A Willow Flycatcher Survey Protocol for California

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BACKGROUND

Willow flycatchers are small migratory passerines that historically nested throughout California where the species' primary habitat, riparian willow thickets, occurred (Grinnell & Miller 1944). Willow flycatchers were once considered abundant in the inland valleys and the coastal regions of central and northern California (Barlow 1900, Wheelock 1904, Ridgway 1907, Beal 1910, Grinnell & Withe 1927, Pickwell 1932, Grinnell 1933, Davis 1938, Miller 1941, Bent 1942,). In the Sierra Nevada, willow flycatchers were historically described as locally abundant along willow lined streams and meadows, especially in broad river bottomlands such as the Merced River in Yosemite Valley, and the Upper Truckee River in the Lake Tahoe Basin (Bendire & Brevet 1895, Ray 1903, 1913, Ingersoll 1913, Grinnell & Storer 1924, Grinnell et al. 1930, Linsdale 1932, Grinnell 1934, Bent 1942, Dixon 1943, Grinnell & Miller 1944, Sumner & Dixon 1953, Orr & Moffitt 1971, Gaines 1977, Klebenow & Oakleaf 1984). Based on the available historical literature, nest records, and museum specimens, it is assumed that willow flycatchers were locally common residents of willow dominated riparian/meadow communities across California, including the Sierra Nevadas, as recently as the late 1930's and early 1940's.

In the last five or six decades, however, the breeding populations have been lost from most lower elevation riparian areas in the state (Gaines, 1974, Serena 1982). Additionally a number of sites occupied as recently as the mid-1980's are now vacant (Serena 1982, Harris et al. 1987, Laymon 1996, CNDD 1997, Bombay 1999, USDA Forest Service: unpublished survey results). As many as 46 sites in the Sierra Nevada occupied by willow flycatchers since 1982, were vacant during their most recent survey (CNDD 1997, unpublished Forest Service Data). Willow flycatchers *(E. t. brewsteri, and E. t. adastus)* are currently known to occupy less than 100 sites in riparian areas throughout central and northern California. The known breeding population is estimated at only 400 individuals (Schlorff 1990).

Sound management and conservation of an endangered species require current, detailed information on the species' abundance, distribution, and natural history. As a result, there is a crucial need to identify and monitor as many willow flycatcher breeding areas as possible, as well as to determine those areas in which they do not currently occur. Effective, standardized survey protocols and consistent reporting are crucial to conservation and management of species at risk, on both local and regional levels. However, the willow flycatcher is a difficult species to survey for and identify, and inconsistent or ineffective surveys are of little value and would hinder regional and range-wide analyses.

We developed this document to address the need for information and a standardized survey protocol. It is based on experience gained through the use of Craig et al. (199 1), and Harris et al. (1997) protocols, and borrows heavily from Sogge et al. (1997) as a template for both form and content. The fist section summarizes the current state of knowledge regarding willow flycatcher natural history, based on a wide array of published and unpublished literature. The second section details a standard survey protocol that provides for consistent data collection, reporting, and interpretation.

WILLOW FLYCATCHER SURVEY PROTOCOL

A number of factors interact to make willow flycatcher surveys relatively difficult. The willow flycatcher is one of ten *Empidonax* flycatchers common in North America, all of which look very much alike. Like all *Empidonax* species, willow flycatchers are nondescript in appearance, making them difficult to see in dense vegetation. Although the willow flycatcher has a characteristic "fitz-bew" song that distinguishes it from other *Empidonax* (and other birds in general), willow flycatchers are not vocal at all times of the day or during all parts of the breeding season (Sogge et al. 1997b). Because willow flycatchers are rare they may occur only in a small area within a larger riparian system, thus decreasing detectability during general bird surveys. Migrating willow flycatchers (of all subspecies) often sing during their migration through California (Garrett & Dunn 1981, Unitt 1987, Sogge et al. 1997b). Although willow flycatchers in central and northern California tend to breed later than most willow flycatchers in the West, there is a chance that late migrants could be confused with local breeders (Laymon 1981, Stafford & Valentine 1985, Unitt 1987). In addition, willow flycatchers are in breeding areas for only 3-4 months of the year (Serena 1982, Stafford & Valentine 1985, Sanders & Flett 1989, Sogge et al. 1997b). Surveys done too early or late in the year would fail to find flycatchers even at sites where they breed.

Life history characteristics and demographic factors influence how willow flycatcher surveys should be conducted (see Appendix A for a complete discussion of willow flycatcher natural history). Like the southwestern willow flycatcher protocol (Sogge et al. 1997b), this protocol is based on the use of repeated tape-playback surveys during pre-determined periods of the breeding season, to confirm presence or absence at a site. Such species-specific survey techniques are necessary to collect reliable presence/absence information for rare species (Verner 1985, Bibby et al. 1992, Reed 1996).

I. OBJECTIVES

This protocol was designed to provide a standardized survey technique to detect willow flycatchers and provide consistent and standardized data reporting. There are two basic objectives of this protocol:

A. The primary objective of the willow flycatcher protocol is to determine the presence or absence of willow flycatchers at a given site during the year in which surveys are completed. Recent data on southwestern willow flycatchers suggest that surveys completed within the timeframes of this protocol will have a 70-90% certainty of detecting at least one willow flycatcher if any exist at the site (see discussion below in section B).

B. The second objective of this protocol is to provide an estimate of the number of singing willow flycatchers at a survey site during the year in which surveys are completed. At this time, data are not available to predict with accuracy how many surveys are necessary to detect ALL singing willow flycatchers at a site. Nonetheless,

a repeated survey centered on the peak singing period should provide an estimate that will be useful for project related analysis. Further refinement of this protocol based on outyear results and additional analysis should allow confidence levels for this objective to be calculated in the future.

This protocol does NOT provide guidance on the interpretation of results beyond the year in which surveys are completed. At this time. guidelines related to the number of surveys necessary to assume presence or absence for a period longer than the survey year are being developed. Direction on this sort of implementation and interpetation are expected for the 2001 survey season.

This protocol does NOT address issues and techniques associated with nest monitoring or other willow flycatcher research activities. Because nest searching and monitoring entail the risk of nest abandonment and even direct nest upset, these sorts of activities should be undertaken only through coordination with the California Department of Fish and Game, and when it can be shown that the resulting data will be of enough demographic importance to outweigh the risks.

This protocol is designed for use by persons who are nonspecialists with *Empidonax* flycatchers, or who are not expert birders. However, observers must have sufficient knowledge, training, and experience with bird identification and surveys to distinguish the willow flycatcher from other *non-Empidonax* species, and recognize the willow flycatcher's primary song. It is strongly recommended that observers attend a willow flycatcher survey training workshop. Surveys done improperly or by unqualified or inexperienced personnel may lead to inaccurate results.

Willow flycatcher surveys are targeted at this species and require a great deal of focused efforts. Observers must be constantly alert and concentrate on detecting flycatcher responses. Therefore, fieldwork such as generalized bird surveys (e.g., point counts or walking transects) or other distracting tasks should not be done during willow flycatcher surveys. Avoid bringing pets or additional people who are not needed for the survey.

II. TIMING AND NUMBER OF VISITS

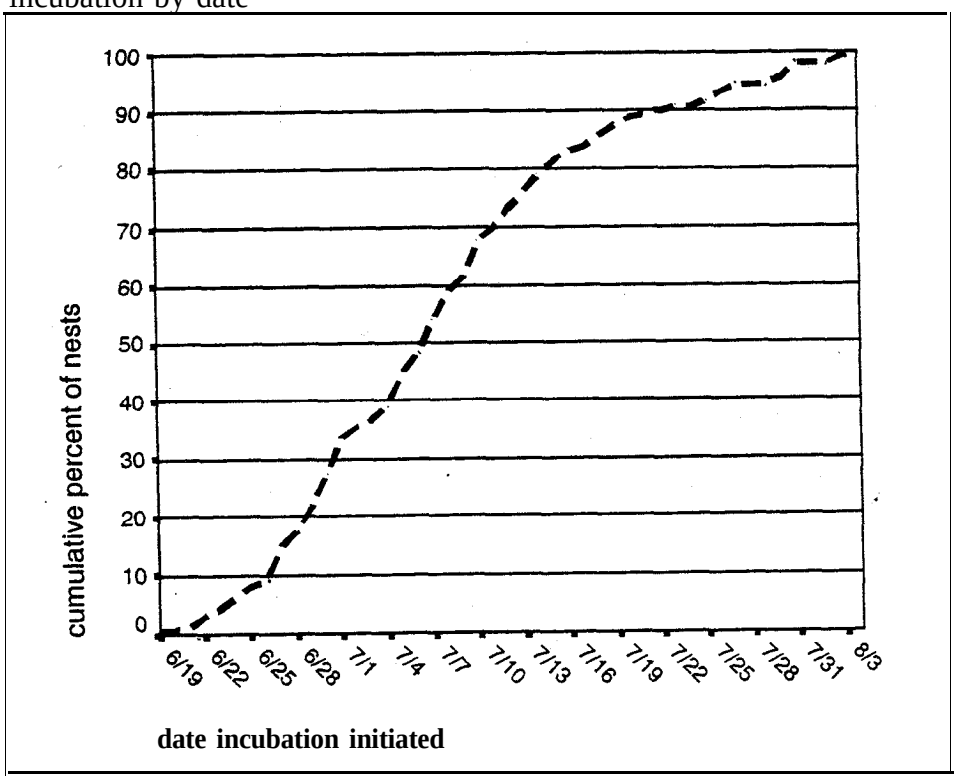
This survey protocol requires a minimum of two surveys at each site, one during survey period 2 (June 15-25) and one during either survey period 1 (June 1-14), or survey period 3 (June 26-July 15) to document presence or absence of willow flycatchers in the survey year (Table 1). In addition, successive surveys must be at least 5 days apart; surveys done fewer than 5 days apart are not considered to be in separate survey periods.

Table 1. Inclusive dates for three willow flycatcher survey periods

Survey Period 1	Survey Period 2	Survey Period 3
June l - June 14	June 15 - June 25 VISIT REQUIRED	June 26 - July 15

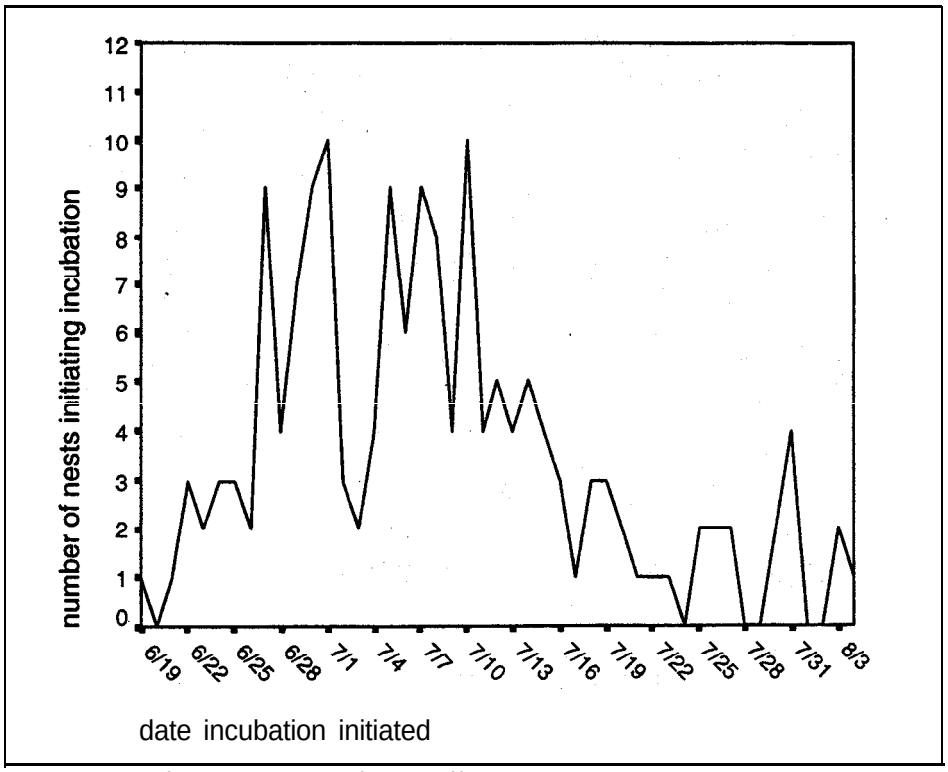
Performing repeated surveys during the early nesting season maximizes the likelihood of detecting singing willow flycatchers (Sogge et al. 1997a, Sogge et al. 1997b, Braden & McKernan 1998). Specifically, detection probabilities are highest (70-100%) prior to the initiation of incubation (Braden & McKernan 1998). Data from a number of study sites indicate that, for central and northern California, incubation for the majority of the population is not initiated until after June 25 (Figures 1 & 2) (Stafford and Valentine 1985, Sanders & Flett 1989, Bombay & Morrison unpublished data, T. Ratcliff pers. comm., PRBO/USFS unpublished data).

Figure 1. Cumulative percent of willow flycatcher nests in the Sierra Nevada initiating incubation by date*



* Data used in figure 1 collected from Stafford and Valentine 1985, Sanders and Flett 1989, and from H. Bombay and M. Morrison unpublished data.

