



United States Department of the Interior
Fish and Wildlife Service

Arizona Ecological Services Field Office
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
(602) 640-2720 Fax (602) 640-2730



In Reply Refer To:
AESO/SE
2-21-92-F-042

August 28, 1997

Mr. Robert E. Hollis
Arizona Division Administrator
U. S. Department of Transportation
Federal Highway Administration, Region Nine
234 North Central Avenue, Suite 330
Phoenix, Arizona 85004

Dear Mr. Hollis:

The U.S. Fish and Wildlife Service (Service) has reviewed the U. S. 93 Wickenburg-Kingman Highway Improvement Project concerning the proposed widening of U. S. 93 from the south bank of the Santa Maria River to Wikieup in Mohave and Yavapai counties. Your March 19, 1996, request for formal consultation was received on March 22, 1996. A revised project description was received on March 26, 1997, and July, 14, 1997. On August 27, Stephen Thomas of your office requested that we finalize this biological opinion; therefore, this document represents the Service's biological opinion on the effects of that action on the southwestern willow flycatcher (*Empidonax traillii extimus*) in accordance with section 7 of the Endangered Species Act of 1973, as amended, (16 U.S.C. 1531 et seq.).

It is the Service's opinion that direct and indirect effects of the proposed action as described below are not likely to jeopardize the continued existence of the southwestern willow flycatcher. Five terms and conditions are described to reduce the amount of incidental take of the southwestern willow flycatcher.

CONSULTATION HISTORY

The Service was asked to comment on the U.S. 93 Wickenburg-Kingman Corridor Study in a letter from Cannon and Associates, Inc, written on October 25, 1991. The goal of the Corridor Study was to recommend short and long-term highway improvements after identifying traffic operation conditions, environmental and cultural resources, and land uses within the corridor extending from Wickenburg to Kingman. The Service responded on November 20, 1991, with a list of 11 endangered and candidate species that may occur in the project area. The Service advised Cannon and Associates, Inc., that endangered species should be considered prior to initiation of the project and that it may be prudent to contact the Army Corps of Engineers regarding the placement of fill into the waterways along the corridor. The Service received a draft copy of the corridor study for review on January 27, 1992. In response, the Service informed

Arizona Department of Transportation (ADOT) that 4 candidate species (including the southwestern willow flycatcher) should be added to the project species list. The Service also stated that impacts to the endangered Arizona cliffrose would be avoided if the existing bridges were used.

On April 8, 1993, the Service received a letter requesting any additional information on environmental concerns in the project area. The Service was informed that ADOT was planning to proceed with a more detailed outline of the project segment extending from Wikieup to the Santa Maria River. The Service responded with a letter on April 16, 1993, informing ADOT that we had no additions or corrections to offer regarding our November 20, 1991, letter. The Service received a draft Environmental Assessment concerning the project segment on January 8, 1996. In the section entitled Biological Resources (pages 4-17 and 4-18) in the Environmental Assessment it is stated that "ADOT will prepare site-specific reclamation and revegetation plans, which will be included in the construction documents. The plans will include methods for preserving existing vegetation, minimizing cleared areas, disposing of slash, and revegetating." The Service responded with a letter on January 23, 1996. The letter informed ADOT of the recent listing of the southwestern willow flycatcher and recommended that flycatcher surveys be done in riparian habitat along the rivers in the project area. This letter also made recommendations concerning the desert tortoise and recommended surveys for Arizona cliffrose.

Formal consultation was requested on March 19, 1996. The request was received by this office on March 22, 1996. The biological assessment (BA) concluded that there would be no affect on the Arizona cliffrose (Purshia subintegra), the desert pupfish (Cyprinodon macularius) or the Gila topminnow (Poeciliopsis occidentalis) and that the action may affect, but was not likely to adversely affect the southwestern willow flycatcher. The BA described the action area as extending from the south bank of the Santa Maria River to Wikieup. The Service reviewed the BA and wrote a letter on August 22, 1996 asking for additional information on the scope and magnitude of the proposed action and requesting more detailed maps showing the existing and proposed alignment. The Service expressed concern as to why no project specific flycatcher surveys had been conducted at the Big Sandy River crossing since 1994 and pointed out that the determination of not likely to adversely affect appeared to have been made without adequate survey data. The Service also expressed concern about the lack of proposed mitigation for the loss of riparian habitat and potential effects to the southwestern willow flycatcher.

A revised BA was received by this office on October 8, 1996. The revised BA described the action area as extending from the south bank of the Santa Maria River to south of the Big Sandy River (as opposed to Wikieup as the first BA stated). ADOT wanted to reinitiate formal consultation when the project reached the Big Sandy River. Better maps were included as was additional information on the scope and magnitude of the proposed action. No explanation for the lack of project specific flycatcher surveys was given and no mitigation for loss of riparian habitat was presented. On October 9, 1996, the FHWA wrote a letter to the Service's Regional Director expressing concern about the expected delay of the consultation until January 1997. On November 14, 1996 this office received a copy of a memo from Rich Strange to Steve Thomas of ADOT expressing concern that further delays regarding the U.S. 93 project would result in

more fatalities and injuries along the highway. A December 13, 1996, letter from the FHWA requested that the Service furnish a schedule for completion of the formal section 7 consultation. The field supervisor in the Phoenix Ecological Services office informed EcoPlan Associates, Inc. during a telephone conversation on January 2, 1997, that the Service would not be able to give a time frame for completion of the consultation due to direction to work on higher priorities.

The Service was able to resume work on the project in January and wrote a letter on January 21, 1997, informing FHWA. The Service and EcoPlan Associates, Inc. visited the project area on February 21, 1997. It was discussed that the current habitat at the Big Sandy River crossing appeared suitable for the southwestern willow flycatcher and that, with management, the habitat at the Santa Maria River crossing appeared to have potential. EcoPlan Associates, Inc. expressed interest in consulting on the Big Sandy River crossing separately (as conveyed in the revised BA), because it would not be reached for approximately 5 years. The Burro Creek crossing and the Kaiser Springs crossing did not contain sufficient riparian vegetation to support flycatchers.

On March 10, 1997, the Service sent a letter to FHWA explaining the implications of consulting separately on the Big Sandy River crossing. The Service asked FHWA to submit a complete description of the action at the Big Sandy River if they chose to include it in the consultation. The Service also asked for aerial photos of the area and a summary of the expected time frame for the project.

On March 12, 1997, EcoPlan Associates met with the Service in Phoenix to discuss the consultation. The Service was told to consider the widening of U. S. 93 from the south bank of the Santa Maria River to Wikieup as the proposed action and that EcoPlan would provide the Service with as much of the requested information as possible within 48 hours. The Service expressed concern about the loss of habitat occupied by flycatchers along the Big Sandy River. The feasibility of several ways to reduce disturbance were discussed and EcoPlan promised to discuss them with FHWA. Specifically, the possibility of moving the proposed bridge alignment closer to the existing bridge to reduce the amount of riparian habitat lost or modified along the Big Sandy River was discussed. The possibility of land acquisition around both rivers was also discussed.

The requested information including aerial photos, a detailed description of the proposed action at the Big Sandy River, and information on the projected time frame was delivered to the Service on March 13, 1997. At this time, the Service and EcoPlan Associates discussed ways to avoid jeopardy. On March 26, 1997, the Service received another revised description of the proposed action that included moving the new bridge closer to the existing bridge at the Big Sandy River along with acquiring habitat at a 1:1 ratio downstream of the Big Sandy River as mitigation for the loss of riparian habitat at both the Big Sandy River and the Santa Maria River. The Service wrote a letter on April 3, 1997, to FHWA acknowledging that formal consultation had begun now that all pertinent information had been received.

The Service, FHWA, and ADOT met on May 1 and July 2, 1997, to discuss additional aspects of project description modification that would reduce effects and avoid jeopardizing the continued existence of the southwestern willow flycatcher, and that would apply to the entire project from SR89 to I40. The Service received additional project description material from FHWA's contractor, EcoPlan Associates, on July 14, 1997.

On July 28 and August 14, ECOPLAN, acting for FHWA, forwarded comments on the Service's draft language for the opinion. Through one comment, FHWA made a major change to the project description that scheduled construction activity on the Santa Maria River through two southwestern willow flycatcher growing seasons. The Service responded on August 18, 1997, with requests for clarification and help with measures to reduce take during the Santa Maria construction period.

The Service and ADOT, acting as agent for FHWA, took part in several phone calls between August 20 and 22, 1997, concerning the Santa Maria construction period and issues over take. At this late planning date, few measures were deemed available in construction schedules.

On August 25, 1997, the Service, in conference call with ADOT again discussed incidental take of the flycatcher and possible ideas for reasonable and prudent measures.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

Corridor

The project corridor extends from the junction of SR 89 and US 93, just northwest of Wickenburg in Maricopa County and extends to the junction of US 93 and I-40, east of Kingman in Mohave County. The long-term goal of the Arizona Department of Transportation is to provide four travel lanes on US 93 within the entire 102-mile corridor. The corridor has been divided into three segments, each approximately 33 miles long. Segment 1 includes US 93 from I-40 (Milepost, MP 91.5) south to Wikieup (MP 124.5). Segment 2 extends from Wikieup to the Santa Maria River (MP 160.5). Segment 3 extends from the Santa Maria River to the junction of US 93 and SR 89 (MP 193.5). FHWA intends that, after minimizing effects to the extent practicable, compensation actions for southwestern willow flycatcher and its habitat beyond segment 2 covered specifically in this consultation, will be implemented if additional southwestern willow flycatcher habitat is involved. This consultation incorporates that intention to cover the entire highway 93 project corridor.

Segment 2 is in mountainous terrain. The roadway has steep grades and many curves. This segment was selected for improvement first, followed by Segment 1 and finally Segment 3. The upgrade of US 93 will occur over the next 20 years.

The Arizona Department of Transportation is proposing to widen US 93 between the south bank of the Santa Maria River, Yavapai County (MP 161.5, Station 1600) and Wikieup, Mohave County (MP 122.75, Station 3569). Currently the average right-of-way ranges from 61 m (on private land) to 122 m (on BLM land) encompassing a total of 575 hectares (1420 acres). Habitat along the corridor is primarily composed of Sonoran desert scrub with 4 river crossings, 2 of which (Santa Maria River and Big Sandy River) include substantial riparian vegetation. The proposed action would widen the existing two-lane highway to a four-lane highway with a median between northbound and southbound lanes. The action includes the construction of emergency shoulders, guard rails and posts, bridges, concrete box culverts, corrugated metal pipes, slope contouring and erosion control.

Additional bridges will need to be constructed at four locations: Santa Maria River, Burro Creek Canyon, Kaiser Springs Canyon, and Big Sandy River. Work on the Burro Creek and Kaiser Springs Canyon bridges will not affect the southwestern willow flycatcher.

Big Sandy River

The proposed Big Sandy River (BSR) bridge on US 93 will involve building a new southbound bridge downstream (west) of the existing bridge. The existing bridge will be utilized for northbound traffic upon completion of the new bridge. The bridges at BSR will be separated by 6.1 meters (20 feet). The new bridge will be 268 m (880 feet) long and 13.7 m (45.2 feet) wide, the same dimensions as the existing bridge. The new bridge will be supported by six piers with a basal diameter of 1.5 m (5 feet), located approximately 38 m (125 feet) apart. The bridge at BSR is depicted on the attached plan sheet. An aerial photograph in the administrative record depicts the location of the right-of way boundaries and the proposed centerline of the alignment. Both exhibits are at approximately 1:400 scale.

