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# A Southwestern Willow Flycatcher Natural History Summary and Survey Protocol

Technical Report NPS/NAUCPRS/NRTR-97/12

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## BACKGROUND

The southwestern willow flycatcher (*Empidonax traillii extimus*) is an endangered species currently known to breed at only about 75 sites in riparian areas throughout the southwest. The known breeding population is estimated at between 300 and 500 pairs. The flycatcher nests only in dense riparian vegetation associated with streams, rivers, lakes, springs, and other watercourses and wetlands.

*E.t. extimus* populations have declined during the twentieth-century, primarily because of habitat loss and modification (see Threats, page 15). In 1991 the U.S. Fish and Wildlife Service (USFWS) 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 (USFWS 1993). A final ruling listing *E.t. extimus* as endangered was published in February 1995, although designation of critical habitat was postponed (USFWS 1995).

The southwestern willow flycatcher is also listed as an endangered species or species of concern in Arizona (Arizona Game and Fish Department, in prep.), New Mexico (New Mexico Department of Game and Fish 1996), California (California Department of Fish and Game 1991), and Utah (Utah Division of Wildlife Resources 1997).

Sound management and conservation of an endangered species requires current, detailed information on the species' abundance, distribution, and natural history. Unfortunately, there is relatively little published information available on *E.t. extimus*. Most existing data is found in agency or consulting firm reports, unpublished museum records, or researcher databases. Access to such information is difficult, limiting the data's value.

From a management and conservation perspective, it is crucial that the maximum possible number of southwestern willow flycatcher breeding areas be identified and monitored. It is also imperative to determine potential habitat areas where willow flycatchers do not currently occur. Effective, standardized survey protocols and consistent reporting are crucial to conservation and management of endangered species, 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 rangewide analyses.

We developed this document to provide up-to-date information about southwestern willow flycatcher biology and to furnish a standardized survey protocol. The first section summarizes the current state of knowledge regarding southwestern willow flycatcher natural history, based on a wide array of published and unpublished literature. Emphasis is given to information relevant to flycatcher conservation and management, and to conducting and interpreting surveys. The second section details a standard survey protocol that provides for consistent data collection, reporting, and interpretation.

**SECTION I: NATURAL HISTORY**

**Breeding Range and Taxonomy**

Four subspecies of willow flycatcher are commonly recognized in North America (Hubbard 1987, Unitt 1987). The subspecies occupy distinct breeding ranges (Figure 1) and are differentiated primarily by subtle differences in color and morphology. The breeding range of the southwestern willow flycatcher includes southern California (from the Santa Ynez River south), Arizona, New Mexico, southwestern Colorado, extreme southern portions of Nevada and Utah, and western Texas (although recent breeding records from west Texas are lacking). Records of probable breeding southwestern willow flycatchers in Mexico are few and restricted to extreme northern Baja California del Norte and Sonora (Unitt 1987, Wilbur 1987).

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1994, Howell and Webb 1995). Specific wintering sites for the southwestern race are currently unknown. Southwestern willow flycatchers typically arrive on breeding grounds between early May and early June (Muiznieks et al. 1994, Maynard 1995, Sferra et al. 1997). Because arrival dates vary annually and geographically, northbound migrant willow flycatchers (of all races) pass through areas where *E.t. extimus* have already begun nesting. Similarly, southbound migrants in late July and August may occur where southwestern willow flycatchers are still breeding (Unitt 1987).

## Habitat

The southwestern willow flycatcher breeds in dense riparian habitats in all or part of seven southwestern states, from sea level in California to over 2600 m in Arizona and southwestern Colorado. Although other willow flycatcher subspecies may breed in shrubby habitats away from water, *E.t. extimus* breeds only in dense riparian vegetation near surface water or saturated soil. Other characteristics such as dominant plant species, size and shape of habitat patch, canopy structure, vegetation height, etc., vary widely among sites, as described below.

Southwestern willow flycatcher breeding habitat can be broadly described and classified based on plant species composition and habitat structure. These two habitat characteristics are the most conspicuous to human perception, but are not the only important components. However, they have proven useful in conceptualizing, selecting and evaluating suitable survey habitat, and in predicting where breeding flycatchers are likely to be found.

Narrative descriptions of four general habitat types used throughout the southwestern willow flycatcher's range are provided below. The photographs in Figure 3 provide examples of some of the variation in southwestern willow flycatcher breeding habitat. The habitat "types" described below include a continuum of plant species composition (from nearly monotypic to mixed species) and vegetation structure (from simple, single stratum patches to complex, multiple strata patches). The intent of the descriptions and photographs is to provide a general guide for evaluating suitable survey habitat.

**Monotypic high-elevation willow:** [Figures 3a-b] Nearly monotypic, dense stands of willow (often *Salix exigua* or *S. geyeriana* above 2300 m in Arizona), 3 - 7 m in height with no distinct overstory layer; often associated with sedges, rushes, nettles and other herbaceous wetland plants; usually very dense structure in lower 2 m; live foliage density is high from the ground to the canopy.