Figure 2. Number of willow flycatcher nests in the Sierra Nevada initiating incubation by date*



*Data used in figure 2 collected from Stafford and Valentine 1985, Sanders and Flett 1989, and from H. Bombay and M. Motion unpublished data.

Survey visits prior to June 15th are at risk of detecting migrating willow flycatchers that are only passing through the region, and visits after June 25 are somewhat less likely to detect singing willow flycatchers. For these reasons this protocol requires a mandatory visit during survey period 2, which coincides with the pre incubation time period and also the post migration period (Figure 1). The second required visit can occur either during survey period 1 or survey period 3, depending on the site vegetation phenology or management needs (Table 1). The following discussion portrays the pros and cons of selecting either survey period 1 or 3 for the additional visit and is intended to help guide survey decisions on a site-by-site basis.

A. Survey Period 1: 1 - 14 June

The timing of this survey is intended to coincide with the period of high singing rates of newly arrived males, which tends to begin June 1 in most years.

Survey period 1 is one of the most reliable times to detect willow flycatchers that have established their territories, and the use of survey period 1 would allow for both required surveys to be done during periods of relatively high singing rates (prior to June 26). This survey period is most applicable for use at lower

elevation sites, the south-central portion of the state, or during low snow years when/where birds may initiate breeding slightly earlier. In addition to allowing for surveys during the period of high singing rates, survey period 1 will also likely provide information on stopover habitat use. This would occur when willow flycatchers are detected at sites during this period, but not later in the season during survey period 2.

The disadvantages of using survey period 1 include the chance that not all territorial males have arrived by this time, and migrants may still be present and singing during this period. The use of survey period 1 would be inappropriate if, during this time window, riparian shrubs have not yet leafed out, due to elevation, latitude or weather patterns.

B. Survey Period 2: 15 - 25 June (Mandatory Visit)

By June 15 the earliest arriving males may already be paired, with nest building beginning, while other males have only just arrived. By June 25 most males should be paired and only 5-10% of nests will have initiated incubation (Figures 1 & 2). Braden & McKeman (1998) and others have shown this to be the period of greatest song 'frequency. After June 15 it is unlikely that migrating willow flycatchers will still be passing through California and singing (Unitt 1987). Therefore any willow flycatchers that are detected using the Fitz-bew song are assumed to be at least attempting to breed.

One of the two required survey visits MUST occur during survey period 2 (Table 2).

C. Survey Period 3: 26 June - 15 July

Most willow flycatcher territories are established by this time, and any birds arrivinglate due to weather or other unknown causes on the wintering and breeding grounds should be present. Flycatcher singing rates may have lessened, and most paired flycatchers will have initiated nesting activity.

Even if willow flycatchers are detected during survey period 2, observers are required to complete a second visit (Table 2). This visit is necessary to more accurately estimate territory numbers, and the failure to complete the visit would result in surveys not meeting the protocol.

If willow flycatchers are detected during survey period 2, but not survey period 3, managers should not assume that this implies that the missing bird was a migrant or floater. A lack of detection may only indicate a reduced song advertisement due to initiation of incubation/brooding (Braden & McKernan 1998).

The advantage of using survey period 3, rather than survey period 1, falls mainly in the elimination of confusion over the detection of migrants. Willow flycatchers detected during survey periods 2 and 3 can be assumed to be residents. Additionally survey period 3 allows for the detection of any late arriving birds that might have been missed if the initial survey occurred early in survey period 2 due to years with late snow storms, delayed migration, or at sites at higher elevations.

The disadvantage of using survey period 3 is that, during most years, singing rates will already be starting to decline by the beginning of this period. This makes detection of birds that are present more difficult. Additionally by using this period surveys cannot be completed to protocol until later in the season, which may have some management implications.

D. Follow-Up Visits

Follow-up visits are required when a flycatcher is detected, and suspected but not confirmed to be a willow flycatcher (no Fitz-bew) (see discussion below under Survey Methods). Follow-ups can occur on the same day as the survey visit if they can be completed prior to 10:00 a.m. Follow-ups must be completed within 5 days of the initial detection (Table **2). Failure to complete follow up visits will result in the surveys not meeting the protocol.**

Table 2. Summary of possible survey outcomes and resulting required action

Survey period 1	Survey period 2	Survey period 3	Required action
present			another visit required during survey period 2
absent			another visit required during survey period 2
possible detection			follow-up visit required within 5 days, and another survey visit required during survey period 2
present	present		completed to protocol. WIFLs present during survey year
absent	present		completed to protocol. WIFLs present during survey year
present	absent		completed to protocol. WIFLs NOT present during survey year
absent	absent		completed to protocol. WIFLs NOT present during survey year
present	possible detection		follow-up visit required within 5 days. Results determine whether WIFLs are present during survey year
absent	possible detection		follow-up visit required within 5 days. Results determine whether WIFLs are present during survey year
	present		WIFLs present during survey year. Additional visit required during survey period 3 to estimate territory numbers, and meet protocol
	absent		another visit required during survey period 3
	possible detection		follow-up visit required within 5 days, and another survey visit required during survey period 3.
	absent	present	completed to protocol. WIFLs present during survey year
	absent	absent	completed to protocol. WIFLs NOT present during survey year
	absent	possible detection	Follow-up visit required within 5 days. Results determine whether WIFLs are present during survey year

III. SURVEY COVERAGE AND SPACING

To more efficiently survey meadows and riparian areas for willow flycatchers, color photocopies or original aerial photographs should be procured for each survey site. Acetate or mylar overlays should then be attached for the delineation of survey points and bird locations. If aerial photos are not available, a rough map of meadow edge, vegetation clumps, streams, ponds, roads, and other landmarks; such as, large snags, downed logs, cabins, should be drawn during a preliminary reconnaissance visit.

Once a photo or preliminary map has been prepared, approximate locations of the meadow edge and all survey points should be delineated. Survey **points should be spaced at a maximum distance of 50 m for large open meadow settings, and 30 m for areas with tall/dense vegetation, and/or high levels of stream noise that impair sight or hearing.** Locations of survey points should be marked on the map/photo by overlaying a grid with at a 50 X 50 m (or 30 x 30 m) spacing. These spacing guidelines will help to standardize effort between observers, sites, and years, and therefore it is important to know or calculate the scale of the photo or map used to accurately translate this distance between the map and the ground. Where the vegetation/topography allow, it is advisable that the observer pace off the 50/30 meters between points rather than relying solely on the map or overlay. If the point falls in a location where the observer's sight or hearing are impaired they should attempt to find a better survey location within a 10 m radius of the designated point, and then revise the map/overlay to reflect the change. <u>All points included in the survey should be numbered on the aerial photo overlay or map and on the survey forms.</u> **The same survey point locations must be used for both visits during the year, and between years.**

Because willow flycatchers are known to require riparian deciduous shrubs for breeding and foraging, survey efforts should be designed to avoid spending large amounts of time surveying areas with no shrub component. <u>Survey points need not be designated in portions of meadows that are further than 50 m from a stand of riparian deciduous shrubs or sapling stage deciduous trees.</u>

The maximum 50 m distance between points is based on the average territory size of roughly 0.4 hectares (range 0.09 - 1.0 hectares) for willow flycatchers in the Sierra Nevada (Stafford & Valentine 1985, Sanders and Flett 1989, Bombay 1999). Assuming that on average territories are somewhat oblong in shape, this territory size translates into average dimensions of roughly 50 m by 80 m. As a result, the 50/30 m distance between survey points will maximize detection of willow flycatchers by ensuring that the territorial fitz-bew recording is played within the vicinity of all possible territories (no portion in the survey site is greater than 25 m from a survey point). Additionally the maximum distance of 50 m helps ensure that responses can be consistently heard by observers (Sogge et al. 1997b). In montane meadow settings willow flycatchers could be heard, and also responded to, taped recordings at distances greater than 100 m (Bombay 1999). In many instances the observer could hear the same individual bird from as many as six different survey points. Additionally, when Bombay (1999) used a point spacing of

100 m during initial surveys, subsequent monitoring visits did not result in the observation of previously undetected willow flycatchers. Therefore the 30/50 m spacing is conservative and should ensure that even observers with little experience with willow flycatcher vocalizations will be able to detect all singing willow flycatchers at each site.

IV. SURVEY METHODS

The survey methods described below fulfill the primary and secondary objectives of documenting the presence or absence of willow flycatchers during a single breeding season and estimating the number of singing willow flycatchers. This protocol is primarily a tape-playback technique, a proven method for eliciting response from nearby resident willow flycatchers (Seutin 1987, Craig et al. 1992, Sogge and Tibbitts 1994, Sferra et al. 1995, Sogge et al. 1997b).

A. General Guidelines

At each site, observers will broadcast recorded willow flycatcher songs, look and listen for responses, and record willow flycatcher locations for 6 minutes at survey points spaced 50/30 m apart (see detailed discussion below under Specific Survey Guidelines). **When traveling between points observers should move slowly and look and listen for willow flycatchers. The 50/30 m spacing is intended to be a minimum distance between points. If the observer determines that some areas are not being adequately covered with this spacing, additional points should be added where necessary. Observers should however, resist the urge to broadcast the tape recording repeatedly while walking between points. Broadcasting the tape incessantly decreases the amount of time during which the observer can actually hear responses.**

Response to the broadcast call could take several forms. A responding willow flycatcher will usually move toward the observer and sing (fitz-bew) from within or at the top of vegetation, Actively territorial willow flycatchers almost always vocalize strongly when a tape is played in their territory early in the season. If several flycatchers are present in an area, some or all may start singing after hearing the tape or the first responding individual. Flycatchers can often hear the tape from far away but will not usually move outside of their territory, so listen for distant responses. Another common response is alarm calls (whitts) or interaction twitters from within nearby vegetation, particularly once nesting has begun. Willow flycatchers often sing after a period of whitting in response to a tape, so observers should remain in the area and quietly listen for fitz-bews for several minutes. Because some flycatchers may initially respond by approaching quietly, it is critical to watch carefully for responding birds.

For the purpose of this protocol, detection of a fitz-bew song is essential to identify a bird as a willow flycatcher. Similar appearing species (including other *Empidonax* flycatchers) occur as migrants, and even breeders, at potential willow flycatcher breeding areas. A few of these other species may even approach a broadcast willow flycatcher

song and respond with vocalizations. To standardize interpretation of survey results and assure a high degree of confidence in surveys done by biologists of varying experience and skill, positive identification must be based on detection of the willow flycatcher's most unique characteristic, its' song. It is important to remember that the whitt call is not unique to willow flycatchers, and therefore cannot serve as the basis of a positive identification. However, whitts are extremely useful for locating flycatchers and identifying areas needing follow-up visits. Loud, strong whitting may indicate a nearby nest, dictating that observers exercise extra caution while moving through the area.

Because in open meadow-like settings some individual birds can be heard from multiple survey points, the observer needs to use caution to avoid double counting birds. This involves listening for counter-singing and watching to see if birds are being pulled off of their territories by the recording. Additionally, it may be helpful to have two people working through a site and recording bird locations on photos, as long as only one is broadcasting the tape.

If a site is large, every effort should be made to survey it in one morning. This may require two or more different observers. When multiple observers are used, the site should be divided in a manner that minimizes the risk of observers hearing each other's tape broadcasts and mistaking them for an actual willow flycatcher. If multiple observers are not available the site should be surveyed on consecutive mornings.

B. Specific Survey Guidelines

Begin surveys as soon as there is enough light to safely walk (about one hour before sunrise) and end by 10:00 a.m. Surveys should not be done during periods of steady rain or wind greater than about 12 mph (indicated by leaves and small twigs in constant motion).

1. Prebroadcast Listening

The observer will start at a survey point at one end of the survey site. He/she will stand quietly and listen for spontaneous singing by willow flycatchers and attempt to visually detect individual birds for **10 minutes.** A period of quiet listening is important because it helps acclimate observers to background noises (which can be quite loud due to roads, aircraft, machinery, waterways). It also allows observers to recognize and "filter out" the songs and calls of other bird species, letting them focus attention on listening for willow flycatchers. Although it happens rarely, some singing willow flycatchers will actually stop vocalizing and approach quietly in response to a broadcast song. Therefore, playing a tape before listening for singing individuals has at least some potential of reducing detectability.

2. Survey Point - Tape Broadcasting

After the initial listening period the observer should begin the active survey procedure. At each point the observer will initially listen quietly for I minute, after which a taped recording of the "fitz-bew" call will be broadcast. The observer will broadcast 4 "fitz-bew" vocalizations, and then listen and watch for responses for 2 minutes. The broadcast process will then be repeated again for a total of **6 minutes** of survey at each point (1 min + 2.5 min + 2.5 min). The tape should be played at the volume of natural bird calls, and not so loud as to cause distortion of the broadcast.

WILLOW FLYCATCHER DETECTED

If a willow flycatcher is detected during the 6 minute period, the point number, time, and whether this is the l^{st}, 2^{nd}, 3^{rd}, etc. willow flycatcher will be recorded. In addition, the types of detection (visual, fitz-bew, call), and approximate distance of the detection will be recorded. The location of the bird should be marked on the overlay/map. By listening for counter-singing and watching the birds' movements, the observer should make an effort to determine whether detections are new, or birds from previous survey points. If the previous survey point had the first detection, that bird was numbered as "l", if the current station is Still detecting the same bird, that detection will also be numbered as willow flycatcher number "1" in the "wifl #" column of the survey form.

