restricted to localized suitable habitat, in montane northern California and the northern coast ranges. Based on the absence of suitable habitats in arid interior coast ranges and northeastern California, and the lack of reports of concentrations of Willow Flycatchers, the species was probably uncommon and localized east of the Sierra Nevada and Cascade mountains and in the interior coast ranges. As noted in the distribution section above, Willow Flycatchers were historically and are currently absent from elevations above 8000 feet and from the hot deserts.

Surveys funded by the Department in 1986 (Harris et al. 1988) resulted in sightings of 118 singing males in the Sierra Nevada and Cascades. The majority of Sierra Nevada Flycatchers were located in three general areas. Forty-three singing males were found between the Little Truckee River (Tahoe National Forest) and Westwood Meadow (Lassen National Forest), 25 of which were along the Little Truckee River. 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 of any single location with 39 singing males. In addition to these major population concentrations, small numbers were located on the east side of the Sierra Nevada, near Mono Lake (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.) but no birds were found during a 1987 survey, and there seems to be insufficient habitat to support large populations.

Northern California sightings outside the Sierra/Cascade region have been sporadic and generally have involved one or two individuals. Singing males have been reported in recent years from Forks of Salmon (1), vicinity of Mt. Shasta (1), and Lower Klamath Lake (3 nests in 1985) (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 probably were migrants (R. LeValley, pers. comm.) and have not been included on the distribution map. Recent U.S. Fish and Wildlife Service Breeding Bird Surveys have produced a few sightings in the northern counties (S. Droege, pers. comm.). There are 29 survey routes in Humboldt, Trinity, Del Norte, Siskiyou, Shasta, and Modoc counties. Only seven of these routes have recorded Willow Flycatchers during the period from 1982 to 1985 (4,3,3,

and 6 total birds respectively in the four years). A single male was observed at Modoc National Wildlife Refuge for the first time in 1985, and a pair fledged a single young at the NWR in 1986 (W. Radke, pers. comm.). This successful nesting may have resulted from protection of riparian habitat from grazing over the last 6 years. During summer 1987, U.S. Forest Service biologists located 6 singing males at scattered locations along seven miles of the McCloud River (Shasta-Trinity National Forest). Further surveys in northern California will likely produce more sightings, but there is no indication that large populations occur in this part of the State.

In southern California, Unitt (1987) and L. Salata (pers. comm.) reported 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). Unitt (1987) lists several southern California sites at which small numbers of Willow Flycatchers have been reported in recent years, including the Prado Flood Control Basin (Riverside Co.), Big Morongo Wildlife Preserve (San Bernardino Co.), Lake Cuyamaca, Sweetwater Reservoir, Tijuana River Valley, and Lower Otay Lake (all in San Diego Co.). These sites have not been occupied consistently. There was a statewide total for the 1986 known population of about 145 singing males. About 70% of the statewide total was from the five largest populations: Little Truckee River, Shaver Lake area, Kern River, Santa Margarita River, and San Luis Rey River.

The current statewide population can be estimated by taking the maximum number of individuals observed at all of the sites known to be occupied in the 1980s. This gives a figure of approximately 240 singing males. However, the number of singing males in any single year is certainly less, as most of the smaller sites are occupied intermittently (Serena 1982, Unitt 1987, Harris et al. 1988). In addition, there is considerable evidence that not all singing males are indicative of breeding pairs (Stafford and Valentine 1985, Flett and Sanders 1987, Valentine 1987, Sanders and Flett 1989, Harris in prep.). A conservative estimate would suggest that the number of breeding pairs might be 10-20% fewer than the number of singing males. This further supports the conclusion that there are probably not many more than 200 pairs of Willow Flycatcher remaining in California at the present time.

Threats

Reduced Population Size and Range

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, Harris et al. 1988, Sanders and Flett 1989). 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 Unitt 1984, Roberson 1985). 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, Harris et al. 1988), having become alarmingly scarce in the Yosemite region. 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.

Surveys by Harris et al. (1988) and other reports resulted in total sightings of 118 singing males in the 1986 breeding season. Unitt (1987) and L. Salata (pers. comm.) suggested 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 gave a statewide total for the 1986 known population of about 145 singing males. It appears that in California, the species has been reduced to a small number of marginal populations. Sierra Nevada populations may be particularly susceptible to weather fluctuations, as demonstrated by the total failure of the Perazzo Meadows breeding population after a July 1987 snowstorm (Sanders and Flett 1989).

Population Isolation

Marginal Willow Flycatcher populations belong to three subspecies, one of which (*E. t. extimus*) has declined dramatically in most of its range (southern California, southern Nevada, Arizona, New Mexico) (Unitt 1987). 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 (Harris et al. 1988).