**Monotypic exotic:** [Figures 3c-d] Nearly monotypic, dense stands of exotics such as saltcedar (*Tamarix* spp.) or Russian olive (*Elaeagnus angustifolia*), 4 - 10 m in height forming a nearly continuous, closed canopy (with no distinct overstory layer); lower 2 m often very difficult to penetrate due to dense branches, however, live foliage density may be relatively low, 1 - 2 m above ground, but increases higher in the canopy; canopy density uniformly high.

**Native broadleaf dominated:** [Figure 3e - h] Composed of single species (often Goodding's [*Salix goodingii*] or other willow species) or mixtures of native broadleaf trees and shrubs including (but not limited to) cottonwood (*Populus* spp.), willows, boxelder (*Acer negundo*), ash (*Fraxinus* spp.), alder (*Alnus* spp.), and buttonbush (*Cephalanthus occidentalis*), height from 3 - 15 m; characterized by trees of different size classes; often (but not always) a distinct overstory of cottonwood, willow or other broadleaf tree, with recognizable subcanopy layers and a dense understory of mixed species; exotic/introduced species may be a rare component, particularly in the understory.

**Mixed native/exotic:** [Figure 3i - l] Dense mixtures of native broadleaf trees and shrubs (such as those listed above) mixed with exotic/introduced species such as saltcedar or Russian olive; exotics are often primarily in the understory, but may be a component of overstory; the native and exotic components may be dispersed throughout the habitat or concentrated as a distinct patch within a larger matrix of habitat; overall, a particular site may be dominated primarily by natives or exotics, or be a more-or-less equal mixture.

Regardless of the plant species composition or height, occupied sites always have dense vegetation in the patch interior (Figures 3m - o). These dense patches are often interspersed with small openings, open water, or

shorter/sparser vegetation, creating a mosaic that is not uniformly dense.

Riparian patches used by breeding flycatchers vary in size and shape, and may be a relatively dense, linear, contiguous stand (Figure 3e) or an irregularly-shaped mosaic of dense vegetation with open areas (Figure 3a). Southwestern willow flycatchers have nested in patches as small as 0.8 ha (e.g., Grand Canyon) and as large as several hundred hectares (e.g., Roosevelt Lake, AZ; Lake Mead, AZ). However, flycatchers have not been found nesting in narrow, linear riparian habitats that are less than 10 m wide, although they will use such linear habitats during migration.

Flycatcher territories and nests are typically near open water, cienegas, marshy seeps, or saturated soil, and flycatchers sometimes nest where the nest plants are in standing water (Sferra et al. 1997, M. Whitfield and R. McKernan unpublished data). However, in the Southwest, hydrological conditions at a site can vary remarkably within a season and between years. At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (i.e., May and part of June). At other 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 such as the Kern River at Lake Isabella (CA), Tonto Creek and Salt River at Roosevelt Lake (AZ), and the Rio Grande near Elephant Butte Reservoir (NM). There may be a total absence of water or visibly saturated soil for several years at some 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). However, we do not know how long such sites will continue to support riparian vegetation and/or remain occupied by breeding flycatchers.

Other potentially important aspects of southwestern willow flycatcher habitat include distribution and isolation of vegetation patches, hydrology, prey types and abundance, parasites, predators, environmental factors (e.g., temperature, humidity), and interspecific competition. Population attributes such as demography (i.e., birth and death rates, age-specific fecundity), distribution of breeding groups across the landscape, flycatcher dispersal patterns, migration routes, site fidelity, philopatry, and conspecific sociality also influence where flycatchers are found and what habitats they use. Most of these factors need further study, but may be critical to understanding current population dynamics and habitat use. Refer to Wiens (1989 and 1996) for additional discussion of habitat selection and influences on bird species and communities.

The ultimate measure of habitat suitability is not simply whether or not a site is occupied. Suitable habitats are those in which flycatcher reproductive success and survivorship results in a stable or growing population. Without long-term data showing which sites have stable or growing populations, we cannot determine which habitats are suitable or optimal for breeding southwestern willow flycatchers. Some occupied habitats may be acting as population sources, while others may be functioning as population sinks (Pulliam 1988).

Migrant willow flycatchers may occur in non-riparian 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 flycatcher productivity and survival.

### **Breeding Chronology and Biology**



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oriented vertically, horizontally, or at an angle, and stem diameter for the main supporting branch can be as small as 3 - 4 cm. Vertical stems supporting the nest cup are typically 1 - 2 cm in diameter.

Nest height varies considerably, and may be correlated with height of nest plant, overall canopy height, and height of the vegetation strata that contains small twigs and live growth. Southwestern willow flycatcher nests have been found from 0.6 - 18 m above the ground. Flycatchers using mainly native broadleaf riparian habitats often nest relatively low (usually 2 - 3 m above ground), whereas those using mixed native/exotic and monotypic exotic riparian habitats often nest higher (usually 4 - 7 m above ground). However, in any habitat type, nests may be placed at any height where appropriate twig structure and plant cover occurs.