If a willow flycatcher is detected at a distance closer than 50m before the 6-minute period is complete, the observer will continue to listen/look for additional willow flycatchers at this point, until six minutes are up, but they need not continue playing the tape. If willow flycatchers were detected at a distance greater than 50m, the recording of willow flycatcher vocalizations should continue to be broadcast from this point to detect or elicit a response from other willow flycatchers in the vicinity. At the end of the 6-minute period the observer will move to the next survey point, or at least 50 m past the location of the identified willow flycatcher. This will help avoid "double-counting" flycatchers that have already responded. Willow flycatchers may follow the broadcast song for 50 m or more (Sogge and Tibbitts 1994).

At the end of the 6-minute period the observer will move slowly to the next survey point, watching and listening for willow flycatchers. This process must be completed until all survey points have been covered. **Failure to survey all points will result in a site not meeting protocol. Observers must make an effort to detect all willow flycatchers present.**

UNCONFIRMED FLYCATCHER DETECTED

If a bird is detected but cannot be confirmed as a willow flycatcher (no "Fitz-bew"), the location of the bird should be marked on the map/overlay and must receive a subsequent **follow-up visit** as described below.

Whenever a willow flycatcher (suspected or verified) is detected, be careful not to overplay the song tape. Excessive tape playing could divert the bird from normal

breeding activities, and/or attract the attention of predators and brood parasites. Overplaying the tape may constitute harassment of the flycatcher. If you have heard even a single fitz-bew, this is sufficient for verification (although willow flycatchers usually sing repeatedly, once prompted).

NO WILLOW FLYCATCHER DETECTED

If after 6 minutes no willow flycatchers or, unconfirmed flycatchers are detected at a survey point, move 30/50 m to the next survey point. This process must be repeated until all points at the site are completed. Failure to cover all surveys points will result in the survey not meeting protocol. Before leaving the site observers should revisit the map/photo and determine whether all portions of the site were adequately covered. At this point additional survey points can be added to ensure good coverage of the entire area.

3. Follow-Up Visit

If during either visit a flycatcher is detected but cannot be positively identified (no Fitz-bew), an additional follow-up visit to the specific location (50 m radius) of the suspected willow flycatcher is required. The follow-up visit can be done on the same day as the suspected detection if it can be completed prior to 10:00 a.m. Follow-up visits must be completed within 5 days of the initial visit.

The observer should approach the area within a 50 m radius of the initial detection and listen and watch for 15 minutes. If no willow flycatcher is detected, the tape should be broadcast using the standard 6-minute procedure described above. The observer should then listen for an additional 15 minutes. If during this time a bird is detected and "whitting" in a persistent and alarmed manner, the observer should back off and observe from a distance. After the **36-minute** time period is over the follow-up visit is complete.

If unconfirmed flycatchers do not receive a follow-up visit, the site has not been surveyed to protocol, and willow flycatchers cannot be presumed absent. Remember the best way to eliminate the problem of unconfirmed *Empidonax* flycatchers is to be familiar with the diagnostic song and call notes of the other species present within the survey region.

4. Verifying the Number of Singing Willow Flycatchers

Accurately determining the number of singing birds is more difficult than determining simple presence or absence. Flycatchers sing from multiple song perches within their territories, sometimes appearing to be more than one flycatcher. A flycatcher responding to or following an observer playing a tape may move considerable distances in a patch and thus be counted more than once.

If, after a survey is complete, the observer feels that birds may have been double counted, they should attempt to verify the number of singing willow flycatchers. This can be done by slowly walking through the area in question and listening for counter-singing. In addition, it is very helpful to watch each flycatcher to determine approximate boundaries of its territory, and to determine if and how it interacts withother flycatchers. If one or more singing birds stay primarily in mutually exclusive areas, they can be considered as separate territories. Conversely if you see a bird fly repeatedly between the two areas you counted as separate birds, you likely have a single territory.

V. RECORDING ADDITIONAL INFORMATION

A. Looking for and recording color bands

Several on-going research projects involve the banding of willow flycatchers at breeding sites in California and elsewhere in the West. In many projects, each flycatcher is banded with a unique combination of small colored leg bands (one or more per leg), and a numbered USFWS aluminum band (which will appear silver). Observers may see color-banded individuals at their sites, and identification of the band combination will provide important data on willow flycatcher movements, survivorship, and site fidelity.

To look for bands, move to get a good view of the flycatcher's legs. This may be difficult in dense vegetation, but flycatchers often perch on more exposed branches at the edges of their territory or habitat patch. If bands are seen, carefully note the band colors. If there is more than one band on a leg, differentiate the top (farthest up the leg) from the bottom (closest the foot), and those on the bird's left leg versus the right leg. If you are unsure of the color, DO NOT GUESS. Instead, record the color and unknown and attempt to get a better look during your next visit. Incorrect color-band data are worse than incomplete data, so record only colors of which you are certain. The fact that a banded bird was seen, even without being certain of its color combination, is very important information. Record the color-band information on the survey form, and report the sighting to the appropriate state or federal contact as soon as you return from the survey.

B. Documenting signs of breeding behavior

For the purposes of this protocol a singing willow flycatcher found during survey periods 2 and 3 is assumed to be a resident bird on a territory (although there is a small chance it could be a nonterritorial "floater"; Sogge and Tibbitts 1994, Sogge et al. 1997a). Additionally, for management purposes, all singing birds are assumed to be attempting to breed.

Although this protocol is not designed to cover determination of nesting status, the observations of some behaviors provide valuable information and should be recorded on the survey form. If the presence of a willow flycatcher has been verified by the Fitz-bew

vocalization, the following behaviors should be reported. These signs of breeding activity include:

1. Observation of another unchallenged willow flycatcher in the immediate vicinity of a singing willow flycatcher (indicates possible pair);
2. Whitt calls between nearby willow flycatchers (indicates possible pair);
3. Interaction twitter calls between nearby willow flycatchers (indicates possible pair);
4. Willow flycatcher carrying nest material (verifies nesting attempt, but not nest outcome);
5. Willow flycatcher carrying food or fecal sac (verifies nest with young, but not nest outcome);
6. Observation of adult flycatchers feeding fledged young (verifies successful nesting).

Be sure to note on the survey form any breeding activity that is observed, including detailed descriptions of the number of birds, specific activities observed, etc. Also note the location of breeding activities on an aerial photograph, map, or sketch of the area.

Failure to observe these behaviors during surveys should NOT be interpreted to mean that willow flycatchers are not breeding.

C. Documenting Presence of Cowbirds

In some areas of the West, brown-headed cowbirds significantly impact many willow flycatcher populations by decreasing or eliminating flycatcher productivity, nesting success, and juvenile survival (Flett & Sanders 1987, Unitt 1987, Brown 1988, Whitfield 1990, USFWS 1993, Whitfield and Strong 1995, Sferra et al. 1997, Sogge et al. 1997a, Sedgwick & Iko 1999, Whitfield and Sogge 1999). It is important to document if cowbirds occur at a willow flycatcher breeding site to determine if those flycatchers are at risk from cowbird brood parasitism. As noted earlier, another reason to watch for cowbirds is to avoid attracting cowbirds to a flycatcher territory or making flycatcher nests more detectable to cowbirds.

Observers should look and listen for cowbirds at, and in the vicinity of, the survey site. This requires that observers are able to identify cowbirds by sight and vocalizations. The latter is particularly important because cowbirds are often heard even when not seen in the dense habitat at flycatcher sites. Accurate estimation of cowbird numbers at a site is often difficult. Cowbirds may be either very inconspicuous or very prominent. They often travel in groups, with individuals and groups ranging over wide areas during short periods of time. A count may be high or low depending on the activities of a cowbird flock ranging in **the** area. **Because of the difficulty of accurately estimating brown-headed cowbird abundance, the flycatcher survey form requests simple presence/absence. A relative estimate of cowbird abundance can be included in the comment section.**

VI. PERMITS

It is the observer's responsibility to obtain all necessary federal, state, and agency permits prior to conducting any surveys. Failure to do so leaves you liable for violation of the California Endangered Species Act and state laws.

VII. PRE-SURVEY PREPARATION

Observers should use all methods available to become familiar with the morphology of the willow flycatcher, including training sessions, drawings, photographs, study skins or mounts, and the training video currently being prepared by the U.S.D.A. Forest Service for release in early 2001. It is critical for observers to be familiar with willow flycatcher vocalizations before going in the field. Although the "fitz-bew" song is the basis for verifying detections using this protocol, willow flycatchers use many other vocalizations that are valuable in locating birds and breeding sites. We strongly encourage that all observers learn as many vocalizations as possible (see Stein 1963). It is imperative that recordings of the varied vocalizations be studied prior to surveys. Tapes are available through the contacts listed at the end of this protocol. Several commercial bird song tapes include willow flycatcher vocalizations, but these tapes typically include only a few vocalizations.

If possible, visit known willow flycatcher breeding sites (after obtaining landowner or management agency permission) to become familiar with flycatcher appearance, behavior, vocalizations, and habitat. Such visits are usually part of the standardized flycatcher survey training sessions. All visits should be coordinated with U.S.D.A. Forest Service, State wildlife agencies, and the property manager/owner, and must avoid disturbance to resident willow flycatchers.

Observers must be able to identify, by sight and vocalizations, other species likely to be found in survey areas, that may be confused with willow flycatchers. In central and northern California species similar in appearance include western wood-pewee *(Contopus sordidulus),* and especially the dusky flycatcher *(Empidonax olberholseri),* Hammond's flycatcher *(Empidonax hammondii),* and other *Empidonax* flycatchers. At a distance, partial song or call notes of ash-throated flycatchers *(Myiarchus cinerascens)* and some swallows can sound considerably like a "fitz-bew". Observers should also be able to identify (by sight and sound) brown-headed cowbirds. It is worthwhile to make one or more pre-survey trips to the survey sites (or other similar areas) to become familiar with the local bird fauna.

Be prepared to work hard and remain focused and diligent in a wide range of physically demanding conditions. At many sites these include heat, cold, wading through flowing or stagnant water, muddy or swampy conditions, crawling through dense thickets (often on hands and knees), and exposure to snakes, skunks, bears, and copious biting insects.

Familiarity with the survey site prior to the first surveys is the best way to be prepared for the conditions you will experience.

A. Willow Flycatcher Identification:

1. Physical description

The willow flycatcher is a small bird, approximately 15 cm long and weighing about 11-12 g. Sexes look alike and cannot be distinguished by plumage. The upper parts are brownish-olive; a white throat contrasts with the pale olive breast, and the belly is pale yellow. Two pale wing bars are visible (juveniles have buffy wing bars) but are not highly prominent (Bent 1942, McCabe 1991, Pyle 1997, Sogge et al. 1997b). From a distance one of the most notable plumage characteristic is the high level of contrast between the dark crown and pale "whitish" chin and throat. The area around the eye called the "eye ring" is a common diagnostic feature in *Empidonax* flycatchers; in the willow flycatcher the eye ring is faint or absent. The upper mandible is dark, and the lower mandible light yellow from base to tip (Pyle 1997). Overall the bill is very wide and relatively long, giving it a larger appearance than other *Empidonax* flycatchers' bills. The tail is not strongly forked. When perched, the willow flycatcher often flicks its tail upward.

The *Empidonax* flycatchers are a difficult groups of birds to distinguish by appearance. For the purpose of this protocol, willow flycatchers cannot be identified solely by sight; the "fitz-bew" vocalization is the critical identification criterion. Within central and northern California, the species most similar in appearance are the dusky and Hammond's flycatchers. Hammond's flycatchers are found in cool forests and woodlands and primarily breed in dense fir (Grinnell & Miller 1944, AOU 1983, Gaines 1992). The dusky flycatcher is primarily found in scrub, brushy areas, thickets and open areas with scattered trees and breeds in aspen groves, willow thickets, open coniferous forest, and montane chaparral, especially near water (Grinnell & Miller 1944, Gaines 1992). In the Sierra Nevada dusky flycatchers are commonly observed nesting and foraging in willows in montane meadows, frequently with territories overlapping willow flycatcher territories (Grinnell & Miller 1944, Gaines 1992, H. Bombay pers. obs., J. Cain unpublished data). Dusky flycatchers will occasionally respond to taped willow flycatcher recordings with "whitts" and other agitation calls (H. Bombay pers. obs.). Therefore it is essential that observers be familiar with the frequently overlooked dusky flycatcher song, and diagnostic "de-hick" call. Knowledge of these two vocalizations will often allow the observer to quickly eliminate an otherwise "unknown" *Empidonax* from further question.