A temporary 6 m (20 feet) wide access road for bridge construction will be placed within the channel on the downstream side of the new southbound bridge alignment. An estimated 279 m² (3000 ft²) of rail-bank protection will be placed around the south abutment and 465 m² (5000 ft²) of wire-tied riprap apron will be placed around the north abutment for bank erosion protection. A drainage channel, approximately 46 m (150 feet) wide by 89 m (290 feet) long, will be relocated to the west to accommodate the proposed approach road. A total of 2.68 hectares (ha, 6.60 acres) will be modified or lost during construction of the bridge, piers, abutments, approach roadway, bank protection, drainage channel relocation and fencing. This includes 0.49 ha (1.20 acres) of cottonwood-willow-saltcedar habitat, 1.50 ha (3.70 acres) of mesquite-acacia habitat and 0.69 ha (1.70 acres) of bare ground. The 0.49 ha of cottonwood-willow-saltcedar habitat are considered to be potential habitat for Southwestern Willow Flycatchers. Bridge construction at BSR is scheduled to begin in 2007 and will require 12 months to complete. Construction period for the Big Sandy bridge will be between September 1 and April 15, to avoid presence of southwestern willow flycatchers in the project area.

Santa Maria River

The proposed Santa Maria River (SMR) bridge on US 93 will involve building two new bridges downstream, and adjacent to, the existing bridge. The existing bridge will be utilized for existing traffic until completion of the new bridges and approach roadways. Upon completion, the existing bridge will be removed. The new northbound and southbound bridges will be separated by just over 24 m (80 feet). The new bridges will be 320 m (1050 feet) long and 13.7 m (45.2 feet) wide. Each new bridge will be supported by 8 piers with a basal diameter of 1.5 m (5 feet) located approximately 37 m (120 feet) apart. The bridges at SMR is depicted on the attached plan sheet. An aerial photograph depicts the location of the right-of way boundaries and the proposed centerlines of the alignments. Both exhibits are at approximately 1:400 scale.

A temporary 6 m (20 feet) wide access road for bridge construction will be placed within the channel on the downstream side of each new bridge alignment. An estimated 204 m² (2200 ft²) of wire-tied riprap apron will be placed around the south abutment of both bridges and 408 m² (4400 ft²) of wire-tied riprap apron will be placed around the north abutment of both bridges for bank erosion protection. A total of 3.00 ha (7.40 acres) will be modified or lost during construction of the bridge, piers, abutments, approach roadway, bank protection, drainage channel relocation and fencing. This includes 0.81 ha (2.00 acres) of cottonwood-willow-saltcedar habitat, 1.13 ha (2.80 acres) of mesquite-acacia habitat and 1.05 ha (2.60 acres) of bare ground. The 0.81 ha of cottonwood-willow-saltcedar habitat are considered to be potential, presently unoccupied, habitat for Southwestern Willow Flycatchers. Bridge construction at SMR is scheduled to begin in 1998 and will require approximately 12 months to complete. The breeding period for southwestern willow flycatchers will not be avoided.

Additional Project Measures

Additional measures outlined in the EA for the project and an April 29, 1997, letter from FHWA include the following:

1. Seasonal or perennial water flows will not be diverted;
2. There will be no damming or discharge of fill material into the existing river course;
3. Sand, gravel, or other material will not be removed from the existing river channel or from existing riparian areas;
4. Equipment and vehicle access through vegetated areas will be minimized;
5. Equipment and other materials will be stored outside the 100-year floodplain;
6. Where possible, bank and main channel crossings will be avoided to prevent damage to the existing bank establishment and riparian vegetation;

7. Disturbed areas (including the old Santa Maria River bridge site that is to be removed and all temporary access lanes) will be revegetated with riparian-associated native plant species (ADOT 1995) with Goodding's willow and Fremont cottonwood in a 3:1 ratio in conformance with standards recommended by the Natural Resources Conservation Service;
8. Construction period for the Big Sandy bridge will be between September 1 and April 15, to avoid presence of southwestern willow flycatchers in the project area.

Compensation for Habitat Loss

The following actions will be implemented by FHWA to replace or compensate for effects to southwestern willow flycatchers and their habitat. Habitat that may be affected similarly in other phases of the project through the Highway 93 corridor will follow the same methodology. To compensate for project effects at the Big Sandy and Santa Maria river crossings, FHWA will protect sufficient riparian habitat on private, state, or Federal lands from threats to southwestern willow flycatchers or from factors limiting southwestern willow flycatchers in the following priority order [habitat purchase, easement, expanded rights-of-ways (ROW), and/or other improvement/agreements are acceptable] for the life of the project:

1. Occupied, within 1-2 km of project site(s);
2. Occupied, in Big Sandy or Santa Maria drainages upstream of Alamo Reservoir;
3. Unoccupied, suitable habitat within 1-2 km of project site(s);
4. Unoccupied, suitable habitat in Big Sandy or Santa Maria drainage;
5. Potentially suitable habitat (with management) within the big Sandy or Santa Maria drainages upstream of Alamo Reservoir.

Efforts will follow a stepwise progression to concentrate on the highest priority before the next successive priority is pursued. These efforts will be documented and submitted to the Service. Any suitable riparian habitat protected within the ROW of either bridge will count toward the required compensation. The number of tracts of land with protected habitat will be minimized as much as possible to ensure that larger habitat patches are favored. Every effort will be documented to avoid having more than four separate protected tracts of land involved in the compensation. If four areas of fewer are found infeasible, more areas will be acceptable upon concurrence with the Service.

Protection will be afforded to sufficient lands to support a total of 3.9 hectares (9.6 ac) of dense riparian habitat dominated by willows and cottonwoods in the first 4 priority cases, a 3:1 ratio, and 6.5 ha (16.1 ac) in the 5th priority case, a 5:1 ratio.

Compensation habitats will be fully protected and functional to support flycatchers, barring natural catastrophic events, by the end of the construction period. Appropriate management or agreements will be in place before or concurrent with loss at each bridge site and conditions will be maintained that can support habitat for the life of the project. It is recognized by all parties that actual suitable habitat will fluctuate due to natural events after protections are in place.

As appropriate, the following features or conditions will be applied to compensation habitats, will be coordinated with the Service for concurrence, and will include coordination with appropriate State agencies and other parties related to the project:

- a. Construct and maintain fences to exclude grazing or holding of livestock (including cattle, burros, horses, llamas, etc.).
- b. No trails or structures other than fencing shall be developed on the compensation habitat within the 100-year floodplain without approval of the Service.
- c. Compensation habitat will have, or have the potential to develop, the primary constituent elements required by the southwestern willow flycatcher. This includes, but is not limited to, proximity to surface water or moisture during the breeding season, and a floodplain not characterized by erosion, downcutting, or a significantly-lowered water table.
- d. In all but the 5th priority case, at the time of protection, compensation habitat shall include contiguous native broadleaf riparian habitat, which may include willow, box elder, buttonbush, ash, and cottonwood. Tamarisk (saltcedar) may be a component, but not the dominant species in areal extent. Contiguous vegetation must contain early to mid-successional stages of the above plant species characterized by high canopy cover (approximately 80-85% or greater) and high vertical foliage density (approximately 50%) in all strata. Presence of southwestern willow flycatchers at the replacement habitat will negate the need for strict vegetation parameters.
- e. Compensation habitat will have contiguous vegetation with the above characteristics and will not already be protected from land-use or other activities that threaten reproductive success or establishment and maintenance of suitable flycatcher habitat.
- f. It will likely be necessary to acquire or protect larger parcels of land to protect the indicated acreage of suitable or occupied habitat. Succession, a natural biological process, will occur and eventually habitat presently suitable for flycatchers will not be suitable. All parties anticipate that actual suitable and occupied habitat areas will vary on a temporal and geographic scale within the overall compensation areas.
- g. The Service will be reserved the right to visit replacement habitat for monitoring compliance, conducting status surveys, or monitoring and research work. The Service will make every reasonable effort to coordinate all site visits with the relevant land management authority.
- h. If FHWA chooses to purchase land, the Service requests that land only be purchased from willing sellers. Condemnation is not an option.
- i. If FHWA chooses to make arrangement with a third party for habitat acquisition, protection, and for management, the third party shall have demonstrated a successful record of resource management and riparian habitat protection. If FHWA arranges with a third party for long-term

compensation habitat protection and management, FHWA will ensure annual maintenance needs are funded, if and when necessary.

STATUS OF THE SPECIES

The southwestern willow flycatcher is a small passerine bird (Order Passeriformes; Family Tyrannidae) measuring approximately 15 centimeters (5.75 in.) in length from the tip of the bill to the tip of the tail and weighing only 11 grams (0.4 ounces). It has a grayish-green back and wings, whitish throat, light gray-olive breast, and pale yellowish belly. Two white wingbars are visible (juveniles have buffy wingbars). The eye ring is faint or absent. The upper mandible is dark, the lower is light yellow grading to black at the tip.

The southwestern willow flycatcher is an insectivore typically perching on a branch and making short direct flights, or sallying, to capture flying insects. The southwestern willow flycatcher is a riparian obligate, nesting along rivers, streams, and other wetlands where dense growths of willow (*Salix* sp.), *Baccharis*, buttonbush (*Cephalanthus* sp.), boxelder (*Acer negundo*), saltcedar (*Tamarix* sp.) or other plants are present, often with a scattered overstory of cottonwood (*Populus* sp.) and/or willow.

One of four currently-recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993), the southwestern willow flycatcher is a neotropical migratory species that breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historical range of the southwestern willow flycatcher included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja)(Unitt 1987).

The States of California and New Mexico list the southwestern willow flycatcher as endangered (California Department of Fish and Game 1992, and New Mexico Department of Game and Fish 1988). The State of Arizona considers the southwestern willow flycatcher a species of special concern (AGFD 1996). The Service included the southwestern willow flycatcher on its Animal Notice of Review as a category 2 candidate species on January 6, 1989 (USFWS 1989). A proposal to list the southwestern willow flycatcher as endangered, with critical habitat, was published on July 23, 1993 (USFWS 1993), and a final rule without critical habitat was published on February 27, 1995 (USFWS 1995), becoming effective on March 29, 1995. Following the review of comments received during the public comment period, the Service deferred the designation of critical habitat, invoking an extension on this decision until July 23, 1995. A moratorium on listing actions under the Act passed by Congress in April 1995 required the Service to cease work on the designation of critical habitat. On April 26, 1996, the moratorium was lifted and on May 16, 1996, the Service published a notice in the Federal Register announcing listing prioritization guidance. Listing actions were placed in categories of decreasing order of priority: Tier 1 - Emergency listings; Tier 2 - Finalization of listing decisions on

proposed species; and Tier 3 - all other listing actions (proposed rules, petition findings, critical habitat designations). On May 13, 1997, the Southwest Center for Biological Diversity filed a lawsuit claiming that the Service violated the Act by not finalizing critical habitat for the southwestern willow flycatcher. On March 20, 1997, the District Court ordered the Service to finalize critical habitat for the flycatcher by July 18, 1997. As ordered, the critical habitat was published on July 18, 1997, and became effective on August 21, 1997. A correction notice was published in the Federal Register on August 20, 1997.