Historically, 75 - 80 % of southwestern willow flycatcher nests were placed in willows (Herbert Brown field notes 1902, Phillips 1948, Phillips et al. 1964, Hubbard 1987, Unitt 1987, San Diego Natural History Museum 1995). Currently, the flycatcher nests in a variety of plant species. At the monotypic willow stands that characterize high elevation sites in Arizona, Geyer willow was used almost exclusively for nesting (Sferra et al. 1997). At the inflow to Lake Mead on the Colorado River, Goodding's willow was the primary nesting substrate (R. McKernan unpublished data). Along the Gila River in Grant County, New Mexico, 76% of flycatcher nests were placed in boxelder (the dominant understory species), with the remainder in other native and exotic plants (Skaggs 1995). At the inflows of Tonto Creek and Salt River to Roosevelt Lake in Gila County, Arizona, both of which include nearly monotypic stands of saltcedar, all flycatcher nests were placed in saltcedar (Sferra et al. 1997). On the San Luis Rey River in San Diego County, California, approximately 90% of flycatcher nests were in live oak (*Quercus agrifolia*), which became the dominant plant species adjacent the river following willow removal in the 1950s (W. Haas, pers. comm.). Southwestern willow flycatcher nests have also been found in buttonbush, black twinberry (*Lonicera involucrata*), Fremont cottonwood, alder (*Alnus* spp.), blackberry (*Rubus ursinus*), baccharis (*baccharis* spp.) and stinging nettle (*Urtica* spp.).

Willow flycatcher eggs are buffy or light tan, approximately 18 mm long and 14 mm wide, with brown markings in a wreath at the blunt end. Clutch size is usually 3 or 4 eggs for first nests. 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.

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. 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 (typically a "peep" call).

Second clutches within a single breeding season are uncommon if the first nest is successful, though this may vary between sites and years. Willow flycatchers often attempt another nest if the first nest is unsuccessful. Replacement nests are built in the same territory, either in the same nest plant or at a distance of up to 20 m from the previous nest. In one case, renesting flycatchers reused the same nest (W. Haas, pers. comm.). Replacement nest building and egg laying can occur (uncommonly) as late as late-July or early August. Pairs may attempt a third nest if the second fails (Sferra et al. 1997, Whitfield pers. comm.). Clutch size (and therefore potential productivity) decreases with each nest attempt (Whitfield and Strong 1995).

### Site Fidelity and Persistence

Most existing information on southwestern willow flycatcher site fidelity comes from studies by Whitfield (1990), Whitfield and Strong (1995), and Whitfield and Enos (1996) at the Kern River Preserve (CA). Twenty-one of 58 nestlings (36%) banded since 1993 returned to the study site to breed. Since 1989, 18 of 67 birds (31%) 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 overwinter survival and site fidelity, varied with fledging date. Among banded juvenile flycatchers that were recaptured in subsequent years, 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).

Little is known about southwestern willow flycatcher movement between breeding sites, or about the persistence of breeding sites. "Large" populations such as the Kern River Preserve (CA), San Pedro River

(AZ), and Gila River (NM) have persisted for 10 or more years. On the other hand, small populations may be ephemeral and last only a few years. Between 1992 and 1995, a small population on the Verde River in Arizona decreased from four pair to two pairs (Sogge 1995b), 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, Sogge et al. in press). Therefore, one cannot assume a habitat is unsuitable or unoccupied in the long term based on flycatchers absence during only a single year, especially if there is evidence of recent occupancy.

Threats to the Flycatcher and Habitat

The most significant historical factor in the decline of the southwestern willow flycatcher is the extensive loss, fragmentation, and modification of riparian breeding habitat. Large scale losses of southwestern wetlands have occurred, particularly the cottonwoodwillow riparian habitats of the southwestern willow flycatcher (Phillips et al. 1964, Johnson and Haight 1984, Katibah 1984, Johnson et al. 1987, Unitt 1987, General Accounting Office 1988, Dahl 1990, State of Arizona 1990). Changes in the riparian plant community have reduced, degraded and eliminated nesting habitat for the willow flycatcher, curtailing its distribution and numbers (Serena 1982, Cannon and Knopf 1984, Taylor and 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 (see USFWS 1993 and Tibbitts et al. 1994 for detailed discussions of threats and impacts). Hydrological changes, natural or man-made, can greatly reduce the quality and extent of flycatcher habitat. Although riparian areas are often not considered as fire-prone, several sites with relatively large numbers of breeding willow flycatchers were recently destroyed by fire (Paxton et al. 1996), and many others are at risk to similar catastrophic loss. Fire danger in these riparian systems may be exacerbated by conversion from native to exotic vegetation (such as salt cedar), diversions or reductions of surface water, and drawdown of local water tables.

Brood parasitism by the brownheaded cowbird is another significant and widespread threat to the southwestern willow flycatcher (Rowley 1930, Garret and Dunn 1981, Brown 1988, Whitfield 1990, Harris 1991, Sogge 1995a and 1995b, USFWS 1993 and 1995, Whitfield and Strong 1995, Sferra et al. 1997). Although some host species seem capable of simultaneously raising both cowbirds and their own chicks, such is not the case with southwestern willow flycatchers. Of the hundreds of flycatcher nests monitored throughout the Southwest between 1988 and 1996, only two are known to have successfully fledged both flycatchers and cowbirds. In all other cases, parasitism causes complete nest failure or the successful rearing of only cowbird chicks (Brown 1988, Whitfield 1990, Whitfield and Strong 1995, Sogge 1995a and 1995b, Maynard 1995, Sferra et al. 1997, Sogge et al. in press). Therefore, once a southwestern willow flycatcher nest is parasitized, it has almost no chance of producing flycatcher young.