2. Vocalizations

Willow flycatchers have a variety of vocalizations (see Stein 1963, McCabe 1991), but two are most commonly heard during surveys or in response to tape-playback:

(a) "Fitz-bew". This is the willow flycatcher's characteristic primary song, and the only vocalization that is considered to be diagnostic for the purposes of this survey protocol. Male willow flycatchers may sing almost continuously for hours, with song rates as high as one song every few seconds. Song volume, pitch, and frequency may change as the season progresses (Ettinger & King 1980, Prescott & Middleton 1988, McCabe 1991, Braden & McKernan 1998). During prolonged singing bouts, short "britt" notes often separate fitz-bews. A male most often gives fitz-bews, but studies have shown that female willow flycatchers also sing, sometimes quite loudly and persistently (though generally less than males)(Seutin 1987). Flycatchers often sing from the top of vegetation (riparian shrubs, trees, snags, sign posts) but will also vocalize while perched or moving about in dense vegetation.

(b) "Whit". This is a call often used by birds on their territory and commonly heard even during periods when the flycatchers are not singing (fitz-bewing)(McCabe 1991, Braden & McKernan 1998). The whitt call appears to be a contact call between sexes, as well as an alarm call (much louder), particularly when responding to disturbance near the nest. Whitt calls can be extremely useful for locating potential willow flycatchers later in the season and identifying areas requiring follow-up visits. When flycatcher pairs have active nests (particularly once young have hatched), whitts may be the most noticeable vocalization (McCabe 1991, Sogge et al. 1997b, Braden & McKeman 1998). However, many species of bird's **whitt, so the whitt call is not a diagnostic characteristic for willow flycatchers.**

(c) "Whee-o,[n] Zweeo". This is a loud call similar in tone and quality to the "Fitz-bew". It is typically made by males from their singing perches, often alternating with the "Fitz-bew" song. This call is made throughout the breeding season, with some birds using it frequently while others rarely do. Next to the primary song, this call is probably the most easily distinguished. The purpose of this call is unknown.

(d) "Quiver," "Twitter," or "Chitter". This is an agitation call typically given during interactions between willow flycatchers (mates or other conspecifics); or sometimes during interactions between willow flycatchers and other species of birds. This vocalization is typically rather loud and emphatic. Beware; dusky flycatchers sometimes give a similar call when alarmed.

(e) Bill-snapping. Adults most frequently make this vocalization during handling of them or their young. Bill snapping is an agitation call used by many *Empidonax* flycatchers, as well as other bird species.

(f) Other calls. Other calls willow flycatchers produce include a low, slurred "churr" (function unknown), a metallic-sounding "Da-dink" (given by the fledglings almost continuously; it accelerates into a twitter when the parents approach with food)(Harris et al. 1997).

The fitz-bew and whitt calls are the most commonly heard willow flycatcher vocalizations. The whitt and other less common willow flycatcher vocalizations can be very useful in alerting observers to the potential presence of willow flycatchers, however they alone are not sufficient to determine willow flycatcher presence for the purpose of this survey protocol. Because these sounds can be valuable in guiding when and where follow-up visits are needed, they should be studied prior to going in the field. Information on how to obtain willow flycatcher vocalization tapes is available from the agency contacts listed at the end of this protocol. Refer to Stein (1963) for detailed discussions of flycatcher vocalizations.

Willow flycatcher song rates are highest early in the breeding season (late May to late June) and appear to decline after nesting is initiated (Flett and Sanders 1987, Sogge and Tibbitts 1992, Braden & McKernan 1998). In areas with many territorial flycatchers, or where an unpaired flycatcher is still trying to attract a mate, or multiple renesting attempts are occurring, however, singing rates may be high well into July (Craig et al. 1992, Sogge 1995). Additionally, after fledging occurs song rates tend to increase again (Braden & McKernan 1998). Although not always the case, isolated pairs can be much quieter and harder to detect than pairs with adjacent territorial flycatchers (Sogge et al. 1997b, M. Whitfield, pers. comm., H. Bombay pers. obs.). At some sites, predawn singing (0330 - 0500 hrs) appears to continue strongly at least through mid-July (Sogge et al. 1995, Petterson and Sogge 1996, J. Sedgwick pers. comm.).

B. Equipment:

The following equipment is necessary to conduct willow flycatcher surveys:

1. USGS topographic maps of the area (a marked copy to be attached to survey data sheet). Be sure to ALWAYS submit a copy of a topographic map with survey area and flycatcher sightings clearly marked.

2. Standardized survey form (bring more copies than you think you need).

3. Handheld cassette/megaphone assemblage, or light-weight tape player (with adequate volume to carry well).

4. Extra tape player and batteries (dirt, water, dust and heat often cause equipment failure, and having backup equipment helps avoid aborting a survey due to equipment loss).

5. Willow flycatcher tapes. Two or more tapes per observer (tapes do get damaged and wear out in the field, extra tapes are very important). Information on where to obtain tapes can be acquired through the contacts listed in the back of this protocol.

6. Clipboard and **multiple** pencils and/or permanent (waterproof) ink pens (we recommend recording survey results directly on the survey data form, to assure that you collect and record all required data).

7. Aerial photograph with clear plastic/mylar overlay (if available). Aerial photographs can significantly improve your surveys by allowing you to accurately target your survey, thus saving time (and energy) in the field. By marking survey points ahead of time you can better evaluate the amount of time and number of observers needed to adequately cover the area. Check with local planning offices and/or state and federal land management agencies for availability. Take color photocopies, not the original aerial photos, with you in the field. Aerial photos are also very useful when submitting your survey results but cannot be submitted in place of a topographic map.

8. Binoculars and bird field guide

9. Hip- or chest-waders

10. Dress in muted earth-tone colors, and avoid wearing bright clothing.

The following equipment is recommended:

1. Camera and film (for habitat photos, especially at sites where flycatchers are found).

2. GPS unit - for determining survey coordinates and verifying location of survey plots on topographic maps.

3. Survey flagging (conservative earth-tone colors) for marking survey sites, areas where flycatcher are detected, and/or areas in need of follow-up visits to confirm willow flycatcher presence. Check with the local landowner or management agency before flagging sites.

C. Reconnaissance

If possible, a reconnaissance visit should be made to each site prior to actual surveys. During this visit, mileage, directions and road numbers should be recorded to assist in subsequent visits later in the year, or in future years. Also at this time, observers will note any barriers existing between survey points (large streams, impenetrable shrub thickets). If barriers do exist, routes around them should be noted. These changes and travel routes within the site will then be marked on the map/overlay.

D. Special Considerations

To avoid adverse impacts to willow flycatchers, follow these guidelines when performing all surveys:

1. Do not play the tape more than necessary and/or needlessly elicit vocal responses once willow flycatchers have been located and verified. This may distract resident birds from caring for eggs or young, or defending their territory. Excessive tape playing may also attract the attention of predators or brood parasites, and may result in reduce willow flycatcher response rates due to habitualization.

2. Proceed cautiously while moving through willow flycatcher habitat. Continuously check the area around you to avoid disturbance to nests of willow flycatchers and other species. Do not break understory vegetation, even dead branches, to create a path through the surveyed habitat.

3. Do not approach known or suspected nests. Nest searches and monitoring require specific state permits and are not intended to be a part of this survey protocol.

4. If you find yourself close to a nest (or a suspected nest), move away slowly to avoid startling birds. Avoid physical contact with the nest or nest shrub, to prevent physical disturbance and leaving a scent. If possible, do not leave a nest by the same route that you approached. This leaves a "dead end" trail, that could guide a potential predator to the nest/nest tree.

5. Watch for and note the presence of potential predators and nest parasites, particularly ravens, crows, jays, magpies, and cowbirds. If such predators are in the immediate vicinity, wait for them to leave before playing the tape.

6. If you use flagging to mark an area where flycatchers are found, use earth-tone colors and make certain the flagging is not near an active nest. Check with the property owner or land management agency before flagging to be sure that similar flagging is not being used for other purposes in the area. Flagging should be placed no closer than 30 m from any nest. Keep flagging inconspicuous from general public view to avoid' attracting people or animals to an occupied site, and remove it at the end of the breeding season.

VIII. REPORTING RESULTS

Fill in all appropriate information on the willow flycatcher survey forms 1 and 2 (Appendix A) while still in the field, and mark the location of detections on a copy of the USGS topographic map. Make a habit of reviewing the form before you leave any site, as trying to remember specific information and record it later leads to missing and inaccurate data. Put the location of the sighting on an aerial photograph or sketch of the site. Then summarize survey visit information and willow flycatcher locations on form 3 (Appendix A). Whenever a willow flycatcher territory is confirmed, notify the California Department of Fish and Game (CDF&G) and the agency governing the site where the bird was located (see Contacts section) as soon as you return from the field.

Complete all survey forms (Appendix B) for each site surveyed, whether or not flycatchers were detected Negative data (e.g., a lack of detections) is important to document absence of willow flycatchers and help determine what areas have already been surveyed. Make and retain a copy of each survey form, and submit the original. Survey forms must be returned to the CDF&G and/or the appropriate agency by October 1 of each year. Timely submission of survey data will ensure the information is included in annual statewide and regional reports.

IX. ACKNOWLEDGMENTS

We thank Mark Sogge for allowing us to use the current southwestern willow flycatcher survey protocol (Sogge et al. 1997b) as a template for both form and content, as well as the authors of previous U.S. Forest Service guidelines (Craig et al. 1992, Harris et al. 1997). We also thank the California "Willow Flycatcher Working Group" for providing feedback and suggestions. The experience and insights of many observers and researchers contributed greatly to the development of this protocol - we are grateful to all of them.

X. CONTACTS

Personnel at the following agencies can be contacted for information about willow flycatcher survey training, research permits, and to report flycatcher detections.

STATE AGENCIES

Ron Schlorff — 916/653-7664
California Dept. of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

FEDERAL AGENCIES

U.S.D.A. Forest Service

John Robinson — 707/562-8929
Region 5 (CA)
1323 Club Drive
Vallejo, CA 94592

Teresa Ritter — 760/376-3781
Willow Flycatcher Program Coordinator
Sequoia National Forest
P. O. Box 9
Kernville, CA 93238

U.S. Fish and Wildlife Service:

Sacramento Fish and Wildlife Office — 916/414-6600
2800 Cottage Way
Suite W-2605
Sacramento, CA 95825-1846

APPENDIX A

NATURAL HISTORY

NATURAL HISTORY OF THE WILLOW FLYCATCHER

I. BREEDING RANGE, TAXONOMY, AND SPECIES STATUS

The willow flycatcher *(Empidonax trailli)* is a small passerine that breeds in riparian and mesic upland thickets in the United States and southern Canada (AOU 1983). Its breeding range extends from central British Columbia south to northern Baja California and east to the Atlantic coast. The willow flycatcher was formerly considered the western race of the Traill's flycatcher *(E. t. brewsteri;* "the little flycatcher")(Bent 1942). The eastern race was known as the "alder flycatcher" *(E. t. traillii)* (Bent 1942). Traill's flycatcher was divided into two species in 1973: *Empidonax traillii* (Audubon), the willow flycatcher; and *Empidonax alnorum* (Brewster), the alder flycatcher (AOU 1973). The two species are almost indistinguishable morphologically, differing primarily in vocalizations and ecology, and are considered the "traillii complex" or "Traill's flycatcher" super-species (AOU 1973).

There are four subspecies of the willow flycatcher currently recognized (Hubbard 1987, USFWS 1995, Browning 1993, Unitt 1987). The subspecies occupy distinct breeding ranges and are differentiated primarily by subtle differences in color and morphology. Three of these subspecies occur in California (Phillips 1948, Unitt 1987). All three subspecies were designated as endangered in California under the California Endangered Species Act in 1990 (CDFG 1991). Additionally these subspecies are designated as Sensitive species in California by the U.S. Forest Service (USFS) Region 5, and by the U.S. Fish and Wildlife Service (USFWS) Region 1.

The southernmost subspecies, known as the southwestern willow flycatcher *(E. t. extimus),* is found south of the Owens Valley, the South Fork Kern River, and the Santa Ynez River. In 1991 the U.S. Fish and Wildlife Service designated the southwestern willow flycatcher as a candidate category 1 species (USFWS 1991). In July 1993, the USFWS proposed to list *E. t. extimus* as an endangered species and to designate critical habitat under the Act (USFWS 1993). A final ruling listing *E. t. extimus* as endangered was published in February 1995, and designation of critical habitat was designated in July 1997 (USFWS 1997). As a result of its federally endangered status, the *E. t. extimus* subspecies is not covered by this protocol. Surveys within the range of the southwestern willow flycatcher must be carried out in accordance with the protocol prepared by Sogge et al. (1997b).

The two subspecies occurring in central and northern California, and covered by this protocol, are *E. t. brewsteri,* and *E. t. adastus.* In California, *E. t. brewsteri* breeds west of the Sierra/Cascade crestline, from Tulare County north (Phillips 1948, Unitt 1987). This subspecies is currently limited to montane and north coastal locations. In California, *E. t. adastus* occurs east of the Sierra/Cascade crestline from the Oregon border south to Inyo County. A number of current breeding sites for willow flycatchers in California occur within only a few miles of the Sierra Crest. It is unknown at this time whether these individuals represent *the adastus* or *brewsteri* subspecies. Additionally, it

is possible that these birds are hybrids between the two subspecies since they occur along the predicted zone of intergradation (Phillips 1948, Unitt 1987).