Life History

The southwestern willow flycatcher forages within and above dense riparian vegetation, taking insects on the wing or gleaning them from foliage (Wheelock 1912, Bent 1960). No information is available on specific prey species. However, fecal samples containing identifiable invertebrate body parts were collected during banding operations from more than 70 southwestern willow flycatchers in California, Arizona, and southwestern Colorado (M. Sogge, pers. comm.). These samples could yield important data on prey use at various locations and timing throughout the breeding season.

The southwestern willow flycatcher begins arriving on breeding grounds in late April and May (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Sogge and Tibbitts 1994, Muiznieks *et al.* 1994, Maynard 1995, Sferra *et al.* 1995). Migration routes are not completely known. However, willow flycatchers have been documented migrating through specific locations and drainages in Arizona that do not currently support breeding populations, including the upper San Pedro River (BLM, unpubl. data), Colorado River through Grand Canyon National Park (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Sogge and Tibbitts 1994), lower Colorado River (Muiznieks *et al.* 1994, Spencer *et al.* 1996), Verde River tributaries (Muiznieks *et al.* 1994), and Cienega Creek (BLM, *in litt.*). These observations probably include subspecies *E.t. brewsteri* and *E.t. adastus*. *Empidonax* flycatchers rarely sing during fall migration, so that a means of distinguishing some migrating *Empidonax* without a specimen is not feasible (Blake 1953, Peterson and Chalif 1973). However, willow flycatchers have been reported to sing and defend winter territories in Mexico and Central America (Gorski 1969, McCabe 1991).

Nesting begins in late May and early June and young fledge from late June through mid-August (Willard 1912, Ligon 1961, Brown 1988, Whitfield 1990, Sogge and Tibbitts 1992, Sogge *et al.* 1993, Muiznieks *et al.* 1994, Whitfield 1994, Maynard 1995). Southwestern willow flycatchers typically lay three to four eggs in a clutch (range = 2-5). The breeding cycle, from laying of the first egg to fledging, is approximately 28 days. Eggs are laid at one-day intervals (Bent 1960, Walkinshaw 1966, McCabe 1991); they are incubated by the female for approximately 12 days; and young fledge approximately 12 to 13 days after hatching (King 1955, Harrison 1979). Southwestern willow flycatchers typically raise one brood per year but have been documented raising two broods during one season (Whitfield 1990). They have also been documented reneating after nest failure (Whitfield 1990, Sogge and Tibbitts 1992, Sogge *et al.* 1993, Sogge and Tibbitts 1994, Muiznieks *et al.* 1994, Whitfield 1994, Whitfield and Strong 1995).

Whitfield, who has accumulated the largest data set on southwestern willow flycatchers, reported the following data on survivorship of adults and young: of 58 nestlings banded since 1993, 21 (36%) returned to breed; of 57 birds banded as adults (after hatch year) since 1989, 18 (31%) returned to breed at least one year (10 males, 8 females); five (9%) returned to breed for two years (all males); and two (3.5%) returned to breed for three years (M. Whitfield, Kern River Preserve, pers. comm.). Whitfield (1995) also documented statistically significant variation in return rates of juveniles as a function of fledging date: approximately 21.9% of juveniles fledged on or before July 20th returned to her study area the following year, whereas only 6.4% of juveniles fledged after July 20th returned the following year.

Walkinshaw (1966), who studied *E.t. traillii* in Michigan, estimated that 40.9% of the males at his study site returned to breed for at least two years, 22.7% returned for at least three years, 13.6% returned for at least four years, and at least 4.5% returned during their fifth year. Female return rates were substantially lower. Only 22.6% returned to breed for one year. Whitfield and Walkinshaw do not incorporate potential emigration rates into their estimates of returns and, thus, may underestimate actual survivorship. However, these data are consistent with survival rates for other passerines (Gill 1990, chap. 21) suggesting that the life span of most southwestern willow flycatchers is probably two to three years (i.e. most flycatchers survive to breed one or two seasons).

Brood parasitism of southwestern willow flycatcher nests by the brown-headed cowbird (*Molothrus ater*) has been documented throughout the flycatcher's range (Brown 1988, Whitfield 1990, Muiznieks *et al.* 1994, Whitfield 1994, Hull and Parker 1995, Maynard 1995, Sferra *et al.* 1995, Sogge 1995b). Cowbirds lay their eggs in the nests of other species directly affecting their hosts by reducing nest success. Cowbird parasitism reduces host nest success in several ways. Cowbirds may remove some of the host's eggs, reducing overall fecundity. Hosts may abandon parasitized nests and attempt to reneest, which can result in reduced clutch sizes, delayed fledging, and reduced overall nesting success and fledgling survivorship (Whitfield 1994, Whitfield and Strong 1995). Cowbird eggs, which require a shorter incubation period than those of many passerine hosts, hatch earlier giving cowbird nestlings a competitive advantage over the host's young for parental care (Bent 1960, McGeen 1972, Mayfield 1977, Brittingham and Temple 1983). Where studied, high rates of cowbird parasitism have coincided with southwestern willow flycatcher population declines (Whitfield 1994, Sogge 1995a, Sogge 1995c, Whitfield and Strong 1995), or, at a minimum, resulted in reduced or complete elimination of nesting success (Muiznieks *et al.* 1994, Whitfield 1994, Maynard 1995, Sferra *et al.* 1995, Sogge 1995a, Sogge 1995c, Whitfield and Strong 1995). Whitfield and Strong (1995) found that flycatcher nestlings fledged after July 20th had a significantly lower return rate and that cowbird parasitism was often the cause of delayed fledging.

Habitat Use

The southwestern willow flycatcher breeds in dense riparian habitats from sea level in California to over 7000 feet in Arizona and southwestern Colorado. Throughout its wide geographic and elevational range, its riparian habitat can be broadly described based on plant species composition

and habitat structure (Sogge *et al.* 1997). These attributes are among the most conspicuous components of flycatcher habitat but not necessarily the only important components. They are easily identified from photographs or during field visits and have been useful in conceptualizing, selecting, and evaluating suitable survey habitat. Photographs and accompanying text provided in Sogge *et al.* (1997) characterize the considerable variation in habitat structure and plant species composition found at breeding sites throughout the southwestern willow flycatcher's range. Two components that vary less across this subspecies' range are vegetation density and the presence of surface water. Those and other characteristics, such as size and shape of habitat patches, are described further below.

Based on the diversity of plant species composition and complexity of habitat structure, four basic habitat types can be described for the southwestern willow flycatcher. Those types are described below and should be referenced with photographs provided in Sogge *et al.* (1997). When reviewing the habitat descriptions below and applying them to a particular location in the field, keep in mind that characteristics of actual breeding sites fall somewhere on a continuum from monotypic to multiple plant species, and from a relatively simple habitat structure characterized by a single vegetation stratum to more complex habitat patches characterized by multiple-strata.

Monotypic willow: Nearly monotypic, dense stands of willow (often *S. exigua* or *S. geyeriana*) 3 to 7 m in height with no distinct overstory layer; usually very dense structure in at least lower 2 m; live foliage density is high from the ground to canopy.

Monotypic exotic: Nearly monotypic, dense stands of exotics such as saltcedar (*Tamarisk* sp.) or Russian olive (*Elaeagnus angustifolia*) 4 to 10 m in height forming a nearly continuous, closed canopy (with no distinct canopy layer); lower 2 m may be very difficult to penetrate due to branch density; however live foliage volume may be relatively low from 1 to 2 m above ground; canopy density uniformly high.

Native broadleaf dominated: Comprised of dense stands of single species (often Goodding's or other willows) or mixtures of native broadleaf trees and shrubs including, but not limited to, cottonwood, willows, boxelder, ash, buttonbush, and stinging nettle from 4 to 15 m in height; characterized by trees of different size classes; may have distinct overstory of cottonwood, willow or other broadleaf species, with recognizable subcanopy layers and a dense understory of mixed species; exotic/introduced species may be a rare component, particularly in understory.

Mixed native/exotic: Dense mixtures of native broadleaf trees and shrubs (such as those listed above) mixed with exotic species such as tamarisk and Russian olive; exotics are often primarily in the understory, but may also 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, exotics, or be a more or less equal mixture.

There are other potentially important dimensions or characteristics of southwestern willow flycatcher habitat, including: size, shape, and distribution of vegetation patches; hydrology; prey

types and abundance; parasites; predators; environmental factors (e.g. temperature, humidity); and interspecific competition. Underlying these are factors relating to population dynamics, such as demography (i.e. birth and death rates, age-specific fecundity), the distribution of breeding groups across the landscape, flycatcher dispersal patterns, migration routes, site fidelity, philopatry, and degree of conspecific sociality (e.g. coloniality). Most of these attributes are not well understood for the southwestern willow flycatcher. However, some of these factors may be critical to understanding current population dynamics and habitat use. For example, characterizations of suitable breeding habitat may be significantly biased if observed patterns of habitat use are influenced by intrinsic dispersal patterns and capabilities rather than overall habitat quality.

Ultimately, habitat suitability should be measured in terms of reproductive success and survivorship that result in a positive rate of population growth. Without long term data that correlate or experimentally verify which combination of the above attributes contribute to population growth, habitat descriptions should be viewed broadly and considered descriptors of "suitable survey habitat."

The size and shape of occupied riparian habitat patches vary considerably. Southwestern willow flycatchers have been found nesting in patches as small as 0.8 ha (e.g. Grand Canyon) and as large as several hundred hectares (e.g. Roosevelt Lake, Lake Mead). When viewed from above, the mixed vegetation types in particular often appear as a mosaic of plant species and patch shapes and sizes. In contrast, narrow, linear riparian habitats one or two trees wide do not appear to contain attributes attractive to nesting flycatchers. However, flycatchers have been found using these habitats during migration.

Open water, cienegas, marshy seeps, or saturated soil are typically in the vicinity of flycatcher territories and nests; flycatchers sometimes nest in areas where nesting substrates were in standing water (Maynard 1995, Sferra *et al.* 1995, 1997). However, hydrological conditions at a particular site can vary remarkably here in the arid Southwest 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). However, the total absence of water or visibly saturated soil has been documented at several sites where the river channel has been modified (e.g. creation of pilot channels), where modification of subsurface flows has occurred (e.g. agricultural runoff), or as a result of changes in river channel configuration after flood events (Spencer *et al.* 1996).