**SECTION II: THE SURVEY PROTOCOL**

A number of factors conspire to make southwestern willow flycatcher surveys relatively difficult and anything but straightforward. The willow flycatcher is one of ten Empidonax flycatchers common in North America, all of which look very much alike. Like all Empidonax, willow flycatchers are nondescript in appearance, making them difficult to see in dense breeding habitat. Although the willow flycatcher has a characteristic titz-bew song which distinguishes it from other birds (including other Empidonax), willow flycatchers are not vocal at all times of the day or during all parts of the breeding season. Because southwestern willow flycatchers are rare and require relatively dense riparian habitat, 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 the Southwest, and could therefore be confused with local breeders. In addition, southwestern willow flycatchers are in breeding areas for only 3-4 months of the year. Surveys conducted too early or late in the year would fail to find flycatchers even at sites where they breed.

These life history characteristics and demographic factors influence how southwestern willow flycatcher surveys should be conducted. This protocol is based on the use of repeated tape-playback surveys during predetermined 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). Currently, federal endangered species permits are required for surveys in all USFWS regions where the southwestern willow flycatcher breeds. State permits may also be required before you can survey within any of the states throughout the southwestern willow flycatcher's range: be certain to check with the appropriate state wildlife agency in your area.

The primary objectives of this protocol are to provide a standardized survey technique to detect southwestern willow flycatchers and determine breeding status, and provide consistent and standardized data reporting. The survey technique will, at a minimum, help determine presence or absence of the species in the surveyed habitat for that breeding season.

This protocol is designed for use by persons who are non-specialists with Empidonax flycatchers or who are not expert birders. However, surveyors 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. Surveys conducted improperly or by unqualified or inexperienced personnel may lead to unwarranted and inaccurate results.

Surveys conducted by qualified personnel in a consistent and standardized manner will enable continued monitoring of general population trends at and between sites. Annual or periodic surveys in cooperation with state and federal agencies should aid resource managers in fulfilling their basic information needs for the southwestern willow flycatcher.

The first version of this protocol (Tibbitts et al. 1994) has been used extensively and successfully for three years. Hundreds of flycatcher surveys conducted throughout the Southwest since 1994 have taught us much about the usefulness and application of this survey technique. Two important lessons are: (1) the tape-playback technique works and detects flycatchers that would have been overlooked; and (2) with appropriate effort, general biologists without extensive experience with Empidonax can find and verify willow flycatcher breeding sites.

This revised protocol is still based on tape-playback techniques and detection of singing individuals. However, it includes changes in the timing and number of surveys to increase the probability of detecting flycatchers and to help determine if they are breeders or migrants. Changes in the survey data sheets make them easier to use and submit, and allow reporting all site visits within a single year on one form.

This protocol does not address issues and techniques associated with nest monitoring or other flycatcher research activities. Those efforts are beyond the scope usually needed, and require advanced levels of experience and skills to gather useful data and avoid potential negative effects to the flycatcher.

Biologists who are not expert birders or specialists with regard to Empidonax flycatchers can effectively use this protocol. However, users must attend the mandatory southwestern willow flycatcher survey training workshop, and have knowledge and experience with bird identification and ecology sufficient to effectively apply this protocol. See Contacts section (page 29) for a listing of agencies offering survey training workshop.

**Permits**

Currently, all USFWS regions within the southwestern willow flycatcher breeding range require that all persons conducting surveys per this protocol obtain endangered species permits. It may take several months to receive permits, so apply early to avoid delays in starting your surveys. State permits may also be required. Check with the appropriate state wildlife agency. You must also obtain permission from government agencies and private landowners prior to conducting any surveys on their lands.

**Pre-survey Preparation**

Surveyors should study drawings and photographs of willow flycatchers, and where possible, examine study skins or mounts. It is critical for surveyors to be familiar with willow flycatcher vocalizations before going in the field. Although the fitz-hew song is the basis of verifying detections using this protocol, willow flycatchers

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use many other vocalizations that are valuable in locating birds and breeding sites. We strongly encourage that all surveyors learn as many vocalizations as possible (see Stein 1963). If possible, study recordings of southwestern subspecies; 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 and the dialects may differ from those in the southwest.

If possible, visit known willow flycatcher breeding sites (but only 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 workshops. All visits should be coordinated with USFWS, State wildlife agencies, and the property manager/owner, and must avoid disturbance to resident flycatchers.

Surveyors must be able to identify, by sight and vocalizations, other species likely to be found in survey areas which may be confused with southwestern willow flycatchers. These include Bell's vireo (*Vireo bellii*), western wood-pewee (*Contopus sordidulus*), young or female vermilion flycatchers (*Pyrocephalus rubinus*), and other *Empidonax* flycatchers. At a distance, partial song or call notes of Bell's vireo, ash-throated flycatchers (*Myiarchus cinerascens*) and some swallows can sound considerably like a fitz-bew. Surveyors should also be able to identify (by sight and sound) brownheaded 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 or swimming through flowing or stagnant water, muddy or swampy conditions, crawling through dense thickets (often on hands and knees), and exposure to snakes, skunks, and 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.