II. MIGRATION AND WINTER RANGE

All subspecies of willow flycatchers breed in North America, but winter in Central and South America. Winter distribution is not completely known, but includes Mexico, Central America, and possibly northern South America (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). Specific wintering sites for *E. t. adastus* and *E. t. brewsteri* are currently unknown. In central and northern California willow flycatchers typically arrive on their breeding grounds in late May (southern Sierra Nevada) and more commonly in early June (Stafford & Valentine 1985, Flett and Sanders 1987, Valentine et al. 1988, Fowler et al. 1991, Bombay 1999).

Within the range of southwestern willow flycatchers northbound migrants traveling to central and northern California and points north pass through areas where resident southwestern willow flycatchers are already breeding in Late May and early June. This creates confusion during southwestern willow flycatcher surveys because migrating birds often sing at their stopover locations (Sogge et al. 1997a). In central and northern California, however, the migration period does not generally overlap with the breeding period. For this reason, birds detected after June 15th can reliably be considered resident birds. Conversely, southbound migrants in late July and August may occur where willow flycatchers are still breeding, however the likelihood of these fall migrants singing is reduced (Unitt 1987, J. Sedgwick pers. comm.).

III. HABITAT

Given the extensive geographic range of the willow flycatcher it is not surprising that there is geographic variation in the characteristics of willow flycatcher habitat within this region. Just as vegetation communities change with differing climatic influences of elevation, aspect and latitude, sites used by willow flycatchers vary somewhat in California. Nonetheless, some generalizations about *E. t. adastus* and *E. t. brewsteri* habitat associations can be made. These two subspecies breed in shrubby riparian vegetation and typically have at least some surface water or saturated soil within the defended territory during the early portion of the breeding season (Bent 1942, King 1955, Serena 1982, Harris et al. 1988, Sanders & Flett 1989, Sedgwick & Knopf 1992, Bombay 1999). In the Sierra Nevada, the shrub layer is typically 2 - 4 meters in height, with the lower 2 meters of dense woody structure. The live foliage density is moderately high and also relatively uniform from the ground to the canopy (Sanders & Flett 1989, Bombay 1999). Other characteristics of sites occupied by willow flycatchers, such as dominant plant species, size and shape of patch, and amount and type of water can vary widely among sites.

Narrative descriptions of five general vegetation/hydrology types currently used by willow flycatchers within their range in central and northern California are provided

below. The vegetation/hydrology "types" described below include a continuum of plant species composition (from nearly monotypic to mixed riparian shrub species), and hydrologic sources (from simple spring fed systems to complex riverine systems). The intent of the descriptions is to provide a general guide for evaluating whether a site would require survey efforts. They are not, however, an inclusive list of all potentially occupied areas, so some individual judgment is necessary when evaluating sites that do not neatly fit one of the following descriptions.

A. Monotypic willow meadow - seep/snowmelt

Usually 1-20 acre (0-4-8.0 ha) meadows with nearly monotypic stands of willow scattered in patches across the site. Willow is generally 2-4 meters in height, and overstory is only present along the meadow edge. Often sedge dominated, but with other herbaceous cover. Water to the site usually provided by large springs, seeps, fens, bogs or snowmelt. Generally no defined stream course, occasionally small braided rivulets. Sites may be low to moderate gradient slope, and water may pond in low lying areas. These sites tend to retain saturated soils throughout most of the summer season.

B. Monotypic willow meadow - small stream

Typically 1-20 acre (0.4-8.0 ha) meadows with nearly monotypic stands of willow scattered in patches across the site, or occurring linearly along the stream channel. Willow is generally 2-4 meters in height and with the exception of a few scattered trees within the riparian zone, the overstory is only present along meadow edge. Either conifer forest or sagebrush communities often border these meadow/riparian areas. The herbaceous layer is highly variable depending on soil moisture and hydrology. Small streams less than 2 meters, in width largely provide water at the site. Generally low to moderate gradient streams with little standing water. Soils may be saturated from overbank flows, snowmelt, or localized springs/seeps early in the season but tend to dry out by late summer.

C. Monotypic willow marsh - lake margin

Usually 10 - 200+ acre (4.0-S0.0+ ha) meadows with nearly monotypic stands of willow scattered in patches near margin of open water. Size of willow patches varies, but large patches (300 sq. m/0.07 acres) usually have at least some small openings of 1 meter in width or more. Willow is generally 2-5 meters in height, and a tree overstory is absent. Seasonally inundated areas dominated by often monotypic stands of sedges or rushes, but sites may also contain vast drier areas dominated by grasses and forbs, and lacking a shrub component. Water to the site provided by the lake/reservoir margin. Suitable sites are generally restricted to natural lakes or reservoirs that do not undergo drastic changes in water levels during the summer months. In areas used by willow flycatchers (including the nest shrub), the ground may be completely covered by up to a meter of water during the first half of the breeding season. Streams flowing into the lake/reservoir may provide secondary water and willow sources.

D. Monotypic willow meadow - large low gradient stream/riverine

Usually 5 - 200+ acre meadows with nearly monotypic stands of willow scattered in patches across the site. The size of willow patches varies, but large patches (300sq. m) usually have at least some small openings of 1 meter in width or more. Willow is generally 2-4 meters in height, and with the exception of occasional scattered trees within the meadow, an overstory is only present along the meadow edge. Often sedge dominated in the wet portions of the site, but may contain vast drier areas dominated by grasses and forbs, and lacking a shrub component. Water to the site provided by large (>2m wide) low gradient stream with a pronounced meander pattern. Additional standing water is often present on site in old depressions and oxbows created by historical river movement. These hold water for varying periods of time, and are filled by over bank flows in the spring, or by snowmelt. These sites often have localized areas with springs or seeps providing water away from the stream course. Willow flycatcher habitat may be located along the main channel, or may occur along oxbows/springs at distances of over 200 meters from the current channel.

E. Mixed Shrub Riparian - varying stream size

Typically riparian zones with openings 10 - 40 meters in width, and or stringer meadows or openings less than 5 acres (2.02 ha) in size. Riparian shrub vegetation highly varied including: willow, alder, dogwood, aspen, wild rose, ninebark, elderberry, hawthorn, sapling aspen, etc. Shrubs are generally 2-6 meters in height and because of the narrow openings forest overstory/edge provides a relatively large amount of shading. Shrubs are often distributed in dense linear strips along the stream with relatively few openings. The herbaceous layer is highly variable depending on soil moisture, substrate and hydrology. Water at the site is largely provided by streams or seeps of varying size, generally with moderate gradients, little standing water, and with a minimal meander pattern. Historical or secondary channels occasionally hold standing water, as do off channel beaver impoundments. Soils may also be saturated from overbank flows, snowmelt, or localized springs/seeps. In some cases shrubby habitat at these sites occurs in the form of deciduous secondary growth along woodland edges and clearings, particularly in far northern California where greater rainfall and latitudinal effects provide the required wetness and vegetative characteristics in non-riparian areas (Gabrielson & Jewett 1940, Gilligan et al. 1994, King 1955).

F. Monotypic willow/mixed species area - borrow pit/ditch

Areas occurring along manmade ditches, often borrow pits running parallel to raised railroad beds or levees. Depending upon the elevation these sites have nearly monotypic stands of willow, or mixed riparian species, occurring linearly along the ditch. Willow is generally 2-4 meters in height. Either conifer forest or, more frequently, grassland/sagebrush communities border these “riparian” areas. The herbaceous layer is highly variable depending on soil moisture and hydrology. Seasonally inundated areas dominated by often monotypic stands of

sedges or rushes, but sites usually also contain vast drier areas dominated by grasses and forbs, and lacking a shrub component.

Regardless of the plant/hydrologic combination, riparian/meadow sites used by breeding willow flycatchers vary in size and shape, and may contain relatively dense, linear, stands of shrubs, or irregularly-shaped mosaics of dense vegetation with open areas in between. On average, willow flycatcher territories in the Sierra Nevada contain 2000-2500 sq. meters of riparian shrub, usually willow (Sanders & Flett 1989, Fowler et al. 1991, Bombay 1999). The shrub layer is rarely continuous. In some cases, however, openings in this layer may be only 1 meter in width, or occur as open islands at the center of a patch, and therefore the patch may initially appear continuous. In the Sierra Nevada, willow flycatchers have nested in meadows as small as 1 acre (0.40 ha)(Stafford and Valentine 1985), and as large as several hundred acres (Serena 1982, Flett & Sanders' 1987, Bombay 1999).

Willow flycatcher territories generally contain open water, boggy seeps, or saturated soil. In the Sierra Nevada, Bombay (1999) found that within willow flycatcher territories the average proportion of ground covered by water in June is 44%. Although these territories all tend to have some surface water early in the season, the amount that persists through the summer can vary widely from year to year depending on: the snowpack (onsite and/or upstream), the hydrology, and the ability of the soils at the site to hold water (Ratliff 1982, 1985, Weixelman et al. 1999). In work with the southwestern willow flycatcher, researchers have found that at some sites vegetation may be immersed in standing water during a wet year, but be hundreds of meters from surface water in dry years, this is particularly true of reservoir sites (Sogge et al. 1997b). At other southwestern willow flycatcher breeding sites where the river channel has been recently modified (e.g. by creation of pilot channels), subsurface flows altered (e.g. from agricultural runoff), or the river channel has changed naturally (Sferra et al. 1997), there may be a total absence of water or visibly saturated soil for several years (Sogge et al. 1997b). However, it is not known how long such sites will continue to support riparian vegetation and/or remain occupied by breeding willow flycatchers (Sogge et al. 1997b).

Other potentially important aspects of willow flycatcher habitat include distribution and abundance of prey types, parasites, predators, as well as, environmental factors (e.g. temperature, humidity), and interspecific competition. Population dynamics factors such as demography (i.e. birth and death rates, age-specific fecundity), distribution of breeding groups across the landscape, dispersal patterns, migration routes, site fidelity, philopatry, and conspecific sociality also influence where willow flycatchers may be found and what vegetation communities they use (Wiens 1989, 1996, Sogge et al. 1997b, Netter et al. 1998). Most of these factors need further study, and may be critical to understanding current population dynamics and habitat use.

IV. HABITAT QUALITY

The ultimate measure of habitat quality is not simply whether or not a site is occupied. The highest quality habitats are those in which a given species have high reproductive success and survivorship resulting in a stable or growing population (Van Home 1983, Hall et al. 1997). A secondary indicator of quality from a management standpoint is number of breeding pairs per site. Sites with more pairs are less susceptible to extirpation than sites with small populations, given equal mean reproductive success and survival (Ginzburg et al. 1982, Lande 1998). Additionally, some occupied habitats may be acting as population sources, while others may be functioning as population sinks (Pulliam 1988).

Bombay (1999) found that the likelihood of willow flycatcher territories in the Sierra Nevada fledging young increased significantly with increasing percent shrub cover within the territory. Likewise the success of individual nests was positively associated with increasing distance to the nearest tree (Bombay 1999).

Migrant willow flycatchers may occur in nonriparian habitats and/or be found in riparian habitats unsuitable for breeding. Such migration stopover areas, even though not used for breeding, may be critically important resources affecting local and regional willow flycatcher productivity and survival (Young & Finch 1997).

V. BREEDING CHRONOLOGY AND BIOLOGY

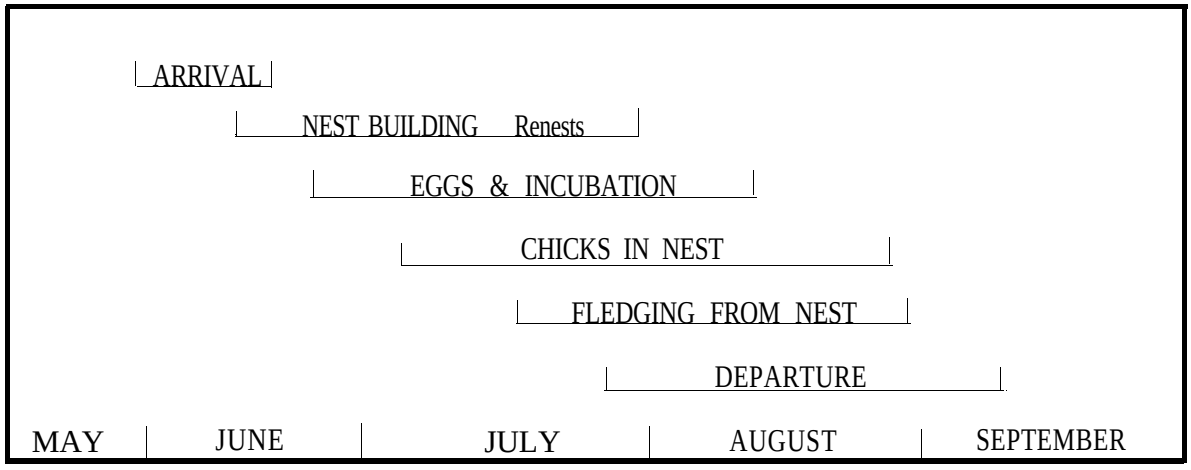
Figure 3 presents a generalized breeding chronology for willow flycatchers in central and northern California. 'Unless otherwise noted, the information that follows, and upon which Figure 3 is based, comes from Sanders & Flett (1989), Stafford & Valentine (1985), Valentine et al. (1988), Bombay (1999), Bombay & Morrison unpublished data. Extreme or record dates for any stage of the breeding cycle may vary as much as a week from the dates presented.