Nest placement and nesting substrate

Southwestern willow flycatcher nests are open cup structures, approximately 8 cm high and 8 cm wide (outside dimensions), exclusive of any dangling material at the bottom. Nests are typically placed in the fork of a branch with the nest cup supported by several small-diameter vertical stems. The main branch from which the fork originates may be oriented vertically, horizontally, or at an angle, and stem diameter for the main supporting branch can be as small as three to four cm. Vertical stems supporting the nest cup are typically one to two cm in diameter. Occasionally, southwestern willow flycatchers place their nests at the juncture of stems from

separate plants, sometimes different plant species. Those nests are also characterized by vertically-oriented stems supporting the nest cup. Spencer *et al.* (1996) measured the distance between flycatcher nests and shrub/tree center for 38 nests in monotypic saltcedar and mixed native broadleaf/saltcedar habitats. In monotypic saltcedar stands (n=31), nest placement varied from 0.0 m (center stem of shrub or tree) to 2.5 m. In the mixed riparian habitat (n=7), nest placement varied from 0.0 to 3.3 m.

Nest height relative to the base of nest substrate also varies across the southwestern willow flycatcher's range and may be correlated with height of nest substrate and/or overall canopy height. Table x1 presents data on nest heights in different riparian habitat types across the flycatcher's range. Southwestern willow flycatcher nests have been found as low as 0.6 m above the ground to 14 m above the ground. The data presented in Table x1 demonstrate that flycatchers using predominantly native broadleaf riparian habitats nest relatively low to the ground (between 1.8 m and 2.1 m on average), whereas those using mixed native/exotic and monotypic exotic riparian habitats nest relatively high above the ground (between 4.3 m and 7.4 m on average).

Historic egg/nest collections and species' descriptions from throughout the southwestern willow flycatcher's range confirm the bird's widespread use of willow for nesting (Phillips 1948, Phillips *et al.* 1964, Hubbard 1987, Unitt 1987, T. Huels *in litt.* 1993, San Diego Natural History Museum 1995). Of the 34 nests found by Brown in 1902 near Yuma on the lower Colorado and Gila rivers, 33 were in Goodding's willow and one was in arrowweed. Data from historic egg collections from southern California and more current studies indicate that 75 to 80% of nests were placed in willows (San Diego Natural History Museum 1995).

Currently, southwestern willow flycatchers use a wide variety of plant species for nesting substrates. At the monotypic willow stands that characterize high elevation sites in Arizona, Geyer willow was used almost exclusively for nesting (Muiznieks *et al.* 1994). At the inflow to Lake Mead on the Colorado River, Goodding's willow was the primary nesting substrate (R. McKernan unpubl. data). Along a 20-mile stretch of the Gila River in Grant County, New Mexico, where boxelder is the dominant understory species, 76% of flycatcher nests were placed in boxelder, with the remainder in Russian olive and saltcedar (Skaggs 1995). At the inflows of Tonto Creek and Salt River to Roosevelt Lake in Gila County, Arizona, both of which are comprised of monotypic stands of saltcedar, 100% of flycatcher nests were placed in saltcedar (Muiznieks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996). On the San Luis Rey River in San Diego County, California, approximately 90% of flycatcher nests were placed in live oak (*Quercus agrifolia*), which became the dominant plant species adjacent to the stream after willows were removed in the 1950s as a water conservation measure and a reservoir upstream reduced flood frequency and streamflow volume (W. Haas, San Diego Natural History Museum, pers. comm., 1995). Other plant species that southwestern willow flycatcher nests have been documented in include: buttonbush, black twinberry (*Lonicera involucrata*), Fremont cottonwood, white alder (*Alnus rhombifolia*), blackberry (*rubus ursinus*), Russian olive, and *S. hindsiana*.

Table x1. Nest height and nest substrate height data by riparian habitat type for the southwestern willow flycatcher.

Habitat Type	n	Mean Nest Ht.		Source
		Relative to Base of Nest Substrate [m] ± 1 STD (range)	Substrate Height [m] ± 1 STD (range)	
Monotypic stands of Geyer willow (Apache Co., AZ)	33	1.8 \pm 0.3 (1.0 - 2.3)	4.4 \pm 0.5 (3.5 - 6.0)	Muiznieks <i>et al.</i> (1994), Sferra <i>et al.</i> (1995) Spencer <i>et al.</i> (1996, 1997)
Mixed native broadleaf, predominantly Goodding's willow (Yuma Co., AZ)	28	2.1 \pm 0.8 (1.2 - 4.9)	-	H. Brown 1902 collections (T. Huels <i>in litt.</i>)
Mixed native broadleaf (Kern Co., CA)	134	2.1 \pm 0.1 (0.6 - 10)	5.6 \pm 0.3 (1 - 14)	Whitfield and Strong (1995)
Mixed native broadleaf/saltcedar (throughout AZ)	70	4.8 \pm 1.8 (1.5 - 10.5)	7.4 \pm 2.3 (3.5 - 17.0)	Muiznieks <i>et al.</i> (1994), Sferra <i>et al.</i> (1995) Spencer <i>et al.</i> (1996, 1997)
Mixed native broadleaf/exotic (Grant Co., NM)	45	7.4 \pm 3.6 (2.0 - 14)	12.7 \pm 5.2 (4 - 28)	Skaggs (1995)
Monotypic saltcedar (throughout AZ)	43	4.3 \pm 1.3 (2.7 - 8.0)	7.7 \pm 2.0 (3.4 - 12.0)	Muiznieks <i>et al.</i> (1994), Sferra <i>et al.</i> (1995) Spencer <i>et al.</i> (1996, 1997)

Territory size

Southwestern willow flycatcher territory size, as defined by song locations of territorial birds, probably changes with population density, habitat quality, and nesting stage. Early in the season, territorial flycatchers may move several hundred meters between singing locations (Sogge *et al.* 1995, Petterson and Sogge 1996). It is not known whether these movements represent polyterritorial behavior or active defense of the entire area encompassed by singing locations. However, during incubation and nestling phases territory size, or at least the activity centers of pairs, can be very small and restricted to an area less than one-half hectare. Sogge *et al.* 1995 estimated a breeding territory size of 0.2 ha for a pair of flycatchers occupying a 0.6 ha patch on the Colorado River. Activity centers may expand after young are fledged but while still dependent on adults.

Distribution and abundance

Unitt (1987) noted that taxonomic confusion between *E. trailli* and *E. alnorum* (alder flycatcher) and among other *Empidonax* species that migrate through the southwestern U.S. probably accounted for the relative lack of research on the southwestern willow flycatcher. The alder and willow flycatchers, formerly known as Traill's flycatcher, were not officially recognized as separate species until the American Ornithologist's Union published its sixth edition Checklist of North American Birds (AOU 1983). The lack of systematic, rangewide collections of southwestern willow flycatchers preclude a complete description of this subspecies' former distribution and abundance. However, the more than 600 egg, nest, and specimen records available from museums throughout the U.S. in combination with state, county, and local faunal accounts from the first half of the 20th Century do indicate that, historically, the southwestern willow flycatcher was more widespread and, at least, locally abundant.

Phillips (1948) first described *E.t. extimus* from a specimen collected by Gale Monson on the lower San Pedro River near Feldman, AZ. The taxonomic validity of *E.t. extimus* was subsequently reviewed by Hubbard (1987), Unitt (1987), and Browning (1993), and has been accepted by most authors (e.g., Aldrich 1951, Behle and Higgins 1959, Phillips *et al.* 1964, Oberholser 1974, Monson and Phillips 1981, Harris *et al.* 1987, Schlorff 1990, Harris 1991). Unitt (1987) reviewed historical and contemporary records of *E.t. extimus* throughout its range, determining that it had "declined precipitously..." and that although the data reveal no trend in the past few years, the population is clearly much smaller now than 50 years ago, and no change in the factors responsible for the decline seem likely.

Overall, Unitt (1987) documented the loss of more than 70 breeding locations rangewide, including locations along the periphery and within core drainages that form this subspecies' range. Unitt estimated that, rangewide, the southwestern willow flycatcher population probably was comprised of 500 to 1000 pairs. Below is a state by state comparison of historic and current data for the southwestern willow flycatcher. Since 1992 more than 800 historic and new locations have been surveyed rangewide to document the status of the southwestern willow flycatcher (some sites in southern California have been surveyed since the late 1980s). Survey efforts in most states were done under the auspices of the Partners In Flight program, which served as the coordinating body for survey

training sessions and review and synthesis of data. The extensive and, in some cases, intensive nature of these efforts have provided a critical baseline for the current distribution, abundance, and reproductive success of southwestern willow flycatchers rangewide.

California

The historic range of southwestern willow flycatchers in California apparently included all lowland riparian areas in the southern third of the state. It was considered a common breeder where suitable habitat existed (Wheelock 1912, Willett 1912, 1933, Grinnel and Miller 1944). Unitt (1984, 1987) concluded that it was once common in the Los Angeles basin, the San Bernardino/Riverside area, and San Diego County. Specimen and egg/nest collections confirm its former distribution in all coastal counties from San Diego Co. to San Luis Obispo Co., as well as in the inland counties, Kern, Inyo, Mohave, San Bernardino, and Imperial. Unitt (1987) documented that the flycatcher had been extirpated, or virtually extirpated (i.e., few territories remaining) from the Santa Clara River (Ventura Co.), Los Angeles River (Los Angeles Co.), Santa Ana River (Orange and Riverside counties), San Diego River (San Diego Co.), lower Colorado River (Imperial and Riverside counties and adjacent counties in AZ), Owen's River (Inyo Co.), and the Mohave River (San Bernardino Co.). Its former abundance in California is evident from the 72 egg and nest sets collected in Los Angeles County, alone, between 1890 and 1912, and from Herbert Brown's 34 nests and nine specimens taken in June of 1902 from the lower Colorado river near Yuma. Local collections of this magnitude suggest that this subspecies was locally very abundant.

Survey and monitoring efforts since the late 1980s have confirmed the southwestern willow flycatcher's presence at 18 locations on 11 drainages in southern California (including Colorado River). Current known flycatcher breeding sites are restricted to three counties, San Diego, Riverside, Santa Barbara, and Kern. Combining survey data for all sites surveyed since the late 1980s for a composite population estimate, the total known southwestern willow flycatcher population in southern California is 114 territories (Table x2). Of the 18 sites where flycatchers have been documented, 72% (13) contain five or fewer territorial flycatchers; 22% (four sites) have single pairs, or unmated territorial birds. Only three drainages are known to have 20 or more flycatcher territories, the San Luis Rey River (San Diego Co.), South Fork Kern River (Kern Co.), and Santa Ynez River (Santa Barbara Co.).

Authorized (permitted) and unauthorized activities in riparian habitats continue to adversely affect occupied flycatcher habitat in southern California. For example, approximately one km of occupied habitat on the Santa Ynez River in Santa Barbara County was modified or completely eliminated in 1996 when expansion of agricultural fields resulted in clearing of riparian vegetation (USFWS *in litt.*). Despite the vast potential for riparian habitat and southwestern willow flycatcher recovery on Camp Pendleton in San Diego County, a programmatic section 7 consultation resulted in a conservation target of 20 southwestern willow flycatcher pairs (Table x3). The Base currently has approximately 22 pairs of flycatchers, in contrast to the 348 pairs of the sympatric and endangered least Bell's vireo (*Vireo bellii pusillus*), which through the Base's conservation efforts increased from a low of 27 pairs in 1984. Army Corps of Engineers operations of Lake Isabella (Kern County) will result in long-term inundation of the 485-ha South Fork Wildlife Area, also proposed critical habitat for the flycatcher.