### Equipment

The following equipment is necessary to conduct the 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 topo map with survey area and flycatcher sightings clearly marked.
- (2) Standardized survey form (bring more copies than you think you need).
- (3) Lightweight tape player (with adequate volume to carry well; use portable speakers if necessary).
- (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 surveyor (tapes do get damaged and wear out in the field, extra tapes are very important). One tape per surveyor can be obtained through the contacts listed in the back of this protocol (you will have to make your own copies).
- (6) Clipboard and permanent (waterproof) ink pen (we recommend recording survey results directly on the survey data form, to assure that you collect and record all required data).
- (7) Aerial photograph (if available). Aerial photographs can significantly improve your surveys by allowing you to accurately target your efforts, thus saving time (and energy) in the field. Check with local planning offices and/or state/federal land management agencies for availability. Take color xerox copies, not the original aerials, with you in the field. Aerials 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.

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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 topo maps.
- (3) Survey flagging (conservative earth-tone colors)--for marking survey sites and/or areas where flycatcher are detected. Check with the local land owner or management agency before flagging sites.

All survey results (both negative and positive) should be recorded directly on data forms when possible. These data forms have been designed to prompt surveyors to record key information crucial to interpretation of survey results and characterization of study sites. Even if no flycatchers are detected or habitat appears unsuitable, this is valuable information and should be recorded. Standardized data forms are provided in Appendix 1.

Willow flycatcher surveys are targeted at this species and require a great deal of focused efforts. Surveyors must be constantly alert and concentrate on detecting flycatcher responses. Therefore, field work such as generalized bird surveys (e.g., point counts or walking transects) or other distracting tasks should not be conducted during willow flycatcher surveys. Avoid bringing pets or additional people who are not needed for the survey. Dress in muted earth-tone colors, and avoid wearing bright clothing.

### **Willow Flycatcher Identification:**

#### Physical Description

The southwestern 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 white wing bars are visible (juveniles have buffy wing bars), and the eye ring is faint or absent. The upper mandible is dark, and the lower mandible light. 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, identification of willow flycatchers cannot be made by sight alone; vocalizations are a critical identification criterion.

#### Vocalizations

Given that willow flycatchers look a lot like other Empidonax flycatchers that may be present at survey sites, the most certain way to verify willow flycatchers in the field is by their vocalization. Willow flycatchers have a variety of vocalizations (see Stein 1963, McCabe 1991), but two are most commonly heard during surveys or in response to tapeplayback:

- (1) Fitzbew. This is the willow flycatcher's characteristic primary song (note that it is not unique to the southwestern subspecies). 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. During prolonged singing bouts, fitz-bews are often separated by short britt notes. Fitz-bews are most often given by a male, but studies have shown female willow flycatchers also sing, sometimes quite loudly and persistently (though generally less than males). Flycatchers often sing from the top of vegetation, but will also vocalize while perched or moving about in dense vegetation.
- (2) Whitt. This is a call often used by birds on their territory, and is commonly heard even during periods when the flycatchers are not singing (fitz-bewing). The whitt call appears to be a contact call between sexes, as well as an alarm call, particularly when responding to disturbance near the nest. Whitt calls can be extremely useful for locating willow flycatchers later in the season (when fitz-bewing may be infrequent), but are easily overlooked by inexperienced surveyors. When flycatcher pairs have active nests (particularly once young have hatched), whitts may be the most noticeable vocalization. However, many species of birds whitt, and a whitt is

not a diagnostic characteristic for willow flycatchers.

The fitzbeew and whitt calls are the primary vocalizations used to locate willow flycatchers. However, other less common willow flycatcher vocalizations can be very useful in alerting surveyors to the presence of flycatchers. These include twittering vocalizations (typically given during interactions between flycatchers and sometimes between flycatchers and other birds), bill snapping, and wheeo's. Because these sounds can be valuable in locating territories, they should be studied prior to going in the field. Willow flycatcher vocalization tapes are 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 early June), and appear to decline after eggs hatch (Flett and Sanders 1987, Sogge and Tibbitts 1992). However, in areas with many territorial flycatchers or where an unpaired flycatcher is still trying to attract a mate, singing rates may be high well into July (Craig et al. 1992, Sogge 1995b). Isolated pairs can be much quieter and harder to detect than pairs with adjacent territorial flycatchers (M. Whitfield, pers. comm.). At some sites, pre-dawn singing (0330 - 0500 hrs) appears to continue strongly at least through mid-July (Sogge et al. 1995, Petterson and Sogge 1996). Singing rates may increase again later in the season, possibly coinciding with re-nesting attempts.

There are some periods during which willow flycatchers do not sing and even the use of tapeplayback sometimes fails to elicit any response. This can be particularly true late in the breeding season (Sogge et al. 1993, Muiznieks et al. 1994). Early and repeated surveys are the best way to maximize the odds of detecting a singing flycatcher and determining its breeding status.

### Special Considerations

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

- (1) Obtain all necessary federal, state, and agency permits prior to conducting any surveys. Failure to do so leaves you liable for violation of the Endangered Species Act and state laws.
- (2) 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. Stop playing the survey tape as soon as you have confirmed the presence of a willow flycatcher at that locale, and do not play the tape again until you have moved to the next survey location.
- (3) 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.
- (4) Do not approach known or suspected nests. Nest searches and monitoring require specific state and federal permits, and are not intended to be a part of this survey protocol.
- (5) 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 tree, to prevent physical disturbance and leaving a scent. Do not leave the nest area by the same route that you approached. This leaves a "dead end" trail which could guide a potential predator to the nest/nest tree.
- (6) 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.
- (7) 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. Unless conducting specific (and authorized/permitted) nest monitoring, flagging should be placed no closer than 30 m to 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.