Males generally arrive at breeding areas first, with females typically arriving a week or two later. Males are usually monogamous, but polygyny has been recorded in the Sierra Nevada (Stafford and Valentine 1985, Valentine et al. 1988, Bombay 1999, Morrison et al. 1999). Nest building usually begins within a week of pair formation. Egg lying begins (rarely) as early as second week in June, but more often starts between June 25 - July 5. Chicks can be present in nests from mid-July through late August. Young typically fledge from nests from late July through late August; later fledging dates are often the product of renesting attempts (Stafford and Valentine 1985, Sanders & Flett 1989, Bombay and Morrison unpublished data). Adults depart from breeding territories as early as mid-August, but may stay until mid-September if they fledged young late in the season (Stafford and Valentine 1985, Bombay 1999). Males that fail to attract or retain mates, and males or pairs that are subject to significant disturbance (such as repeated nest predation, etc.) may leave territories earlier (mid-July). Fledglings

probably leave the breeding areas a week or two after adults, but few details are known (Sogge et al. 1997b).

Analysis of data available for central and northern California suggests that, for most breeding locations north of Alpine County (vicinity of Lake Tahoe), nest phenology is fairly uniform with nest initiation and fledging dates falling squarely within the middle of the time periods shown below in Figure 3. There are somewhat fewer data available for the portion of the Sierra occurring south of Alpine County, however, willow flycatcher nests monitored in the 1980's in the Sierra National Forest (South of Rings Canyon National Park) suggest that nest initiation tends to occur in the earlier portions of the nest stages displayed in Figure 3.

Figure 3. Generalized Willow Flycatcher Breeding Chronology for Central and Northern California*



* Extreme breeding dates may occur slightly earlier or later than indicated. At higher elevations seasonal differences in snowpack and timing of snowmelt may delay starting dates for each stage by up to two weeks (Valentine et al. 1988, Bombay et al. 1999).

Willow flycatcher territory size varies, probably due to differences in population density, habitat quality, nesting stage, polygyny, and individual variation. Early in the season, territorial flycatchers may move several hundred meters between singing locations, although this is most commonly documented at sites with one or two territorial males (Sogge et al. 1995, Petterson and Sogge 1996, Sogge et al. 1997b, R. Marshall pers. obs., H. Bombay pers. obs.). It is not known if such movements represent active defense of the entire area encompassed by singing locations. During incubation and nestling phases, territory size, or at least the activity centers of pairs, can be very small. Estimated breeding territory sizes for willow flycatchers in central and northern California are 0.09 - 1 .0 ha (Stafford & Valentine 1985, Sanders & Flett 1989, Bombay 1999). Flycatchers may increase their activity area after young are fledged and use nonriparian habitats adjacent to the breeding area.

VI. NESTS AND EGGS

Willow flycatchers build open cup nests approximately 9.5 cm high and 8.5 cm wide (outside dimensions), exclusive of any dangling material at the bottom (Sanders & Flett 1989, Bombay 1999). Nests are typically placed in the fork of a branch with the nest cup supported by several small-diameter vertical stems. The main forked branch may be oriented vertically, horizontally, or at an angle. Stems supporting the nest cup are typically 0.5 - 0.7 cm in diameter (Valentine et al. 1988, Sanders & Flett 1989, Bombay 1999).

Nest height also varies considerably and may be correlated with height of nest plant, overall canopy height, and/or the height of the vegetation strata that contains small twigs and live growth (Sogge et al. 1997b). Willow flycatcher nests in the Sierra Nevada have been found from 0.5 m to more than 2 m above the ground, with mean height values ranging from 1.11 - 1.49 m (Stafford & Valentine 1985, Sanders & Flett 1989, Bombay 1999).

Historically, most willow flycatcher nests reported in California were placed in willows, with occasional references to blackberry, aspen and alder as a substrate (Bendire & Brevet 1895, Bent 1942, Western Foundation of Vertebrate Zoology: unpublished nest records). Currently, willows are still the most frequently used riparian shrub group. At the mid- to high-elevation sites in the Sierra Nevada, Lemmon, Geyer, and Jepson willows were used almost exclusively for nesting (Stafford &Valentine 1985, Sanders & Flett 1989, Bombay 1999). Current nest records for other shrub substrates include mountain alder in the Warner Valley region, mountain mahogany *(Cercocarpus)* on the Modoc National Forest, and blackberry along the Klamath River (Harris et al. 1997, J. Villegas pers. comm., S. Cuenca pers. comm.).

Willow flycatcher eggs are buffy or light tan, approximately 18 mm long and 14 mm wide, with brown markings in a loose wreath at the blunt end (Bent 1942, Baicich & Harrison 1997, Sogge et al. 1997b). Clutch size is usually 3 or 4 eggs for first nests (Bent 1942, King 1955, Sanders & Flett 1989, Whitfield & Enos 1996, Sogge et al. 1997b, Sedgwick and Iko 1999, Bombay & Morrison unpublished data). Incubation lasts 12 - 13 days from the date the last egg is laid, and all eggs typically hatch within 24 - 48 hrs of each other (Bent 1942, Walkinshaw 1966, Ring 1955).

The female provides most or all initial care of the young, though the role of the male increases with the age and size of nestlings (Ettinger & King 1980, Prescott 1986). Young willow flycatchers fledge at 12 - 15 days of age and stay close to the nest and each other for 3 - 5 days. Recently fledged birds may repeatedly return to and leave the nest during this period (Spencer et al. 1996). Fledglings stay in the natal area a minimum of 14 - 15 days after fledging, possibly much longer. Male and female adults both feed the

fledged young, which beg loudly (Ettinger & King 1980, Prescott 1986, Sanders & Flett 1989).

While occasionally reported for the southwestern willow flycatcher (Sferra 1987, M. Whitfield unpublished data), second clutches after a successful, first nest are unknown for the *brewsteri* and *adastus* subspecies. Willow flycatchers often attempt a second and even third nest after nest failures (Stafford & Valentine 1985, Sferra et al. 1997, Sedgwick & Iko 1999, Bombay 1999, Morrison et al. 1999). In the Sierra Nevada, Morrison et al. (1999a) found that 15-38% of all pairs had renesting attempts annually. Replacement nests are built in the same territory, either in the same nest plant or at a distance of 30 m or more from the previous nest. Frequently, willow flycatchers will disassemble failed nests in order to build new nests (Stafford & Valentine 1985, McCabe 1991, H. Bombay pers. obs.). On a few occasions renesting flycatchers have been known to reuse the same nest in a single year (Yard & Brown 1999). In California, replacement nest building and egg laying can occur (uncommonly) as late as early August (Figure 3)(Stafford & Valentine 1985, Sanders & Flett 1989, Morrison et al. 1999, Bombay & Morrison unpublished data). Clutch size (and therefore potential productivity) usually decreases with each nest attempt (McCabe 1991, Whitfield and Strong 1995).

VII. SITE FIDELITY AND DISPERSAL

Recent work in the Sierra Nevada has found that roughly 15% of nestlings banded in 1997 and 1998 returned in the subsequent year (5 and 11 birds, respectively) (Morrison et al. 1999). In addition, 4 (11%) of the young banded in 1997 were detected again in 1999. Adults at these sites are not banded so return rates for birds that were present prior to project initiation in 1997 are unknown. The bulk of the remaining information on site fidelity and survival comes from different-regions.

At the Malheur National Wildlife Refuge in southeastern Oregon, *E. t. adastus* has an adult return rate of roughly 50% for both males and females, and roughly 7% for juveniles (Sedgwick & Iko 1999). Mean survival rates for both males and females at this site are roughly 1 year (Sedgwick & Iko 1999). Maximum survival reported for this study site was greater than 11 years (J. Sedgwick pers. comm.).

Sogge et al. (1997b) reported that, based on the studies of Whitfield (1990), Whitfield & Strong (1995), and Whitfield & Enos (1996) at the Kern River Preserve (CA), 21 of 58 southwestern willow flycatcher nestlings (36%) banded since 1993 returned to the study site to breed. Since 1989, 18 of 67 birds (3 1%) banded as adults returned to breed at the study site for at least one year. Six of the 67 (9%) returned to breed for two years. Nestling return rates, which are a function of over-winter survival and site fidelity, varied with fledging date. Whitfield and Strong (1995) found significantly higher return rates in juveniles fledged on or before July 20th compared with those fledged after July 20th (22% vs. 6%, respectively). Whitfield and Sogge (1999) found that, although juvenile return rate as a function of timing of nesting varied substantially between years, when all

years were lumped together, juveniles from early nests were nearly twice as likely to return as those from late nests (30.7% vs. 15.8%).

Sogge et al. (1997b) reported that large populations of the southwestern willow flycatcher, such as the Kern River Preserve (CA), San Pedro River (AZ), and Gila River (NM), as well as the northern subspecies at the Little Truckee River, have persisted for 10 years and often many more. On the other hand, small populations may be ephemeral and last only a few years. Between 1992 and 1995, a small population of southwestern willow flycatchers on the Verde River in Arizona decreased from 4 to 2 pairs (Sogge 1995), and was absent in 1996 (Sferra et al. 1997). Breeding populations may also reappear at unoccupied sites following 1-5 yr. absences (Sogge and Tibbitts 1994, Laymon 1996, Sogge et al. 1997a, unpublished Forest Service data). Therefore, one cannot assume that a habitat is unsuitable or unoccupied in the long-term based on flycatcher absence during only a single year, especially if there is evidence of recent occupancy.

Natal and adult dispersal distances for *E. t. adastus* and *E. t. brewsteri are* also largely unknown. In the Sierra Nevada, 3 willow flycatchers banded as nestlings in 1997/98 in the Red Lake and Little Truckee River areas were relocated as adults at distances of 1/3, 1/2, and 2 miles (Bombay & Morrison unpublished data). In 1997, 2 willow flycatchers color banded in the Little Truckee River area in 1993/4 were detected 3.5 miles downstream (J. Steele unpublished data, Bombay & Morrison unpublished data). Stafford and Valentine (1985) found that in the southern Sierra Nevada, one female willow flycatcher banded as an adult moved 9 miles from her territory in 1983 to her territory in 1984. All of these movements represent within-drainage dispersal.

In their work with southwestern willow flycatchers, Netter et al. (1998) found that 19 willow flycatchers exhibited between-year, between-site movement. Between-site dispersal distances ranged from 0.9 km - 190 km, the mean distance was 31.78 km, and the median distance was 14.5 km (Netter et al. 1998). Four of these dispersal records represent between-drainage movements.

VIII. THREATS TO THE WILLOW FLYCATCHER AND HABITAT

The greatest historical factor in the decline of the willow flycatcher is the extensive loss, fragmentation, and modification of riparian breeding habitat. Large-scale losses of wetlands have occurred, particularly those associated with riverine systems in both valley and montane settings (Phillips et al. 1964, Johnson and Haight 1984, Katibah 1984, Klebenow & Oakleaf 1984, Unsicker et al. 1984, Johnson et al. 1987, Unitt 1987). Changes in the hydrology and riparian plant community have reduced, degraded and eliminated nesting habitat for the willow flycatcher, contributing to its decline in distribution and numbers (Serena 1982, Cannon and Knopf 1984, Klebenow & Oakleaf 1984, Taylor & Littlefield 1986, Unitt 1987, Schlorff 1990). Habitat losses and changes have occurred (and continue to occur) because of urban, recreational, and agricultural development, water diversion and impoundment, channelization, livestock grazing, and

replacement of native habitats by introduced plant species (Klebenow & Oakleaf 1984, Unsicker 1984, Scott & Marquiss 1984, Katibah 1984, Dull 1999). Hydrological changes, natural or man-made, can greatly reduce the quality and extent of willow flycatcher habitat (Sogge et al. 1997b). Although riparian areas are often not considered as fire-prone, several sites with relatively large numbers of breeding southwestern willow flycatchers were recently destroyed by fire (Paxton et al. 1996).

Brood parasitism by the brown-headed cowbird is another potentially significant threat to willow flycatchers in California, especially in lowland parts of their range (Davis 1938, Grinnell & Miller 1944, Friedman 1963, Whitfield 1990, Whitfield & Enos 1996, Whitfield and Sogge 1999). The cowbird lays its eggs in host nests, and the host raises the cowbird young, often to the detriment or death of the host's young. At 11 low elevation sites in California, Nevada, Arizona, and New Mexico, the mean annual percent of southwestern willow flycatcher nests parasitized by brown-headed cowbirds ranged from 0-66% prior to the onset of cowbird trapping efforts (Whitfield & Sogge 1999). Additionally in these same areas 75% of willow flycatcher nests failed completely when parasitized, and only 11% of willow flycatcher eggs survived to fledging in parasitized nests (Whitfield & Sogge 1999). Similarly, Sedgwick and Iko (1999) found that in southeastern Oregon, parasitism rates for willow flycatchers averaged 23.4% and ranged from 17.3% to 5 1.4% over a 10 year period. Only 17.3% of willow flycatcher eggs in parasitized nests survived to fledge (Sedgwick & Ike 1999). Eight instances of cowbird brood parasitism are documented for willow flycatchers in the central-northern Sierra Nevada at elevations above 6,000 feet (Gaines 1977, Sanders & Flett 1989, Bombay et al. 1998, Bombay et al. 1999, Morrison et al. 1999). Seven of these 8 nests were confirmed to produce only cowbirds, or no young at all (Sanders & Flett 1989, Bombay et al. 1998, Bombay et al. 1999, Morrison et al. 1999). The fate of the 8th nest is unknown. While this rate is low, relative to brood parasitism rates in other areas, it is not insignificant given the small willow flycatcher population in the Sierra Nevada, particularly in the Lake Tahoe Basin, where 4 of 12 nests discovered in 1998 and 1999 were parasitized.