Harris et al. (1988) reported that the majority of Sierra Nevada Willow Flycatchers are located in three general areas during 1986. Between the Little Truckee River (Tahoe National Forest) and Westwood Meadow (Lassen National Forest), they found 43 singing males, most of which were along the Little Truckee River. 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 (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.) but no birds were found during the survey, and there seems to be insufficient habitat to support large populations (Harris et al. 1988).

Habitat fragmentation and isolation places the remaining small populations of Willow Flycatcher at risk of local extinction. Due to the small number of breeding pairs in the State, otherwise suitable habitats in the Sierra Nevada may remain unoccupied by Willow Flycatchers for several years following a local extinction event (brought about by a catastrophe such as a summer snowstorm which wipes out all reproductive efforts) simply because there are not enough birds in the population to find and rapidly recolonize these sites.

Although some portions of the Central Valley have not been recently surveyed for Willow Flycatchers (Valentine 1987), the Sacramento River Valley has

recently been surveyed for Bank Swallows (*Riparia riparia*) and Yellow-billed Cuckoos (*Coccyzus americanus*), with no reports of breeding Willow Flycatchers (Gaines 1974, R. Schlorff and S. Laymon, Pers. comm.). The San Joaquin Valley, on the other hand, may harbor a small population of Willow Flycatchers (M. Stafford and B. Valentine, pers. comm.).

Decline of *E. t. extimus* Subspecies

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 north of the Kern River in 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.

Nest Parasitism

Many authors agree that alteration and loss of riparian habitat (c.f. Katabah 1984), 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 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. Studies on the Kern River Preserve suggest that Brown-headed Cowbird parasitism on Willow Flycatchers is heavy, affecting the numbers of birds fledged and the fledging date (Harris, pers. obs.). 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, Laymon 1987). 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) suggests that cowbird parasitism might be less important in the Sierra Nevada than in lower elevation areas. There are apparently only two Sierra Nevada records of Brown-headed Cowbird parasitism on Willow Flycatchers (Flett and Sanders 1987).

Livestock Grazing

Livestock 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, Taylor and Littlefield 1986, Harris et al. 1988, Flett and Sanders 1987, Sanders and Flett 1989). The activities of cattle can adversely affect Willow Flycatchers by the disturbance of nests (Stafford and Valentine 1985, Flett and Sanders 1987, Valentine 1987, Sanders and Flett 1989). Four of 20 nests observed in the Shaver Lake area were destroyed by cattle before fledging of the young, and an additional four nests were destroyed shortly after the young were fledged (Stafford and Valentine 1985, Valentine 1987). Grazing may affect the hydrology of meadows by soil compaction, streambank trampling and gullying, and mineral redistribution, eventually lowering the water table of moist meadows, reducing the amount of free water available, and changing the meadow's vegetation composition (Ratliff 1984, Van Haveren and Jackson 1986). In addition, cattle and sheep consume the lower branches and shrub layers of riparian vegetation, make trails through willow thickets, and consume and trample seedlings of riparian plants thus changing such structural features as willow foliage height and willow foliage volume (Mosconi and Hutto 1981, Rickard and Cushing 1982, Ratliff 1984, Taylor 1986). These changes could clearly have a negative effect on Willow Flycatchers (Serena 1982, Taylor 1986, Taylor and Littlefield 1986). At the Malheur National 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. Recovery of riparian vegetation when grazing is eliminated and efforts made to restore the habitat provide encouraging evidence that habitat may be improved for Willow Flycatchers (Winegar 1977, Duff 1979, Rickard and Cushing 1982, Clay 1984).

Other Factors

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 encroachment on meadows, and habitat loss on the wintering grounds (Serena 1982).

CURRENT MANAGEMENT

No State or federal laws explicitly protect California's riparian woodland and montane meadows, habitats which provide essential resources for the State's remaining populations of Willow Flycatchers. The only Willow Flycatcher population in the State whose habitat is protected in perpetuity is that on the Nature Conservancy's Kern River Preserve.

The U.S. Fish and Wildlife Service has developed management guidelines for this species in Region 1 (Sharp 1986), and studies by the Kings River Conservation District also provide recommendations for protecting and enhancing Willow Flycatcher habitat (Valentine 1987). Several studies by the California Department of Fish and Game and others (Serena 1982, Flett and Sanders 1987, Harris et al. 1988, Sanders and Flett 1989) offer additional management recommendations for this species.

ALTERNATIVES TO THE PETITIONED ACTION

If the Commission does not list the Willow Flycatcher, this bird species would be deprived of the special protections available only to a listed species.