**Timing and Number of Visits**

Performing repeated surveys during the early to mid-nesting season maximizes the likelihood of detecting flycatchers and determining their breeding status. Single surveys, or surveys conducted too early or late in the breeding cycle, do not provide definitive data and are of little value. This survey protocol requires a minimum of three surveys at each site, one during each period outlined below, to document absence of willow flycatchers. Also, successive surveys must be at least 5 days apart; surveys conducted more closely are not considered to be in separate survey periods.

Survey 1: 15 - 31 May

The timing of this survey is intended to coincide with the period of high singing rates in newly arrived males, which tends to begin in early to mid-May. This is one of the most reliable times to detect flycatchers that have established their territories. However, not all territorial males may have arrived by this time, and migrants (of all subspecies) may still be present and singing during this period.

Survey 2: 1 - 21 June

During this period, the earliest arriving males may already be paired and singing less, but later arriving males should still be singing strongly. This survey can provide insight about the status of flycatchers detected during survey 1 (e.g., if detected during survey 1 but not survey 2, the first detection may have been a migrant). Conversely, detecting a flycatcher at the same site on surveys 1 and 2 increases the likelihood that the bird is not a migrant (but does not necessarily confirm it). Survey period 2 is also the earliest time during which you are likely to find nesting activity by resident birds.

Survey 3: 22 June - 10 July

Southwestern willow flycatchers should have arrived on their territories by this time. Flycatcher singing rates may have lessened, and most paired flycatchers will have initiated nesting activity. Migrant willow flycatchers should no longer be passing through the southwest; therefore, any flycatchers that you detect are probably resident breeders or nonbreeding floaters. Surveyors should determine if flycatchers detected during surveys 1 and/or 2 are still present, and watch closely for nesting activity.

Southwestern willow flycatchers may not arrive and/or initiate breeding activities at higher elevation sites (above 2000 m) until early June, possibly later in some years due to weather or migration patterns. Therefore, flycatcher breeding chronology may be "set back" one or two weeks at such sites and surveys should be conducted in the latter part of each period.

It may not require three trips to verify flycatcher presence and/or breeding status. If, for example, willow flycatchers are found during surveys 1 or 2 and are observed carrying nest material, this is conclusive verification of breeders as opposed to migrants. However, three trips is the minimum necessary to determine with relative confidence that willow flycatchers are probably not breeding at a site in that year. Table 1 provides general guidance for interpretation of survey results.

Table 1. Interpretations of willow flycatcher survey results (assuming no observer error).



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broadcast recorded willow flycatcher songs, and look and listen for responses. In addition to maximizing the likelihood of detecting nearby flycatchers, this method also allows for positive identification by comparison to the "known" willow flycatcher tape.

### Documenting Presence/Absence

Begin surveys as soon as there is enough light to safely walk (about one hour before sunrise) and end by about 0900 - 1000 hrs, depending on the temperature, wind, background noise, and other environmental factors. If observers are camped in or near potential willow flycatcher habitat, afternoons and evenings can be spent in reconnaissance of the site(s) and planning a survey strategy for the following morning. If camped immediately adjacent to survey sites, surveyors can awaken early and listen for flycatchers singing during the predawn period (0330 - 0500 hrs), when territorial males often sing loudly.

Conduct surveys from within the sites if it is possible to do so without breaking vegetation or damaging the habitat. Flycatchers often respond most strongly if the tape is played from within the habitat and territory, rather than from the periphery. In addition, it can be surprisingly difficult to hear singing willow flycatchers that are even a short distance away amidst the noise generated by many other singing and calling birds. Therefore, it is preferable to survey from within the habitat, but always move carefully to avoid disturbing habitat or nests. Surveying can be done from the periphery where terrain, extremely dense vegetation, or deep water prohibit walking through the habitat.

Because flycatchers may be clustered within only a portion of a habitat patch, it is critical to survey all suitable habitat within the patch. Small linear sites may be thoroughly covered by a single transect through the patch. For larger sites, choose a systematic survey path that assures complete patch coverage throughout the length and breadth of the site. This may require multiple transects, serpentine, zig-zag or criss-cross routes. Aerial photographs are valuable tools to help plan and conduct surveys, and to assure complete coverage. Always move carefully through the habitat to avoid disturbing vegetation or nests.

Initially approach each site and stand quietly for 1 - 2 minutes or longer, listening for spontaneously singing flycatchers. A period of quiet listening is important because it helps acclimate surveyors to background noises (which can be quite loud due to roads, aircraft, machinery, waterways). It also allows surveyors to recognize and "filter out" the songs and calls of other bird species, letting them focus attention on listening for 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.

If you do not hear singing flycatchers during the initial listening period, broadcast the willow flycatcher song tape for 15 - 30 seconds, then listen for approximately 1 - 2 minutes for a response. Repeat this procedure (including a 10 - 20 second quiet pre-broadcast listening period) every 20 - 30 m throughout each survey site, more often if background noise is loud. The tape should be played at about the volume of natural bird calls, and not so loud as to cause distortion of the broadcast. We recommend tapes include a series of fitz-bews interspersed with several whitts.