APPENDIX B

SURVEY FORMS

Form 1 **Willow Flycatcher Field Survey Form**

Site _____-_____-_____ Date ☐☐/☐☐/☐☐ Observer_____
mo day year

Visit #_____ Temp_____C/F Wind_____ %Cloud_____ Precip_____

point #	time	wifl #	wifl distance	bearing	audio fitz-bew	audio whit	visual

Brown-headed cowbirds present?_____

Notes:_____

_____

page ____ of _____

Form 2 Willow Flycatcher Survey Summary- Site Description

Date_____/_____/_____

Site Name _____ Observer_____

Name of Manager / Owner _____ County_____

USGS Quad Name_____ :UTMs: _____north;

_____east

Location T_____, R_____, Sec_____, 1/4._____ 1/16_____ Elev._____

Willow Flycatchers present?_____ breeding season / migrant; **Estimate # Territories _____**
(circle one)

SITE DESCRIPTION

Type: ☐ meadow; ☐ riparian system; ☐ other_____

size of area surveyed:_____(specify units: acres/hectares)

total number of survey points _____

I. Vegetation

Percent of meadow with **RDS (riparian deciduous shrub)**

component_____

Percent of RDS component consisting of: willow_____, alder_____, other_____

Average RDS height: ☐ <1 m; ☐ 1 - 2 m; ☐ >2 m

Distribution of RDS: ☐ linearly (along stream only) ☐ away from stream, ☐

other_____

Dominant herbaceous vegetation:

☐ sedge; ☐ grasses; ☐ juncus; ☐ forbs

(rank species groups from 1 (least dominant) to 4 (most dominant); if unknown leave blank)

Percent overstory tree cover within RDS areas: ☐< 10%; ☐10-20%; ☐20-50%; ☐>50%

overstory tree species:_____

II. Hydrology

Percent of site with surface water or saturated soils _____%

Source of standing water within RDS patch:

☐in-channel pools; ☐oxbows, ☐ spring fed ponds(s); ☐ lake margin; ☐ seep/snowmelt

☐other_____ ☐ NONE

Livestock present at time of survey?_____ Evidence of beaver activity?_____

Evidence of : ☐RDS highlining, ☐ RDS hedging ☐ bank disturbance

DESCRIBE_____

Evidence of nesting or color banded

WIFLs?_____

ATTACH TOPOGRAPHIC MAP (with survey area, survey points, and WIFL locations marked)

Form 3 Willow Flycatcher Survey Summary- Results Summary

Site Name _____ Observer(s)_____

Name of Manager / Owner _____ County_____

USGS Quad Name_____ :UTMs: _____north;

_____east

Location T_____, R_____, Sec_____, 1/4._____ 1/16

survey visit #	Date (mm/dd/yy)	survey time	WIFL (present/absent/unconf.)	# singing WIFLs	cowbirds present?
survey:_____ followup:_____		Start:_____ Stop:_____			
survey:_____ followup:_____		Start:_____ Stop:_____			
survey:_____ followup:_____		Start:_____ Stop:_____			
survey:_____ followup:_____		Start:_____ Stop:_____			
Total # of presumed breeding territories after all visits completed (no migrants) _____					

willow flycatcher locations

dates present	WIFL #	WIFL location	detection types*
		☐T,R,sec,1/4,1/16 ☐lat/long ☐UTM	
		☐T,R,sec,1/4,1/16 ☐lat/long ☐UTM	
		☐T,R,sec,1/4,1/16 ☐lat/long ☐UTM	
		☐T,R,sec,1/4,1/16 ☐lat/long ☐UTM	
		☐T,R,sec,1/4,1/16 ☐lat/long ☐UTM	

**list all detection types eg: fitz-bew, whit, visual etc.

LITERATURE CITED

AOU (American Ornithologists' Union). 1973. Thirty-second supplement to the American Ornithologists' Union checklist of North American birds. American Ornithologists' Union. Washington D. C.

AOU (American Ornithologists' Union). 1983. Checklist of North American birds. 6th Edition. American Ornithologists' Union. Washington D. C.

Baicich, P. J. and C. J. O. Harrison. 1997. A Guide to the nests, eggs, and nestlings of North American birds: second edition. 347 pp., Academic Press, San Diego, CA.

Barlow, C. 1900. Some additions to Van Denburgh's list of land birds of Santa Clara Co., California. Condor 2: 131- 133.

Beal, F. E. L. 1910. Birds of California in relation to the fruit industry. Part II. USDA Biological Survey - Bulletin No. 34, Washington, Government Printing Office.

Bendire, C. and ?.Brevet. 1895. Life Histories of North American birds: from the parrots to the grackles, with special reference to their breeding habits and eggs. Smithsonian Institution. Untied states National museum. Special bulletin. United States Government printing office

Bent. A. C. 1942. Life histories of North American flycatchers, larks, swallows and their allies: order passeriformes. Smithsonian Institution. Untied States National Museum. Bulletin 179. United States Government printing office.

Bibby, C. J., N. D. Burgess and D. A. Hill. 1992. Bird census techniques. Academic Press, London. 257 pp.

Bombay, H. L. 1999. Scale perspectives in habitat selection and reproductive success for willow flycatchers *(Empidonax traillii)* in the central Sierra Nevada, California. Masters thesis, California State University, Sacramento. 225 pp.

Bombay, H. L., M. L. Morrison, and L. S. Hall. 1998. 1997 Annual report for the challenge cost-share agreement between California State University, Sacramento and USDA Forest Service, Tahoe National Forest regarding willow flycatcher survey and monitoring. January 2,1998.

Bombay, H. L., M. L. Morrison, and L. S. Hall. 1999, 1998 Annual report for the challenge cost-share agreement between California State University, Sacramento and USDA Forest Service, Tahoe National Forest regarding willow flycatcher monitoring. February 22, 1999.

Braden, G. T., and R. L. McKernan. 1998. Nest cycles, vocalizations, and survey protocols of the endangered Southwestern Willow Flycatcher *(Empidonax traillii extimus)*. Report to the U. S. Bureau of Reclamation, Boulder City, Nevada by the San Bernardino County Museum. 36 pp.

Brown, B. T. 1988. Breeding ecology of a willow flycatcher population in Grand Canyon, Arizona. Western Birds 19 (1):25-33.

Browning, M. R. 1993. Comments *on the* taxonomy of *Empidonax traillii* (willow flycatcher). Western Birds 24:241-257.

California Department of Fish and Game. 1991. Endangered and threatened animals of California. State of California, The Resources Agency, Department of Fish and Game. Sacramento, California. 5 pp.

California Natural Diversity Database (CNDD). 1997. Rarefind 2, ver. 2.1.0 (08/31/98). State of California, The Resources Agency, Department of Fish and Game. Sacramento CA

Cannon, R. W. and F. L. Knopf. 1984. Species composition of a willow community relative to seasonal grazing histories in Colorado. Southwestern Naturalist 29:234-237.

Craig, D., R. Schlorff, B. Valentine, and C. Pelles. 1992. Draft survey protocol for willow flycatchers *(Empidonax traillii)* on National Forest Service lands in the Pacific Southwest region. USDA Forest Service. 13 pp.

Davis, W. B. 1938. General Notes. Auk:53:546.

Dixon, J. S. 1943. Birds of the Kings Canyon National Park Area. Condor vol. 45:211

Dull, R. A. 1999. Palynological evidence for 19th century grazing-induced vegetation change in the southern Sierra Nevada, California, U. S. A. Journal of Biogeography 26:899-912.

Ettinger, A. O., and J. R. King. 1980. Time and energy budgets of the Willow Flycatcher *(Empidonax traillii)* during the breeding season. Auk 97:533-546.

Flett, M. A. and S. D. Sanders. 1987. Ecology of a Sierra Nevada population of willow flycatchers. Western Birds 18:37-42.

Fowler, C., B. Valentine, S. Sanders, and M. Stafford. 1991. Habitat Suitability Index Model: Willow Flycatcher *(Empidonax traillii).* USDA Forest Service, Tahoe National Forest.

Friedmann, H. 1963. Host relations of the parasitic cowbirds. U. S. National Museum Bulletin 223:1-276.

Gabrielson, I. N., and S. G. Jewett. 1940. Birds of Oregon. Oregon State University. Corvallis.

Gaines, D. 1974. A new look at the nesting riparian avifauna of the Sacramento Valley, California. Western Birds. 5:61-80.

Gaines, D. 1977. Birds of the Yosemite Sierra. California Syllabus.

Gaines, D. 1992. Birds of Yosemite and the east slope. Artemisia Press, Lee Vining, CA. 352 pp. (revised 2nd printing)

Gilligan, J., M. Smith, D. Rogers, and A. Contreras. 1994. Birds Oregon: status and distribution. Cinclus Pubs.

Ginzburg, L. R., L. B. Slobodkin, K. Johnson, A. G. Bindman. 1982. Quasiextinction probabilities as a measure of impact on population growth. Risk Analysis 2:171-181.

Grinnell, H. 1933. Minutes of cooper club meeting. Condor:volXXXV, pg. 211.

Grinnell, H. 1934. Minutes of cooper club meeting. Condor:volXXXVI, pg. 95

Grinnell, J., J. Dixon, and J. M. Linsdale. 1930. Vertebrate natural history of a section of Northern California through Lassen Peak. Univ. Calif. Publ. In Zool. 10:197-406.

Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna. 27:1-608.

Grinnell, J. and T. I. Storer. 1924. Animal life in the Yosemite. University of California Press, Berkeley.

Grinnell, J., and M. W. Withe. 1927. Directory to the bird-life of the San Francisco Bay region. Pacific Coast Avifauna. No. 18. Cooper Ornithological Club: Berkeley California. 359 pp.

Hall, L. S., P. R. Krausman, and M. L. Morrison. 1997. The habitat concept and a plea for standard terminology. Wildlife Society Bulletin. 25(1):173-182.

Harris, J. H., S. D. Sanders, M. A. Flett. 1987. Willow Flycatcher surveys in the Sierra Nevada. Western Birds 18:27-36

Harris, J. H., S. D. Sanders, and M. A. Flett. 1988. The status and distribution of the willow flycatcher *(Empidonax traillii)* in the Sierra Nevada. California Department of Fish and Game, Wildlife Management Branch Administrative Report 88-1.

Harris, J. H. 1997. Draft - survey protocol for willow flycatchers on national forest service lands in the pacific southwest region. USDA Forest Service

Howell, S.N.G. and S. Webb. 1995. A Guide to the Birds of Mexico and Northern Central America. Oxford University Press, New York. 851 pp.

Hubbard, J. P. 1987. The status of the willow flycatcher in New Mexico. Endangered Species Program, New Mexico Department of Game and Fish, Santa Fe, New Mexico. 29 pp.

Ingersoll, A.M. 1913. Great destruction of birds eggs and nestlings in the Sierra Nevada. Condor: vol:XV, pp8l-87

Johnson, R. R., and L. T. Haight. 1984. Riparian problems and initiatives in the American Southwest: a regional perspective. Pp. 404-412 in California riparian systems: ecology, conservation, and productive management (R. E. Warner and K. M. Hendrix, eds.). University of California Press, Berkeley. 1035 pp.

Johnson, R. R., L. T. Haight, and J. M. Simpson. 1987. Endangered habitats versus endangered species: a management challenge. Western Birds 18:89-96.

Katibah, E. F. 1984. A brief history of riparian forests in the Central Valley of California. Pp. 23-29 in California riparian systems: ecology, conservation, and productive management (R. E. Warner and K. M. Hendrix, eds.). University of California Press, Berkeley. 1034 pp.

King, J. R. 1955. Notes on the life history of Traill's flycatcher *(Empidonax traillii) in* southeastern Washington. Auk 72:148-173.

Klebenow, and R. J. Oakleaf. 1984. Historical avifaunal changes in the riparian zone of the Truckee River, Nevada. In "California riparian systems, ecology, conservation, and productive management. Eds. R. E Warner, K. M. Hendrix. University of California Press.

Lande, R. 1998. Anthropogenic, ecological and genetic factors in extinction. Pp. 29-51 In G. M. Mace, A. Balmford, and J. R. Ginsberg, (eds.), Conservation in a changing world. Cambridge Univ. Press.

Laymon, S. A. 1981. Avifauna of an island of lowland riparian woodland: Dog Island City Park, Red Bluff, California. MS thesis, California State University, Chico.

Laymon, S. A. 1996. Willow Flycatcher Survey 1995: Sierra National Forest. Unpublished report.