When a species is listed as Threatened or Endangered, a higher degree of urgency is mandated, and protection and recovery receives more attention from the Department and other agencies than does a non-listed species.

In the absence of listing, it might be possible to devise a management plan for this species. However, this Departmental status review indicates that the future existence of this species is already seriously threatened. Despite good intentions on the part of the Department and the Commission, promises of management and protection for a non-listed species do not have the weight of law behind them, and thus seldom receive due consideration by other agencies. Without the benefits of listing and the cooperation of other agencies in preservation and recovery actions, the species could decline to the point where populations are no longer viable. Extirpation would soon follow.

PROTECTIONS RESULTING FROM LISTING

If listed, the Willow Flycatcher will receive protection from take during development activities subject to CEQA and State-lead agencies will be subject to formal consultation requirements under CESA. Willow Flycatchers will also be eligible for the allocation of resources by government agencies to implement protection and recovery actions. During the CEQA environmental review process, listed species receive a greater degree of consideration, and protection and mitigation measures can be implemented as terms of project approval. Species that are not listed do not readily receive such consideration or protection.

Listing this species increases the likelihood that State and Federal land and resource management agencies will allocate funds and manpower towards protection and recovery actions that benefit the Willow Flycatcher. With limited funding and a growing list of Threatened and Endangered Species, priority has been and will continue to be given to species that are listed. Those that are not listed, although considered to be of concern, are rarely given adequate consideration for their ecological needs under these circumstances.

ECONOMIC CONSIDERATIONS

Designation of the Willow Flycatcher as Endangered will subject certain projects that will impact essential habitat to CESA and CEQA review. This legislation prohibits taking and possession of Willow Flycatchers except as permitted by the Department. Development projects will be subject to formal consultation procedures. The CEQA presently requires local governments and private applicants undertaking projects to consider *de facto* Endangered species to be subject to the same requirements under CEQA as though they were already listed by the Commission in Section 670.2 (CEQA Guidelines, Section 15380, CAC). The Willow Flycatcher has qualified for protection under CEQA Guidelines Section 15380 for several years.

Required mitigation as a result of lead agency actions under CESA and CEQA, whether or not the species is listed by the Commission, may increase the cost of a project or activity undertaken that adversely impacts Willow Flycatchers or their habitats. Such costs may include, but are not limited to, development of management plans, curtailment or modification of certain management actions (e.g., livestock grazing on public land), transplanting or establishing new populations, purchasing or restoring additional habitat, and

long-term monitoring of mitigation sites. Project modification to avoid impacts may be a less costly alternative than implementing required mitigation. The total expenses incurred in hiring consultants, preparing management plans, transplanting and maintenance activities, and long-term monitoring may be more costly than setting aside suitable habitat for the bird. Lead agencies may also require additional measures to be employed should the mitigation project fail, resulting in additional expenditures of funds by the project proponent.

Listing of the Willow Flycatcher as Endangered could result in additional expenditures of funds for riparian habitat enhancement by the Department and other affected agencies. Enhancement of riparian habitat often requires reduced livestock grazing pressure. Restoration of habitat may be a necessary recovery action for this species.

A potential economic benefit of listing for the local economy and the Department could result from viewing of Threatened and Endangered wildlife. Persons interested in such activities would spend money in local communities for food and lodging. Increased public education could result in increased contributions to the State Income Tax Check-off Program and the California Wildlife Campaign, which would in turn provide further funding for management and recovery activities for all listed species.

Additional economic considerations will be discussed as part of the regulatory process should the Commission find that listing is appropriate.

CONCLUSIONS

Based on this status review we conclude that the Willow Flycatcher has suffered catastrophic population decline in California and is an endangered bird that may soon be extirpated in the State if actions are not taken to recover the species.

The Willow Flycatcher is proposed for endangered status due to its much reduced population size (approximately 200 breeding pairs), the disjunct distribution of remaining population centers, impacts to remaining montane meadow and riparian habitat caused by various human activities, (including livestock grazing), and population vulnerability to random stochastic events such as catastrophic breeding failures caused by sudden weather changes. The population is also impacted by nest parasitism by the Brown-headed Cowbird. Increased incidence of nest-parasitism is itself a result of human-caused environmental change. Expansion of agriculture in California has triggered a population response in cowbirds that has increased their numbers beyond the ability of small songbird populations such as Willow Flycatchers to withstand. Nest parasitism has existed for as long as these species have evolved this breeding strategy. Only recently, however, with the advent of widespread habitat destruction and consequent reduction of small songbird populations, has the problem become serious enough to threaten survival of host species such as the Willow Flycatcher.

In our judgment the Willow Flycatcher qualifies for listing as Endangered under provisions of the California Endangered Species Act.