Response to the broadcast call could take several forms. Early in the breeding season (approximately May - mid-June), 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 there are several flycatchers 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 will often sing after a period of whitting in response to a tape, so surveyors should remain in the area and quietly listen for fitz-bews for several minutes. Because some flycatchers may initially respond by approaching quietly, particularly during periods 2 and 3, 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 sites. A few of these other species may even approach a broadcast willow flycatcher song and respond with vocalizations. In order to standardize interpretation of survey results and assure a high degree of confidence in surveys conducted 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 surveyors exercise extra caution moving through the area.

Whenever a willow flycatcher (suspected or verified) is detected, be careful not to overlay 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, and is not needed to verify species identification. If you have heard even a single fitz-bew, this is sufficient for verification (although flycatchers usually sing repeatedly once prompted). If you have played a tape several times and a bird has approached but has not fitz-bewed, **DO NOT CONTINUE PLAYING THE TAPE**. If a "potential" willow flycatcher responds (approaches or whitts) but does not sing, it is best to carefully back away and wait quietly. If it is a willow flycatcher, it will probably sing within a short time (5 - 10 minutes). Another option is to return to the same site early the following morning to listen for and/or attempt to elicit singing again.

Once a flycatcher is detected and verified, surveyors may continue the survey (if more survey habitat remains) until the entire site is completed. If continuing the survey, move 20 - 30 m past the current detection before again playing the tape, and try to avoid "double-counting" flycatchers that have already responded. Willow flycatchers may follow the broadcast song for 50 m or more (Sogge and Tibbitts 1994).

Looking for and Recording color bands

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

To look for bands, move to get a good view of the flycatchers 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 to 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 as unknown and attempt to get a better look during your next visit. Incorrect color-band data is worse than incomplete data, so only record 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.

Determining the Number of Territories and Pairs

Accurately determining the number of breeding territories and pairs is more difficult than determining simple presence or absence. Flycatcher habitat is usually so dense that visual detections are difficult, and seeing more than one bird at a time is often impossible. Flycatchers sing from multiple song perches within their territories, sometimes appearing to be more than one flycatcher. A flycatcher responding to or following a surveyor playing a tape may move considerable distances in a patch and thus be counted more than once. Resident territorial male flycatchers often sing strongly, but so do many migrants and females, particularly in response to tape-playback (Seutin 1987, Unitt 1987, Sogge et al. in press). Even recently fledged (6-8 wk old) willow flycatchers may respond to a tape by singing (Sogge in press). Rangewide, many territorial male flycatchers are unmated, particularly those in small breeding groups (USFWS data). Clearly, each singing flycatcher may not represent a territory or a mated pair.

Given sufficient time, effort and observation, it is usually possible to approximate the number of territories and pairs. First, determine the number of singing individuals by listening carefully for simultaneously singing flycatchers. Note the general location of each bird (aerial photographs can be useful for this purpose). Spend some time watching each flycatcher to determine approximate boundaries of its territory, and to determine if and how it interacts with other flycatchers. If one or more singing birds stay primarily in mutually exclusive areas, they can be considered as separate territories. To determine if a flycatcher is paired, watch for interactions within a territory. Refer to the Determining Breeding Status section that follows for signs of pairing and breeding activity. Do not report a territorial male as a pair unless you observe one or more of the signs listed below. In some cases, it may be possible only to estimate the number of singing individuals. In others, it may take multiple site visits to differentiate territories or pairs.

### Determining Breeding Status

One way to determine if the flycatchers found at a particular site are migrants or territorial is to find out if they are still present during the "non-migrant" period, which is generally from about 15 June - 20 July (refer to Figure 4 [page 13]; Unitt 1987). A willow flycatcher found during this time is probably a resident bird on a territory (although there is a small chance it could be a non-territorial "floater"; Sogge and Tibbitts 1994, Sogge et al. in press). If the management question is simply whether the site is a potential breeding area, documenting the presence of a territorial flycatcher during this time period may meet all survey objectives, and the site may not need to be re-surveyed during the remainder of that breeding season.

However, in some cases it may be important to determine whether breeding and nesting efforts are actually taking place. At many currently known breeding sites, some males maintain territories well into July yet never succeed in attracting a mate (Sogge 1995b, Petterson and Sogge 1996, Sierra et al. 1997). Thus, an assumption that a singing male represents a breeding pair may not be well founded (especially in small populations).

The best way to determine whether a pair is present and breeding is to move a short distance away from where the bird was sighted, find a good vantage point, and sit or lie quietly to watch for signs of breeding activity. Signs of breeding activity include:

- a) observation of another "unchallenged" willow flycatcher in the immediate vicinity (indicates possible pair);
- b) whitt calls between nearby flycatchers (indicates possible pair);
- c) interaction twitter calls between nearby flycatchers (indicates possible pair);
- d) countersinging or physical aggression against another flycatcher or bird species (suggests territorial defense);
- e) physical aggression against cowbirds (suggests nest defense);
- f) observation of willow flycatchers copulating;
- g) flycatcher carrying nest material (verifies nesting attempt, but not nest outcome);
- h) flycatcher carrying food or fecal sac (verifies nest with young, but not nest outcome);
- i) locating an active nest (see special considerations section above);
- j) observation of adult flycatchers feeding fledged young (verifies successful nesting).