Linsdale, J. M. 1932. Frequency of occurrence of birds in Yosemite Valley, California. Condor: volXXXIV p221-226

McCabe, R. A. 1991. The little green bird: ecology of the willow flycatcher. Palmer Publications, Inc., Amherst, Wisconsin. 171 pp.

Miller, A. H. 1941. A review of the centers of differentiation for birds in the western Great Basin region. Condor, 43:257-267.

Morrison M. L., L. S. Hall, H. Bombay, and J. Cain. 1999. 1999 Annual report for the challenge cost-share agreement between California State University, Sacramento and USDA Forest Service, Tahoe National Forest regarding willow flycatcher survey and monitoring. December 17, 1999.

Muiznieks, B. D., T. E. Corman, S. J. Sferra, M. K. Sogge, and T. J. Tibbitts. 1994. Arizona Partners in Flight southwestern willow flycatcher survey, 1993. Arizona Game and Fish Department report. Phoenix, Arizona.

Netter, M. R., E. H. Paxton, M. K. Sogge. 1998. Banding and Movements of southwestern willow flycatcher at Roosevelt Lake and San Pedro River/Gila River Confluence, Arizona -1998. Ecosystem Science Center, Colorado Plateau Field Station, Flagstaff, AZ

Orr, R. T., and J. Moffitt. 1971. Birds of the lake Tahoe region. California Academy of Sciences. SF, CA.

Paxton, E., J. Owen and M. K. Sogge. 1996. Southwestern willow flycatcher response to catastrophic habitat loss. U.S.G.S. Colorado Plateau Research Station/Northern Arizona University report. 12 pp.

Peterson, R. T. 1990. A field guide to western birds. 3rd ed. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.

Petterson, J. R. and M. K. Sogge. 1996. Distribution and breeding productivity of the southwestern willow flycatcher along the Colorado River in the Grand Canyon - 1996. Summary report. Grand Canyon National Park and National Biological Service Colorado Plateau Research Station/Northern Arizona University. p.30

Phillips, A. R. 1948. Geographic variation *in Empidonax traillii.* Auk65:507-514.

Phillips, A. R., J. Marshall, and G. Monson. 1964. The birds of Arizona. University of Arizona Press, Tucson, Arizona. 212 pp.

Pickwell, G. 1932. From field and study. Condor:vo1:34:100.

Prescott, D. R. C. 1986. Polygyny in the willow flycatcher. Condor. 88:385-386.

Prescott, D. R. C., and A. I,. A. Middleton. 1988. Feeding-time minimization and the territorial behavior of the willow flycatcher *(Empidonax traillii).* Auk105:17-28.

Pulliam, H. R. 1988. Sources, sinks, and population regulation. American Naturalist 132:652-661.

Pyle, P. 1997. Identification guide to North American Birds, Part I: Columbidae to Ploceidae. Slate Creek Press, Bolinas CA. 732 pp.

Ratliff, R. D. 1982. A meadow site classification for the Sierra Nevada, California. USDA Forest Service, Pacific Southwest Region. GTR-PSW-60.

Ratliff, R. D. 1985. Meadows in the Sierra Nevada of California: state of knowledge. USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, Gen. Tech. Report PSW-84.

Ray, S. M. 1903. Land birds of Lake Valley, Ca. Auk:volXX, p.185.

Ray, S. M. 1913. Some further notes on Sierran Fieldwork. Condor:vol:XV, p.198-203

Reed, J. M. 1996. Using statistical probability to increase confidence of inferring species extinction. Conservation Biology 10:1283-1285.

Ridgely, R. S. and G. Tudor. 1994. The birds of South America; suboscine passerines. University of Texas Press, Austin Texas.

Ridgway, R. 1907. The Birds of North and Middle America: a descriptive catalogue. Part IV. Bulletin of the United States National Museum. No. 50, part IV, p.555-558.

Sanders, S. D., and M. A. Flett, 1989 Ecology of the Sierra Nevada population of willow flycatcher *(Empidonax traillii),* 1986-1987. California Department of Fish and Game, Wildlife Management Division.

Schlorff, R. W. 1990, Status review of the willow flycatcher *(Empidonax traillii)* in California. Report to the California Department of Fish and Game, Department Candidate Species Status Report 90-l. 23 pp.

Scott, L. B. and S. K. Marquiss. 1984. An historical overview of the Sacramento River. Pp. 5 1-57 In R. E. Warner and K. Hendrix, (eds.), California riparian systems: ecology, conservation, and productive management. Univ. Calif. Press, Berkeley, CA.

Sedgwick, J. A., and F. L. Knopf. 1992. Describing willow flycatcher habitats: scale perspectives and gender differences. Condor 94:720-733.

Sedgwick, J. A. and W. M. Iko. 1999. Costs of brown-headed cowbird parasitism to willow flycatchers. In M. L. Morrison, L. S. Hall, S. K. Robinson, S. I. Rothstein, D. C. Hahn, and T. D. Rich, [eds]., Research and management of the brown-headed cowbird in western landscapes. Studies in Avian Biology No. 18. Cooper Ornith. Soc.

Serena, M. 1982. The status and distribution of the willow flycatcher *(Empidonax traillii)* in selected portions of the Sierra Nevada, 1982. California Department of Fish and Game, Wildlife Management Branch Administrative Report 82-5.

Seutin, G. 1987. Female song in Willow Flycatchers *(Empidonax traillii).* Auk 104: 329-330.

Sferra, S. J., R. A. Meyer and T. E. Corman. 1995. Arizona Partners in Flight 1994 southwestern willow flycatcher survey. Final technical report 69. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program. Phoenix, Arizona. 46 pp.

Sferra, S. J., T. E. Corman, C. E. Paradzick, J. W. Rourke, J. A. Spencer and M. W. Sumner. 1997. Arizona Partners in Flight southwestern willow flycatcher survey: 1993-1996 summary report. Technical Report 113. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program. Phoenix, Arizona. 46 pp.

Sogge, M. K. and T. J. Tibbitts. 1992. Southwestern willow flycatcher *(Empidonax traillii extimus)* surveys along the Colorado River in Grand Canyon National Park and Glen Canyon National Recreation Area - 1992 summary report. National Park Service Cooperative Park Studies Unit/Northern Arizona University and U.S. Fish and Wildlife Service report. 46 pp.

Sogge, M. K., T. J. Tibbitts, and S. J. Sferra. 1993. Status of the southwestern willow flycatcher along the Colorado River between Glen Canyon Dam and Lake Mead - 1993. Summary report. National Park Service Cooperative Park Studies Unit/Northern Arizona University, U.S. Fish and Wildlife Service, and Arizona Game and Fish Department report. 69 pp.

Sogge, M. K. and T. J. Tibbitts. 1994. Distribution and status of the southwestern willow flycatcher along the Colorado River in the Grand Canyon - 1994. Summary report.

National Biological Service Colorado Plateau Research Station/Northern Arizona University and U.S. Fish and Wildlife Service, Phoenix. 37 pp.

Sogge, M. K. 1995. Southwestern willow flycatcher *(Empidonax traillii extimus)* monitoring at Tuzigoot National Monument. 1995 progress report to the National Park Service. National Biological Service Colorado Plateau Research Station/Northern Arizona University report. 20 pp.

Sogge, M. K., T. J. Tibbitts, C. van Riper III, and T. May. 1995. Status of the southwestern willow flycatcher along the Colorado River in Grand Canyon National Park - 1995. Summary report. National Biological Service Colorado Plateau Research Station/Northern Arizona University. 26 pp.

Sogge, M. K. 1997. Primary song by a juvenile willow flycatcher. Journal of Field Ornithology 68(4):630-631

Sogge, M. K., T. J. Tibbitts, and J. R. Petterson. 1997a. Status and ecology of the southwestern willow flycatcher in the Grand Canyon. Western Birds 28:142-157

Sogge, M. K., R. M. Marshall, S. J. Sferra, and T. J. Tibbitts. 1997b. A southwestern willow flycatcher natural history summary and survey protocol. Colorado Plateau Research Station, Northern Arizona University: Flagstaff, Arizona. National Park Service Technical Report USGS/NAUCPRS/NRTR-97/12.

Spencer, J. A., S. J. Sferra, T. E. Corman, J. W. Rourke, and M. W. Sumner,1996. Arizona Partners in Flight 1995 southwestern willow flycatcher survey. Technical report 79. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program. Phoenix, Arizona. 46 pp.

Stafford, M. D. and B. E. Valentine. 1985. A preliminary report on the biology of the willow flycatcher in the central Sierra Nevada. California-Nevada Wildlife Transactions, 66-67.

Stein, R. C. 1963. Isolating Mechanisms between populations of Traill's flycatcher. Proc. Am. Philo. Soc. 107:21-50.

Stiles, F. G. and A. F. Skutch. 1989. A guide to the birds of Costa Rica. Comstock, Ithaca, New York. 364 pp.

Sumner, L., and J. S. Dixon. 1953. Birds and mammals of the Sierra Nevada. University of California Press, Berkeley.

Taylor, D. M. and C. D. Littlefield. 1986. Willow flycatcher and yellow warbler response to cattle grazing. American Birds 40: 1169-1173.

Unitt, P. 1987. *Empidonax traillii extimus:* an endangered subspecies. Western Birds 18(3):137-162.

Unsicker, J. E., C. A. White, M. R. James, and J. D. Kuykendall. 1984. Protecting stream environment zones to preserve water quality in the Lake Tahoe Basin. Pp. 808-8 14 In

R. E. Warner and K. Hendrix, (eds.), California riparian systems: ecology, conservation, and productive management. Univ. Calif. Press, Berkeley, CA.

U.S. Fish and Wildlife Service. 1991. Notice of review: animal candidate review for listing as endangered or threatened species. November 21, 1991, Federal Register 56:58804-58836.

U.S. Fish and Wildlife Service. 1993. Proposal to list the southwestern willow flycatcher as an endangered species and to designate critical habitat. July 23, 1993, Federal Register 58:39495-39522.

U.S. Fish and Wildlife Service. 1995. Final Rule Determining Endangered Status for the Southwestern Willow Flycatcher. Federal Register 60: 10694 (February 27, 1995).

U.S. Fish and Wildlife Service. 1997. Final Rule Determining Critical Habitat for the Southwestern Willow Flycatcher. Federal Register 62: 140 (July 22, 1997).

Van Home, B. 1983. Density as a misleading indicator of habitat quality. Journal of Wildlife Management 47:813-901.

Valentine, B. E., T. A. Roberts, S. D. Boland, and A. P. Woodman, 1988. Livestock management and productivity of willow flycatchers in the central Sierra Nevada. Transactions of the western section of the Wildlife Society, 24:105-114.

Verner, J. 1985. Assessment of counting techniques. Pp. 247-302 in Current Ornithology, Volume 2. R. F. Johnston (ed.). Plenum Press, NY. 364 pp.

Walkinshaw, L. H. 1966. Summer biology of traill's flycatcher. Wilson Bulletin. 78(1):3l-46.

Weixelman, D. A., D. C. Zamudio, K. A. Zamudio, 1999. Eastern Sierra Nevada riparian field guide, USDA Forest Service, Intermountain Region, R-4-ECOL-99-01.

Western Foundation Of Vertebrate Zoology, oological collection. Riverside, CA.

Wheelock, I. G. 1904. Birds of California: An introduction to more than three hundred common birds of the state and adjacent islands, with a supplementary list of rare migrants, accidental visitants, and hypothetical subspecies. A. C. McClurg & Co., Chicago, IL.

Whitfield, M. J. 1990. Willow flycatcher reproductive response to brown-headed cowbird parasitism. Masters Thesis, California State University, Chico, California. 25 pp.

Whitfield, M. J. and C. M. Strong. 1995. A Brown-headed cowbird control program and monitoring for the southwestern willow flycatcher, South Fork Kern River, California. California Department of Fish and Game, Bird and Mammal Conservation Program Report 95-4, Sacramento, California. 17 pp.

Whitfield, M. J., and K. Enos. 1996. A Brown-headed cowbird control program and monitoring for the Southwestern willow flycatcher, South Fork Kern River, California, 1996. Prepared for U. S. Army Corps of Engineers, Sacramento District, and the California Department of Fish and Game.

Whitfield, M. J. and M. K. Sogge. 1999. Range-wide impact of brown-headed cowbird parasitism on the southwestern willow flycatcher *(Empidonax trailli extimus).* Pp. 182-190 In M.L. Morrison, L.S. Hall, S.K. Robinson, S.I. Rothstein, D.C. Hahn, T.D. Rich, (eds.), Research and management of the brown-headed cowbird in western landscapes. Studies in Avian Biology No. 18. Cooper Ornith. Soc.

Wiens, J. A. 1989. The Ecology of Bird Communities. Volumes 1 and 2. Cambridge University Press, Cambridge.

Wiens, J. A. 1996. Wildlife populations in patchy environments: metapopulations, mosaics, and management. Pages 53-84 in McCullough, D.R. (Ed). Metapopulations and wildlife conservation. Island Press.

Yard. H. K., and B. T. Brown. 1999. Willow Flycatcher nest reuse in Arizona. Journal of Field Ornithology 70(2):211-213.

Young, W., and D. M. Finch. 1997. Migration of the Willow Flycatcher along Middle Rio Grande. Wilson Bulletin. 109:253-268.