Table x2. Rangewide population status for the southwestern willow flycatcher (based on composite of 1993-1995 survey data and 1996 survey data from lower Colorado River)¹.

	No. of Sites with Territories	No. of Drainages with Territories	No. of Sites (Drainages)			Total No. of Territories
			with ≤5 Territories	with 6-20 Territories	with >20 Territories	
New Mexico	19	8	16 (6)	2 (0)	1 (2)	173
Arizona	39	9	29 (4)	10 (4)	0 (2)	150
California	18	11	13 (8)	3 (1)	2 (3)	114
Colorado	6	5	6 (5)	0 (0)	0 (0)	13
Utah	2	1	2 (1)	0 (0)	0 (0)	2
Nevada	1	1	1 (1)	0 (0)	0 (0)	2
Texas	?	?	?	?	?	?
Total	85	35	67 (24)	15 (4)	3 (7)	454

¹Based on surveys conducted at > 800 historic and new sites in NM (Maynard 1995, Cooper 1996, Skaggs 1996); AZ (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Muiznieks *et al.* 1994, Sogge and Tibbitts 1994, Sferra *et al.* 1995, Sogge 1995a, Sogge *et al.* 1995, Spencer *et al.* 1996, 1997, McKernan *in litt.*); CA (Camp Pendleton 1994, Whitfield 1994, Griffith and Griffith 1995, Holmgren and Collins 1995, Kus 1995, San Diego Natural History Museum 1995, Whitfield and Strong 1995, Griffith and Griffith 1996 *in litt.*); CO (T. Ireland 1994 *in litt.*, Stransky 1995); UT (McDonald *et al.* 1995, Sogge 1995b); NV (C. Tomlinson 1995 *in litt.*). Systematic surveys have not been conducted in Texas. For sites surveyed multiple years, highest single-year estimate of territories was used to tabulate status data. Tabulations do not include documented extirpations within survey period. Thus, individual state estimates and rangewide totals may be biased upward.

Table x3. Agency actions that have undergone section 7 consultation and levels of incidental take permitted for the southwestern willow flycatcher rangewide.

Action	Year	Federal Agency ¹	Incidental Take Anticipated
Arizona			
Eastern Roosevelt Lake Watershed Allotment (Maricopa Co.)	1995*	Tonto NF	Indeterminable
Tonto Creek Riparian Unit (Maricopa Co.)	1995*	Tonto NF	Indeterminable
Cedar Bench Allotment (Yavapai Co.)	1995	Tonto NF	Indeterminable
Tuzigoot Bridge (Yavapai Co.)	1995*	NPS	None
Verde Valley Ranch (Yavapai Co.)	1995*	Corps	Loss of 2 flycatcher territories
Windmill Allotment (Yavapai Co.)	1995	Coconino NF	Loss of 1 flycatcher nest annually
Romero Road Bridge (Pinal Co.)	1995*	FEMA	Consultation in process
Glen Canyon Spike Flow (Coconino Co.)	1996	USBR	Adverse modification of proposed critical habitat
Solomon Bridge (Graham Co.)	1996*	FHWA	Loss of 2 territories
Modified Roosevelt Dam (Gila/Maricopa Co.)	1996*	USBR	Loss of 45 territories; reduced productivity/survivorship 90 birds
U.S. Hwy 93 Wickenburg (Mohave Co.)	1996*	FHWA	Consultation in process
Grazing on 13 Allotments (Pinal Co.)	1996	BLM	Consultation in process
Lower Gila Resource Plan Amend. (Yuma Co.)	1996	BLM	Consultation in process
Lower Colorado River Operations	1996*	USBR	Consultation in process
U.S. Forest Service Region 3 Forest Plans	1996	USFS	Consultation in process
Safford District Grazing Allotments	1996	BLM	Consultation in process
Virgin River Diversion/Fill (Mohave Co.)	1997	EPA	None
California			
Prado Basin, (Riverside/San Bernardino Co.)	1994	Corps	None
Orange County Water District (Orange Co.)	1995	Corps	None
Temescal Wash Bridge (Riverside Co.)	1995	Corps	Harm to 2 flycatchers
Camp Pendleton (San Diego Co.)	1995	DOD	Loss of 4 flycatcher territories
Lake Isabella Operations 1996 (Kern Co.)	1996*	Corps	Inundation 700 ac proposed critical habitat; reduced productivity 14 pairs
Lake Isabella Long-Term Operations (Kern Co.)	1997*	Corps	Consultation in process
Nevada			
Gold Properties Resort (Clark Co.)	1995	BIA	Harm to 1 flycatcher from habitat loss

Table x3 (continued).

Action	Year	Federal Agency ¹	Incidental Take Anticipated
New Mexico			
Corrales Unit, Rio Grande (Bernalillo Co.)	1995	Corps	None
Rio Puerco Resource Area	1996	BLM	Consultation in process
Farmington District Resource Management Plan	1996*	BLM	Consultation in process
Mimbres Resource Area Management Plan	1996*	BLM	Consultation in process

¹ BIA = Bureau of Indian Affairs; BLM = Bureau of Land Management; Corps = Army Corps of Engineers; DOD = Dept. of Defense; EPA = Environmental Protection Agency; FEMA = Federal Emergency Management Agency; FHWA = Federal Highway Administration; NF = National Forest; NPS = National Park Service; USBR = U.S. Bureau of Reclamation; USFS = U.S. Forest Service.

* Original proposed action determined to result in jeopardy to the flycatcher and/or adverse modification of proposed critical habitat.

The Wildlife Area represents a significant recovery area occupied by 8 to 10 pairs of flycatchers prior to inundation and lies downstream of one of California's largest southwestern willow flycatcher breeding groups on the Kern River Preserve.

Arizona

Historic records for Arizona indicate the former range of the southwestern willow flycatcher included portions of all major river systems (Colorado, Salt, Verde, Gila, Santa Cruz, and San Pedro) and major tributaries, such as the Little Colorado River and headwaters, and White River. Unitt (1987) noted that "probably the steepest decline in the population levels of *extimus* has occurred in Arizona." The bird has been extirpated, or virtually extirpated from the Santa Cruz River (Pima Co.), upper San Pedro River (Cochise Co.), lower San Pedro River at PZ Ranch (Pinal Co.), Blue River (Greenlee Co.), Colorado River at Lees Ferry (Coconino Co.), Colorado River (Yuma Co.), Gila River (Yuma Co.), and Verde River at Tuzigoot Bridge (Yavapai Co.). Currently, 150 territories are known from 39 sites along nine drainages statewide, including the Colorado River (Table x2). As in California, the majority of breeding groups in Arizona are extremely small; of the 39 sites where flycatchers have been documented, 74% (29) contain five or fewer territorial flycatchers. Moreover, 15 to 18% of all sites in Arizona are comprised of single, unmated territorial birds.

Permitted activities and stochastic events also continue to adversely affect the distribution and extent of occupied and potential breeding habitat throughout Arizona. For example, the Bureau of Reclamation is operating the new conservation space at Roosevelt Lake, which at capacity would totally inundate the riparian stands occupied by Arizona's largest breeding group (Table x3). As a result of Reclamation's operations on the lower Colorado River, the 445-ha Goodding's willow stand at the inflow to Lake Mead has been partially inundated since September 1995. Despite partial inundation, approximately eight pairs of flycatchers were documented nesting at the inflow during the 1996 breeding season. As of April 1997, inundation of that habitat was nearly complete. Reclamation (1996) projected the mortality of that stand sometime during 1997 as a result of prolonged inundation of root crowns (i.e. > two growing seasons).

In June of 1996, a catastrophic fire destroyed approximately one km of occupied habitat on the San Pedro River in Pinal County. That fire resulted in the forced dispersal or loss of up to 8 pairs of flycatchers (Paxton *et al.* 1996). In June of 1995, approximately three miles of occupied riparian habitat burned on the Gila River in Pinal County (Bureau of Land Management *in litt.*). It is not known how many flycatchers occupied that location. Approximately two km of riparian habitat burned in Graham County in the vicinity of Safford during 1996. It is not known whether that area was occupied by southwestern willow flycatchers, however, it did lie just downstream of an occupied patch that was partially eliminated by Solomon Bridge (Table x3). The anticipated effect of construction of the Solomon Bridge was dispersal of flycatchers into adjacent habitat. The capability of adjacent habitat to absorb that dispersal was compromised by the fire near Safford.

New Mexico

Unitt (1987) considered New Mexico as the state with the greatest number of *extimus* remaining. After reviewing the historic status of the flycatcher and its riparian habitat in New Mexico, Hubbard (1987) concluded,

[it] is virtually inescapable that a decrease has occurred in the population of breeding willow flycatchers in New Mexico over historic time. This is based on the fact that wooded sloughs and similar habitats have been widely eliminated along streams in New Mexico, largely as a result of the activities of man in the area.

Unitt (1987), Hubbard (1987), and more recent survey efforts have documented extirpation or virtual extirpation in New Mexico on the San Juan River (San Juan Co.), near Zuni (McKinley Co.), Blue Water Creek (Cibola Co.), Rio Grande (Dona Ana Co. and Socorro Co.). Survey and monitoring efforts since 1993 have documented 173 flycatcher territories on eight drainages (Table x2). Approximately 135 of these territories occur in remnant strips of riparian forest within a 20-mile stretch of the Gila River in Grant Co (Skaggs 1995). This area contains the largest known breeding group rangewide. In a letter responding to proposed critical habitat for the flycatcher, this part of the Gila River is characterized as being contained by flood-control levees that do not support the regeneration of riparian trees such as willow and cottonwood. Thus, under existing conditions, habitat suitable for the southwestern willow flycatcher is not regenerating (Apker, et al. 1995) and this largest population may be lost as a result. Outside of Grant County few flycatchers remain. Statewide, 84% (16) of the 19 sites with flycatchers contain five or fewer territorial birds. Six sites are comprised of single pairs or unmated territorial flycatchers, and six others are comprised of two pairs or two unmated territorial birds.

Texas

The Pecos and Rio Grande rivers in western Texas are considered the easternmost boundary for the southwestern willow flycatcher. Unitt (1987) found specimens from four locations in Brewster, Hudspeth, and Loving counties where the subspecies is no longer believed to be present. Landowner permission to survey riparian areas on private property has not been obtained, thus current, systematic survey data is not available for Texas. There have been no other recent reports, anecdotal or incidental, of southwestern willow flycatcher breeding attempts in the portion of western Texas where they occurred historically. Given that surveys in adjacent Dona Ana County, New Mexico, have failed to document breeding along historically-occupied portions of the Rio Grande, the Service believes it is likely that the southwestern willow flycatcher has been extirpated from Texas.

Colorado

The taxonomic status and the historic distribution and abundance of willow flycatchers in southwestern Colorado remains unclear due to a lack of specimen data and breeding records.

Preliminary data on song dialects suggests that the few birds recently documented in southwestern Colorado may be *E.t. extimus*. These sightings have prompted State and Federal agencies to delineate provisional boundaries for southwestern willow flycatchers and sponsor statewide survey efforts. Survey efforts since 1993 have documented a total of six locations in Delta, Mesa, and San Miguel counties where southwestern willow flycatchers have been found (Table x2). Two locations have single, unmated males; two locations have single pairs, and the remaining two locations are comprised of four to seven territories each.