You may be able to detect flycatcher nesting activity, especially once the chicks are being fed. Adults feed chicks at rates of up to 30 times per hour (Sogge 1995b), and the repeated trips to the nest tree or bush are often quite evident. Be sure to note on the flycatcher survey form any breeding activity that is observed.

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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.

The number of flycatchers found at a site can also provide a clue as to whether they are migrants or territorial residents. Early season detections of single, isolated willow flycatchers often (but not always) turn out to be migrants. On the other hand, discovery of a number of willow flycatchers at one site usually (but not always) leads to verification that at least some of them remain as breeders. This underscores the importance of completing a thorough survey of each site to be confident of the approximate number of flycatchers present.

Documenting Presence of Cowbirds

Brown-headed cowbirds significantly impact many southwestern willow flycatcher populations by decreasing or eliminating flycatcher productivity, nesting success, and juvenile survival (Unitt 1987, Brown 1988, Whitfield 1990, USFWS 1993, Sogge 1995a and b, Whitfield and Strong 1995, Sferra et al. 1997, Sogge et al. in press). It is important to document if cowbirds occur at a 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.

Surveyors should look and listen for cowbirds at, and in the vicinity of, the survey site. This requires that surveyors 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 in accurately estimating cowbird abundance, the flycatcher survey form requests simple presence/absence data. A relative estimate of cowbird abundance can be included in the comment section.

Reporting Results

Fill in all appropriate information on the willow flycatcher survey form 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--trying to remember specific information and recording it later leads to missing and inaccurate data. Put the location of the sighting on an aerial photograph or sketch of the site. Whenever a willow flycatcher territory or nest site is confirmed, notify the USFWS or appropriate state wildlife agency (see Contacts section, page 29) as soon as you return from the field.

Complete a survey form (Appendix 1) for each site surveyed, whether or not flycatchers are 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 USFWS and/or the appropriate wildlife agency by the specified deadline. Contact the appropriate agency each year to find out the submission deadline date. Timely submission of survey data is a permit requirement, and will ensure the information is included in annual statewide and regional reports.

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## CONTACTS

### Arizona:

Mark Sogge, National Biological Service, Colorado Plateau Research Station at Northern Arizona University, Flagstaff, Arizona:

### Other Contacts by Region and Agency:

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

## STATE AGENCIES

Arizona Game and Fish Dept. 602/942-3000  
Nongame Branch  
2221 W. Greenway Rd.  
Phoenix, AZ 85023

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

Colorado Division of Wildlife 970/249-0855  
151 E. 16<sup>th</sup> St  
Durango, CO 81301

Nevada Division of Wildlife 702/688-1500  
Box 10678  
Reno, NV 89520

New Mexico Dept. of Game & Fish 505/827-9904  
Endangered Species Program  
Villagra Building  
Santa Fe, NM 87503

Texas Parks and Wildlife Dept. 512/389-4800  
3000 IH-35 South, Suite 100  
Austin, TX 78704

Utah Div. of Wildlife Resources 801/538-4764  
Nongame Avian Program Coordinator  
1596 West North Temple  
Salt Lake City, UT 84116

## FEDERAL AGENCIES

### U.S. Fish and Wildlife Service:

Region 1 (includes CA, NV) 503/231-2063

DN. OFONJIN. 9.0H

911 NE 11<sup>th</sup> Ave  
Portland, OR 97232

California:

Sacramento Field Office 916/979-2710  
2800 Cottage Way, Rm. E-1803  
Sacramento, CA 95825

Ventura Field Office 805/644-1766  
2493 Portola Rd, Suite B Carlsbad Field Office 760/431-9440  
2730 Loker Ave  
Carlsbad, CA 92008  
Ventura, CA 93003

Nevada:

Nevada State Office 702/784-5227  
4600 Kietzke Ln, Bldg C, Rm 125  
Reno, NV 89502

Region 2 (includes AZ, NM, TX): 505/248-6647

P. O. Box 1306

Albuquerque, NM 87103

Arizona:

AZ Ecological Services 602/640-2720  
2321 W. Royal Palm Rd, Suite 103  
Phoenix, AZ 85021

New Mexico:

NM Ecological Services 505/761-4525  
3530 Pan American Hwy. NE, Suite D  
Albuquerque, NM 87107

Texas:

611 E. 6<sup>th</sup> St., Suite 407 512/389-4505  
Austin, TX 78701

Region 6 (includes CO, UT) 303/236-7904

P.O. Box 25486, Denver Federal Center

Denver, CO 80225

Colorado:

764 Horizon Dr, South Annex A  
Grand Junction, CO 81506  
970/243-2778

44-07070-100M

Utah:

Lincoln Plaza, Suite 404  
145 East 1300 South  
Salt Lake City, UT 84115  
801/524-5001

U.S. Geological Survey Biological Resources Division:

Colorado Plateau Field Station 520/556-7311  
Northern Arizona University  
P.O. Box 5614  
Flagstaff, AZ 86011-5614

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