RECOMMENDATIONS

Petitioned Action

1. The California Fish and Game Commission should find that the petitioned action that is warranted is for the status of Endangered.

2. The Commission should publish notice of intent to amend Title 14 CCR 670.5 to add the Willow Flycatcher to the list of Threatened and Endangered Species.

Recovery and Management Actions

In order to effect recovery of the Willow Flycatcher it will be necessary to increase population size many fold so that it will be able to withstand the negative impacts of livestock grazing and nest parasitism. Enhancement of riparian habitats must take place if we are to recover species dependent on these vegetative communities. Livestock grazing in Willow Flycatcher habitat poses both direct and indirect threats to the species. Cattle, in particular, have been documented destroying Willow Flycatcher nests and their contents (eggs or young) when they tip them over as they move through willow clumps chosen by the birds as nest sites. In addition, cows browse on willow thus reducing cover and availability of suitable nesting sites.

The following recovery actions will be required to reduce or eliminate the several habitat and human disturbance impacts that threaten the survival of Willow Flycatchers breeding in California.

Riparian Habitat Protection

Willow Flycatchers once inhabited riparian habitats throughout California, including many major lowland stream systems (such as the Sacramento and San Joaquin Rivers) and certain coastal streams. There is a need to preserve remaining stands of willow riparian habitats where they exist in sufficient quantity and quality to serve as sites for reestablishment of Willow Flycatchers either by natural recolonization or through management actions. Additional habitat in the form of montane meadows with willows must be protected from destruction and degradation. Most of the current small population of Willow Flycatchers inhabits these areas. It is necessary to protect and enhance these relatively marginal habitats until populations reestablish themselves in more suitable lowland riparian habitats. In order to implement the protections needed, considerable coordination and cooperation between conservation agencies and other State and federal land management agencies will be required. To protect riparian habitat on major stream systems of the State that may be sites for bank protection projects, the Department must institute planning and coordination with the State Reclamation Board, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the U.S. Bureau of Reclamation. Coordination with local governments and private interests will also be necessary in the effort to preserve, enhance and rehabilitate willow riparian habitat for the benefit of Willow Flycatchers and other species such as the endangered Least Bell's Vireo (*Vireo bellii pusillus*).

Preservation of montane meadow habitat and reduction of livestock-caused impacts will involve the Department and the U.S. Forest Service. Reduced

stocking rates (particularly for cattle), exclosures and closures of certain flycatcher breeding meadows will be necessary to both protect and enhance populations currently or potentially nesting on publicly owned willow riparian meadow systems. Initial focus for management will be the meadows of the Tahoe and the Sierra National Forests where moderately sized breeding populations of Willow Flycatchers currently exist.

Control of Brown-headed Cowbirds

Control of Brown-headed Cowbirds has been tried with limited success in order to protect breeding populations of Least Bell's Vireos in southern California. Where the range of Willow Flycatchers and the Vireo overlap, there has already been some benefit to both species from efforts to trap and remove cowbirds. Specific efforts to provide cowbird control must be instituted for all regions of the State supporting Willow Flycatcher populations. In addition, certain conditions conducive to the increase of cowbird populations should be discouraged. These include livestock pens, horse corrals, and certain other agricultural practices that tend to promote growth of cowbird populations or otherwise encourage greater nest parasitism of local songbird populations.

Coordination and Cooperative Management Planning

Other than institute cowbird control programs and acquire suitable riparian habitats to be established as Willow Flycatcher preserves there are relatively few recovery strategies that the Department can implement alone. Most of the necessary actions will require considerable coordination and cooperation among various State and federal agencies and the private sector. Fortunately some progress in this regard already exists. The largest Willow Flycatcher population (35-40 pairs) in the State breeds at The Nature Conservancy's Kern River Preserve. This population expands annually in response to recent curtailment of livestock grazing on the acquired riparian habitats. Some coordination is already in place between the Department and bank protection agencies concerning riparian issues involving other listed species of birds. It should be relatively simple to add Willow Flycatchers as a further species requiring management attention.

One of the most critically important recovery tasks will involve removal or significant modification of livestock grazing on public lands, principally U.S. Forest Service lands. Communication, involving a variety of wildlife and habitat issues has already been established between the Department and the Forest Service. The Willow Flycatcher has been designated as a Forest Service sensitive species which carries with it some commitments for appropriate management of the species on National Forest lands. In fact, according to USFS regulations, management commitment to sensitive species is virtually identical to that afforded federal Threatened and Endangered species. Opportunities exist for both cooperative research and management planning involving U.S. Forest Service administered lands inhabited by Willow Flycatchers.

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