On March 9, 1997 a fire started by an adjacent landowner burned a 32-ha portion of the Escalante Wildlife near Delta, Colorado. That location comprised one of the largest known breeding sites for southwestern willow flycatchers in Colorado with approximately seven pairs occupying the site in 1996.

Utah

Specimen data reveal that southwestern willow flycatcher historically occurred in southern Utah along the Colorado River, San Juan River, Kanab Creek, Virgin River, and Santa Clara River (Unitt 1987). Their northern boundary in south-central Utah remains unclear due to a lack of specimen data from that region. The southwestern willow flycatcher no longer occurs along the Colorado River in Glen Canyon where Lake Powell inundated historically-occupied habitat, nor in unflooded portions of Glen Canyon near Lee's Ferry where southwestern willow flycatchers were documented nesting in 1938. Similarly, recent surveys on the Virgin River and tributaries and Kanab Creek have failed to document their presence (McDonald *et al.* 1995). Single, territorial males and possibly a pair of southwestern willow flycatchers were documented at two locations on the San Juan River (San Juan Co.) in 1995, but breeding was not confirmed (Sogge 1995b). The population totals for Utah are summarized in Table x2.

Nevada

Unitt (1987) documented three locations in Clark County from which southwestern willow flycatchers had been collected, but not found after 1970. Current survey efforts have documented a single location with two unmated males on the Virgin River in Clark County (Tomlinson *in litt.*)(Table x2).

Rangewide, the current known population of southwestern willow flycatchers stands at approximately 454 territories (Table x2). These results indicate a critical population status; more than 75% of the locations where flycatchers have been found are comprised of five or fewer territorial birds and up to 20% of the locations are comprised of single, unmated individuals. The distribution of breeding groups is highly fragmented, with groups often separated by considerable distances (e.g., approximately 88 km straight-line distance between breeding flycatchers at Roosevelt Lake, Gila Co., AZ, and the next closest breeding groups known on either the San Pedro River (Pinal Co.) or Verde River (Yavapai Co.)). Additional survey effort, particularly in southern California, may discover additional small breeding groups. However, rangewide survey efforts have yielded positive results in less than 10% of surveyed locations.

Moreover, survey results reveal a consistent pattern rangewide: the southwestern willow flycatcher population as a whole is comprised of extremely small, widely-separated breeding groups or unmated individuals.

The data presented in Table x2 represents a composite of surveys conducted since 1992. Locations that had southwestern willow flycatchers for only one year were tabulated as if the location is still extant. Given that extirpation has been documented at several locations during the survey period, this method of analyses introduces a bias that may overestimate the number of breeding groups and overall population size. In addition, females have been documented singing as frequently as males. Because the established survey method relies on singing birds as the entity defining a territory (Tibbitts *et al.* 1994), double-counting may be another source of sampling error that biases population estimates upward. The figure of 454 southwestern willow flycatcher territories is an approximation based on considerable survey effort, both extensive and intensive. Given sampling errors that may bias population estimates positively or negatively (e.g., incomplete survey effort, double-counting males/females, composite tabulation methodology), natural population fluctuation, and random events, it is likely that the total population of southwestern willow flycatchers is fluctuating at between 300 and 500 territories with a substantial proportion of individuals remaining unmated. If all extant sites were fully protected, at such low population levels random demographic, environmental, and genetic events could lead to extirpation of breeding groups and eventually render this species extinct. The high proportion of unmated individuals documented during recent survey efforts suggests the southwestern willow flycatcher may already be subject to a combination of these factors (e.g., uneven sex ratios, low probability of finding mates in a highly fragmented landscape).

Southwestern willow flycatcher reproductive success

Intensive nest monitoring efforts in California, Arizona, and New Mexico have revealed that: (1) sites with both relatively large and small numbers of pairs have experienced extremely high rates of brood parasitism; (2) high levels of cowbird parasitism in combination with nest loss due to predation have resulted in low reproductive success and, in some cases, population declines; (3) at some sites, levels of cowbird parasitism remain high across years, while at others parasitism varies temporally with cowbirds absent in some years; (4) the probability of a southwestern willow flycatcher successfully fledging its own young from a nest that has been parasitized by cowbirds is low (i.e., < 5%); (5) cowbird parasitism and/or nest loss due to predation often result in reduced fecundity in subsequent nesting attempts, delayed fledging, and reduced survivorship of late-fledged young, and; (6) nest loss due to predation appears more constant from year to year and across sites, generally in the range of 30 to 50%.

On the South Fork Kern River (Kern Co., CA), Whitfield (1993) documented a precipitous decline in the southwestern willow flycatcher breeding population from 1989 to 1993 (44 to 27 pairs). During that same period cowbird parasitism rates between 50 and 80 percent were also documented (Whitfield 1993) (Table x4). A cowbird trapping program initiated in 1993 reduced cowbird parasitism rates to < 20%. Southwestern willow flycatcher population numbers appear to have stabilized at 32 to 34 pairs in 1993, 1994, and 1995 (Whitfield 1994, Whitfield and

Table x4. Nest predation and brood parasitism rates documented for the southwestern willow flycatcher across its range¹.

Location	Pre-1993	1993	1994	1995
S. Fork Kern River (Kern Co., CA)				
% nests parasitized ²	50 - 80	38*	16*	19*
% nests depredated	33 - 42	37	47	34
San Luis Rey River (San Diego Co. CA)				
% nests parasitized	-	-*	0*	0*
% nests depredated	-	-	28	5
Colorado River (Coconino Co., AZ)				
% nests parasitized	≥ 50	100	44	100
% nests depredated	-	30	78	0
Verde River (Yavapai Co., AZ)				
% nests parasitized	-	100	50	extirpated
% nests depredated	-	100	50	
Little Colorado River (Apache Co., AZ)				
% nests parasitized	-	-	22	0
% nests depredated	-	-	33	28
Rio Grande (Socorro Co., NM)				
% nests parasitized	-	-	20	66
% nests depredated	-	-	40	60
Gila River (Grant Co., NM)				
% nests parasitized	-	-	-	16 - 27
% nests depredated	-	-	-	45

¹ Sources: Sogge and Tibbitts (1992), Sogge *et al.* (1993), Brown (1994), Maynard 1994, Muiznieks *et al.* (1994), Sogge and Tibbitts (1994), Cooper (1995), Skaggs (1995), Sogge (1995a), Sogge *et al.* (1995), Spencer *et al.* (1995), Whitfield and Strong (1995).

² Proportion of nests containing at least one brown-headed cowbird egg.

* Brown-headed cowbird control program implemented.

Strong 1995). Predation rates have remained relatively constant in the range of 33 to 47% (Table x4). Southwestern willow flycatcher nest success increased from 26% prior to cowbird trapping to 48% after trapping was implemented (Whitfield and Strong 1995). In addition, the number of young fledged also increased from 1.01 young/pair to 1.73 young/pair during the same period.

Whitfield and Strong (1995) found that, besides lowering nest success, fecundity, and the number of young produced, cowbird parasitism may also lower survivorship of southwestern willow flycatcher young fledged late in the season. Southwestern willow flycatchers that abandon parasitized nests or renest after fledging cowbirds lay fewer eggs in subsequent clutches and, if successful, fledge young late in the season. Whitfield and Strong determined that cowbird parasitism delayed successful southwestern willow flycatcher nesting by at least 13 days and this delay resulted in significantly different return rates of juveniles. Only 6.4% of southwestern willow flycatcher young that came from late nests were recaptured in subsequent years, whereas 21.9% of young that came from early nests were recaptured. If these recapture rates mirror actual survivorship, then even though some parasitized southwestern willow flycatchers eventually fledge their own young, nest loss due to parasitism or depredation may have the more insidious effect of reducing overall juvenile survivorship. Despite the cowbird trapping program and increased reproductive success, Whitfield has not observed a population increase at her study area. Whitfield and Strong (1995) speculate that other factors in addition to cowbird parasitism, such as habitat loss and pesticide use on wintering grounds and/or stochastic events such as storms resulting in mortality, may be keeping population numbers low.

The number of unmated, territorial, and paired southwestern willow flycatchers detected on the Colorado River in the Grand Canyon has remained low since monitoring began in 1982. Brown (1994) reported that at least 50% of the southwestern willow flycatcher nests monitored in the Grand Canyon between 1982 and 1987 were parasitized by brown-headed cowbirds. Brown (1994) did not report data on productivity. Given that the probability of successfully fledging a single chick is low when a nest is parasitized and the high proportion of nests parasitized during Brown's study, it is likely that southwestern willow flycatcher productivity during that period was also low. In 1992, when comprehensive nest monitoring was initiated, two pairs were present, with only one establishing a nest. That nest successfully fledged three chicks (Sogge and Tibbitts 1992).

In 1993, one breeding pair, one male with two females, and six unpaired males were detected. Three nests were found, all of which were parasitized by brown-headed cowbirds (Table x4). No southwestern willow flycatchers were successfully reared in Grand Canyon in 1993 (Sogge *et al.* 1993). Four pairs and one unpaired male occupied Grand Canyon in 1994. Nine nests were attempted, at least four of which were parasitized by cowbirds. All nesting attempts eventually failed due to predation or abandonment (Sogge and Tibbitts 1994). In 1995, one breeding pair and three unpaired males were detected (Sogge *et al.* 1995). One nest was found with a single cowbird egg on May 23. On June 4, three southwestern willow flycatcher eggs were present, but the cowbird egg was missing. That nest successfully fledged one chick. In summary, since 1992, 10 known pairs of southwestern willow flycatchers have made 14 nesting attempts in the Grand Canyon, two of which successfully fledged a total of four chicks. This low

rate of reproduction indicates that, even with the protections provided annually by the National Park Service (i.e., camping and other activities are prohibited at southwestern willow flycatcher breeding sites), this area is a population sink (Pulliam 1988) where reproduction is not adequate to replace adults and population persistence requires emigration from other breeding areas.

On the Verde River in Yavapai Co., AZ, Ohmart (pers. comm.) discovered four pairs of southwestern willow flycatchers in 1992 at Clarkdale. The breeding status and reproductive success of those birds was not determined. In 1993, two pairs were present and one nest was documented. The nest contained a single cowbird nestling and eventually failed (Muiznieks *et al.* 1994) (Table x4). In 1994, two pairs and one unpaired male were present. Two nests were found, one of which successfully fledged two chicks, the other fledged a single cowbird (Sferra *et al.* 1995). Data from a more limited monitoring effort in 1995 indicate that two unpaired males occupied the Clarkdale site (Sogge 1995a). Surveys during the 1996 breeding season failed to detect any southwestern willow flycatchers at the Clarkdale site. However, one nesting pair was discovered at Tavasci Marsh approximately 2.4 km east of the Clarkdale site. Thus, although since its discovery the Clarkdale site has had only several pairs, cowbird parasitism and nest loss due to depredation resulted in poor reproductive success and may have been responsible for abandonment or extirpation at this site.

Elsewhere in Arizona, population loss or undetected dispersal of breeding groups has been documented since 1993. For example, surveys in 1993 estimated five territorial males at Dudleyville Crossing on the San Pedro River (Pinal Co.). However, surveys in 1994 and 1995 failed to detect any southwestern willow flycatchers at that location (Muiznieks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996). Southwestern willow flycatchers detected in 1993 at Soza Wash on the San Pedro River were not detected in follow-up surveys in 1995, and an individual observed at Ister Flat on the Verde River was not detected in follow-up surveys during 1994. It is not known whether these events represent mortality of southwestern willow flycatchers, changes in habitat quality, or simply a vagile tendency inherent to this species. At other locations on the San Pedro River in Pinal Co., such as Cook's Lake and PZ Ranch, southwestern willow flycatcher breeding group size has remained stable. However, in 1996 a catastrophic fire destroyed much of the breeding habitat at PZ Ranch resulting in nest loss, abandonment of that site and, perhaps, mortality of adults (Paxton *et al.* 1996).

On the Little Colorado River in Apache Co., AZ, a cowbird parasitism rate of 22% was documented in 1994 (Table x4). In 1995 the parasitism rate was zero. Nest loss due to depredation, however, remained relatively constant (Table x4). On the Rio Grande in Socorro Co., NM, parasitism rates increased from 20% in 1994 to 66% in 1995. In 1996, water was diverted above that breeding location and no southwestern willow flycatchers were present (D.Leal, pers. comm.). It is not known whether those birds dispersed elsewhere or if that breeding group was extirpated. Finally, on the Gila River in Grant Co., NM, Skaggs (1995) monitored 46 nests from a breeding group of approximately 135 pairs. From a subset of 25 nests whose contents were checked directly or inferred through observation, Skaggs estimated a cowbird parasitism rate of between 16 and 27% for 1995 (Table x4).

The data presented above and in Table x4 demonstrate that cowbird parasitism and nest depredation are affecting southwestern willow flycatchers throughout their range. Cowbirds have been documented at more than 90% of sites surveyed (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Camp Pendleton 1996, Muiznieks *et al.* 1994, Sogge and Tibbitts 1994, T. Ireland 1994 *in litt.*, Whitfield 1994, C. Tomlinson 1995 *in litt.*, Griffith and Griffith 1995, Holmgren and Collins 1995, Kus 1995, Maynard 1995, McDonald *et al.* 1995, Sferra *et al.* 1995, Sogge 1995a, Sogge 1995b, Sogge *et al.* 1995, Cooper 1996, San Diego Natural History Museum 1995, Stransky 1995, Whitfield and Strong 1995, Griffith and Griffith 1996 *in litt.*, Skaggs 1995, Spencer *et al.* 1996). Thus, the potential for cowbirds to be a persistent and widespread threat remains high. Cowbird trapping has been demonstrated to be an effective management strategy for increasing reproductive success for the southwestern willow flycatcher as well as for other endangered Passerines (e.g., least Bell's vireo [*Vireo bellii pusillus*], black-capped vireo [*V. atricapillus*], golden-cheeked warbler [*Dendroica chrysoparia*]). It may also benefit juvenile survivorship by increasing the probability that parents fledge birds early in the season. Expansion of cowbird management programs has the potential to not only increase reproductive output and juvenile survivorship at source populations, but also to potentially convert small, sink populations into breeding groups that contribute to population growth and expansion.

Nest loss due to predation is common among small Passerines. The rates documented for southwestern willow flycatchers are also typical for small Passerines (i.e., rates < 50%). However, even at these "typical" levels nest loss due to predation is a significant factor contributing to low reproductive success. Nest predation presents a difficult management challenge because of the variety of taxa involved and the difficulty in developing an effective management plan for more than one taxon. Until specific predators on southwestern willow flycatcher nests are identified, measures to reduce potential predator populations should focus on reducing human activities that attract predators, such as camping, picnicking, etc. where pets are loose and refuse is concentrated.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions that are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation. Along the Big Sandy River and the Santa Maria River past and present Federal, State, private, and other human activities that may affect the species include livestock grazing, agriculture, mining, water diversions, sand and gravel operations, road and bridge construction, and recreational activities within flycatcher habitat or areas that contain potential flycatcher habitat. To date, no other consultations concerning impacts to the flycatcher have been conducted within the action area.

The Big Sandy and Santa Maria Rivers are part of the Bill Williams watershed which drains "south and west from its origin along the western margin of the Colorado Plateau to enter the Colorado River just upstream" from Parker Dam, Arizona-California (Minckley 1985). The Bill Williams watershed has undergone significant change over the last 125 years as European settlers colonized the area. Livestock grazing, agriculture, and mining, have significantly changed the biotic and abiotic features of the system (Minckley 1985).

Historical data characterizing biological communities prior to the early 1800s are rare. Records from 1853 describe the Big Sandy as being lined by dense riparian vegetation dominated by willows. Swamps resulting from beaver dams were common (Davis 1973). The river alternated between riffles and beds of sand until it neared its confluence with the Bill Williams River where it became a continuous stream of clear water several feet deep (Davis 1973). The Big Sandy has a drainage area of 2,742 mi², of which 10.1 mi² are noncontributing (USGS 1994). The annual mean flow of the Big Sandy River from 1967-1994 was 93.8 cubic feet per second.

The Santa Maria River has a drainage area of 1,129 mi² (USGS 1994). The river is characterized by broad, shallow, sandy-bottomed runs, with few riffles and low gradient. During summer months, surface flow is not sustained and the stream is reduced to a series of disconnected pools (Kepner 1979). The annual mean flow of the Santa Maria was 68.1 cubic feet per second from 1967-1985, 1989-1994.

Currently, the Bill Williams drainage is one of 35 drainages throughout the southwest known to have sites occupied by the southwestern willow flycatcher (Marshall pers. comm). The presence of flycatchers is documented in 6 sites throughout the Bill Williams watershed (Corman et. al. 1996). The first recent documentation of breeding flycatchers along the lower Colorado occurred at the mouth of the Bill Williams where an adult flycatcher was observed feeding a fledgling (Sferra et. al. 1995). Flycatchers have been consistently surveyed at 2 sites between 25 and 45 km downstream of the action area. A total of 15 flycatchers have been surveyed during 9 visits to the lower Santa Maria River near the Date Creek confluence since 1993 (the first year of surveys) and 22 flycatchers have been surveyed during 9 visits to the lower Big Sandy River at Alamo Lake (Mohave County) since 1994, the first year of surveys (Sferra et. al. 1995, Corman et. al. 1996, Spencer et. al. 1996, Muiznieks et. al. 1994).

Within the action area, there have been a total of 3 southwestern willow flycatcher surveys conducted by the Arizona Game and Fish Department. Two flycatcher surveys were conducted at the Big Sandy River crossing at US 93 on June 6 and June 20, 1994. Three flycatchers were detected, 1 of which were observed downstream of the existing bridge and two were observed upstream of the existing bridge. No follow up, project specific surveys were conducted by the action agency in subsequent years. One flycatcher survey was conducted on May 8, 1996 at the Santa Maria River crossing at US 93. There were no flycatchers. In early May, many flycatchers have not completed their migration from central and south America (McCabe 1991). Therefore, this survey was not adequate in determining if the habitat was occupied by flycatchers. Again, no follow up, project specific surveys were conducted by the action agency. A site visit by the Service and Ecoplan Associates on February 21, 1997 revealed apparently suitable habitat

along the Big Sandy River at US 93 and marginal habitat dominated by native willows and cottonwoods along the Santa Maria River at US 93. Livestock grazing occurs at both river crossings. Though habitat along the Santa Maria River has been degraded by livestock grazing which limits willow and cottonwood recruitment, the currently marginal flycatcher habitat may be usable by the time the proposed action is initiated. There are no negative data conforming to standard protocols regarding the presence of flycatchers. Therefore, we assume that the habitat has at least some value to the flycatcher. The Service believes a reasonable likelihood exists that flycatchers may attempt to use the habitat in the Santa Maria bridge area in the next two years. For purposes of this consultation, in the absence of survey data the Service must consider riparian habitat adjacent to both bridge crossings occupied by southwestern willow flycatchers.

EFFECTS OF THE ACTION

Area of Habitat Lost or Modified

The area affected by bridge alignments at the Santa Maria River and Big Sandy River were delineated, based on the plans and available aerial photography, with flagging tape in the field. The habitat types (i.e., cottonwood-willow-saltcedar, mesquite-acacia and bare ground) were defined and delineated in the field. The bare ground category includes the portion of the channel lacking vegetation. The area of each habitat type was measured by pacing. Two replicates were taken and the average is presented herein. The biologist collecting the data calibrated pace measurements with a steel tape before and after measurements were taken.

The existing Burro Creek Bridge and the Kaiser Springs Bridge will be used for northbound traffic and a new bridge will be constructed at each site parallel to the existing bridge. No riparian vegetation is expected to be lost or modified during the construction of either the Burro Creek bridge or the Kaiser Springs Bridge because of their free spanning design (ADOT 1996).

DIRECT AND INDIRECT EFFECTS: Direct effects to the flycatcher include the permanent loss or modification of approximately 1.3 ha (3.2 ac) of riparian habitat. Approximately 0.8 ha (2.0 ac) of riparian vegetation suitable for southwestern willow flycatchers will be lost at the Santa Maria River crossing due to construction of the proposed bridges. The proposed bridges will further fragment the habitat along the Santa Maria River, thus reducing habitat quality and increasing the potential for both nest predation and nest parasitism by brown-headed cowbirds. Riparian habitat in the Southwest is naturally rare and patchy, occurring as widely-separated ribbons of forest in a primarily arid landscape. In Arizona, for example, riparian habitat comprises less than 0.5 percent of the landscape (Strong and Bock 1990). The actual extent of habitat suitable for the southwestern willow flycatchers is more restricted. Wide-ranging or highly mobile species that rely on naturally patchy habitats, such as the flycatcher, persist at regional scales as metapopulations, or local breeding groups that are linked together and maintained over time through immigration and emigration (Pulliam and Dunning 1994). Persistence of local breeding groups is a function of the group's size (numbers of individuals) and the ability of individuals to disperse from one breeding location to another. Fragmentation

reduces the chance of an individual successfully finding suitable habitat by isolating habitat patches. Searching for increasingly isolated patches leaves individuals vulnerable to mortality from starvation or predation and can result in loss of breeding opportunities.

There will also be temporary loss and modification of riparian habitat during removal of the existing bridge at the Santa Maria River crossing; however, the exact area to be disturbed during this process was not included in the BA, and it will be revegetated. At the Big Sandy River, approximately 0.49 ha (1.2 ac) of riparian habitat will be lost at the Big Sandy River crossing during construction of the new southbound bridge. The loss of 1.3 hectares of suitable habitat lies within a riparian matrix of 5.7 ha (14 ac) of other vegetation cover types.

The removal of riparian vegetation within the project area will undoubtedly alter areas used by breeding flycatchers, resulting in reduced productivity and survivorship near both bridge crossings. Habitat loss and fragmentation combine to isolate and reduce in number and size the spaces necessary for breeding, feeding, sheltering, and migrating. Loss and reduction of space to carry out a species' life cycle increases the probability of extinction of local breeding groups, particularly those that consist of few individuals (Pulliam and Dunning 1994). Habitat loss and fragmentation, ultimately, reduce the viability of a metapopulation whole. Ehrlich et al. (1992) document the species or subspecies in North America (excluding Hawaii) that have been extirpated since 1776 as a result of habitat loss, fragmentation, or modification. They include the San Clemente Bewick's wren (*Thryomanes bewickii leucophrys*), Texas Henslow's sparrow (*Ammodramus henslowii houstonensis*), dusky seaside sparrow (*Ammodramus maritimus nigrescens*), Bachman's warbler (*Vermivora bachmanii*), and ivory-billed woodpecker (*Campephilus principalis*).

Along with the previous effects, the widening of U. S. 93 will most likely result in an increase in the speed traveled by vehicles using the highway and possibly an increase in the number of vehicles using the road. The Service anticipates that this will have the long-term effect of reducing overall habitat suitability for the willow flycatcher. Foppen and Reijnen (1994) and Reijnen and Foppen (1994) documented reduced breeding success, lower breeding densities, and higher dispersal rates of willow warblers (*Phylloscopus trochilus*) breeding next to roads that bisect forested habitat. Sogge (1995a) noted that the population decline and changes in the distribution of willow flycatcher territories on the Verde River in Arizona were consistent with other studies documenting adverse effects of roads that bisect habitat. In addition, a willow flycatcher was killed by an automobile on a rural road that bisects willow flycatcher habitat in the White Mountains of Arizona (Sferra et al. 1995). These effects, documented in Arizona and elsewhere, indicate that habitat fragmentation caused by roads have direct effects including mortality and overall changes to habitat suitability that can further reduce the carrying capacity of a particular habitat patches. Along with the previous concerns, the widening of U. S. 93 could result in an increase in the speed traveled by vehicles and possibly an increase in the number of vehicles using the highway, reducing adjacent habitat suitability and increasing hazards to flycatchers. Such effects could result in local extirpation of the flycatcher in the project area.

TIMING: Bridge construction at the Big Sandy River is proposed to occur outside of the flycatcher breeding season which occurs from April 15 to September 1. Construction at the Santa Maria site, however, would involve two flycatcher nesting seasons.

DURATION: The new bridges will permanently render small areas unusable by flycatchers and reduce the value of adjacent habitat to an unknown degree. The presence of the new bridges will remove the possibility of the regeneration of flycatcher habitat at those sites, although compensation habitat adjacent to the project could still be occupiable if it is in sufficient quantity. Duration of the construction at the Santa Maria River would be yearlong and span two flycatcher nesting seasons. Take of birds by vehicles on bridges will be constant but a low-likelihood threat.

EFFECTS OF ADDITIONAL PROJECT FEATURES AND COMPENSATION: FHWA has proposed to compensate for lost habitat as in the project description. Compensation habitat will be quality habitat that we know is suitable for flycatchers and is large enough to sustain a population of flycatchers. Riparian habitat is spatially dynamic. Habitat currently suitable in one site, may be rendered unsuitable by floods while other habitat is created nearby. It is important that the replacement habitat is of sufficient size to ensure that the entire floodplain is protected as channel dynamics and the distribution of riparian habitat change after flooding events. The ratio of habitat lost to that provided should be sufficient to compensate for the fragmentation effects of the project and spatial dynamics of riparian habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of ESA.

It is anticipated that the ongoing private actions described in the environmental baseline will continue in the action area (except in the area acquired as mitigation for loss of riparian habitat). Continued grazing in the riparian areas within the project site coupled with the loss of habitat resulting from the proposed action is expected to continually limit the chances of the successful recruitment of cottonwood and willow seedlings (Flett and Sanders 1987, Schulz and Leininger 1990).

CONCLUSION

The southwestern willow flycatcher's current status is characterized by extremely small, widely-scattered sites containing an estimated five or few territories; many locations contain single, unmated males. The small, fragmented nature of flycatcher populations makes this species vulnerable to stochastic processes alone, and the Service anticipates continued extirpation at sites containing few birds. It is the Service's opinion that continued losses of established breeding sites, or temporary impacts that negatively affect reproduction and survivorship can significantly reduce the reproduction, numbers, and distribution of the southwestern willow flycatcher rangewide. After reviewing the current status of southwestern willow flycatcher, the

environmental baseline for the action area. the effects of the proposed action, including additional project features and compensation, and the cumulative effects, it is the Service's biological opinion that the U. S. 93 Wickenburg-Kingman Highway, Segment 2: Santa Maria River to Wikieup project, as proposed, is not likely to jeopardize the continued existence of the southwestern willow flycatcher. FHWA has incorporated sufficient project features including avoidance, effect minimization, revegetation, and compensation to avoid jeopardy to the species. No critical habitat for this species occurs in the area, so no destruction or adverse modification of critical habitat is anticipated.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and must be implemented by FHWA, so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If FHWA (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

The Service anticipates that incidental take of southwestern willow flycatchers will occur. When habitat is destroyed or habitat regeneration is impeded in willow flycatcher occupied areas, population maintenance and expansion is precluded. Thus, young that return to breed are unlikely to find suitable habitat or find mates. Habitat loss and degradation caused by construction activities is anticipated to result in displacement of adults, reduced productivity, and reduced survivorship of adults and young for the first 2 years after construction on two territories at the Big Sandy River. Harassment and harm of one pair attempting nesting at the Santa Maria bridge area is anticipated, reducing productivity of that pair for two nesting seasons. Vehicles may collide with flycatchers following the riparian corridors of both rivers. The Service estimates that

the probability of collision is very low, thus 1 bird from collision is anticipated to be killed each decade over the life of the project.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the southwestern willow flycatcher.

1. Document flycatcher use and possible take annually beginning prior to construction of the proposed Santa Maria bridge alignment and the proposed southbound bridge across the Big Sandy River and ending two years after construction of each.
2. Protect areas revegetated due to temporary project disturbance.
3. Enhance southwestern willow flycatcher productivity within the project area during the construction period at the Santa Maria River.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, FHWA is responsible for compliance with the following terms and conditions which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary. Implementation of the following terms and conditions may reveal additional information that will help to better define the extent of take and additional measures to reduce it. If that occurs, FHWA may need to request a modification of the opinion from the Service to address this new information.

1) The following terms and conditions will implement reasonable and prudent measure one.

1.1) Southwestern willow flycatcher surveys must be conducted according to the revised protocol (Sogge et al. 1997) at the Santa Maria River and Big Sandy River crossings before the initiation of construction activities and for the first 2 breeding seasons following construction.

1.2) Surveys must be conducted in all habitat patches within 0.5 km of the action area to the extent allowable by any applicable landowners.

1.3) A report summarizing results of surveys will be submitted to the Service and AGFD at the end of each breeding season. This report will also incorporate annual updates on the status of the compensation area(s).

2) The following term and condition implements reasonable and prudent measure two.

2.1) If the disturbed and revegetated area is not part of the compensation area(s), protect the plants from livestock by erecting a fence around the perimeter of the planting area.

3) The following term and condition implements reasonable and prudent measure three.

3.1) For the construction period on the Santa Maria River bridge (two flycatcher breeding seasons), fund a brown-headed cowbird trapping program at one site for two seasons within the project area where success in reducing nest parasitism seems most likely. Trapping need not be yearlong but must precede flycatcher arrival in the spring by a month or more. Trapping protocol, trap design, and other information is available from the Service upon request. The project area, as defined in the project description and the effects section, includes Highway 93 from State Route 89 to Interstate 40 and within the Big Sandy or Santa Maria drainages upstream of Alamo Lake. FHWA may choose to perform the trapping in-house, by contract, or through arrangement with other agencies (such as the Bureau of Reclamation) which have ongoing cowbird trapping programs. The site to be trapped and methodology will be coordinated with the Service and AGFD. Since cowbirds are migratory birds covered by the Migratory Bird Treaty Act, a permit for trapping from the Service's Regional Office is required.

DISPOSITION OF DEAD, INJURED, OR SICK INDIVIDUALS OF A LISTED SPECIES

If a dead, injured, or sick individual of a listed species is found at the project sites, initial notification must be made to Service Law Enforcement, Federal Building, Room 105, 26 North McDonald, Mesa, Arizona, 85201 (Telephone: 602/261-6443) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the finding, a photograph of the animal, and any other pertinent information. The notification shall be sent to Law Enforcement with a copy to the Arizona Ecological Services Field Office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. If possible, the remains shall be placed with educational or research institutions holding appropriate State and Federal permits. If such institutions are not available, the information noted above shall be obtained and the carcass left in place. Arrangements regarding proper disposition of potential museum specimens shall be made with the institution prior to implementation of the action. Injured animals should be transported to a qualified veterinarian by an authorized biologist. Should any treated animals survive, the Service shall be contacted regarding the final disposition of the animals.

To the extent that this statement concludes that take of any threatened or endangered species of migratory bird will result from the agency action for which consultation is being made, the Service will not refer the incidental take of any such migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), or the Bald Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668-668d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

CONSERVATION RECOMMENDATIONS

Section 7 (a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following actions:

1. Fund research with adequate design and sample size to determine types and scales of effects of various aspects of construction projects on southwestern willow flycatchers or surrogate species.
2. In cooperation with the Arizona Game and Fish Department and Service, initiate and maintain a cowbird trapping program in the areas acquired as replacement habitat to reduce brood parasitism of southwestern willow flycatcher nests and other avian species.
3. Participate in the Arizona Partners In Flight Program by conducting presence/absence surveys, in accordance with the southwestern willow flycatcher survey protocol, in suitable flycatcher habitat along both the Santa Maria River and the Big Sandy River for a distance of 10 miles upstream and downstream of U. S. 93.
4. In order to maximize conservation benefits to the Southwestern willow flycatcher, acquire from willing landowners and protect all non-federal perennial reaches upstream and downstream of the Santa Maria and the Big Sandy bridges including all areas within the 100-year floodplain. Protection includes managing the areas in a manner that will enhance reproductive success of flycatchers. This includes the elimination of grazing or holding of livestock (cattle, burros, horses, llamas, etc.) in the 100-year floodplain.
5. Plan future bridge projects that cross southwestern willow flycatcher habitat to avoid the flycatcher breeding season and to avoid take of the flycatcher or loss of its habitat.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation and conference on the action(s) outlined in your request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

Sincerely,



Sam F. Spiller
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (GMA)(ES)
Director, Arizona Game and Fish Department

LITERATURE CITED

- Aldrich, J. 1951. A review of the races of the Traill's flycatcher. *Wilson Bulletin* 63: 192-197
- American Ornithologist's Union. 1983. Checklist of North American Birds. Sixth Edition.
- Arizona Department of Transportation. 1995. Draft Environmental Assessment. TRACS No. 93 MO 124 H2286 01D.
- _____. 1996. Biological Assessment for Endangered, Threatened and Sensitive Species. 12 pp.
- Arizona Game and Fish Department. 1996. Wildlife of special concern in Arizona (Draft). Nongame and Endangered Wildlife Program. Arizona Game and Fish Department, Phoenix, Arizona. 23 pp.
- Behle, W. H., H. G. Higgins. 1959. The birds of Glen Canyon. Pp. 107-133 in *Ecological Studies of Flora and Fauna in Glen Canyon* (A. M. Woodbury, ed.) Univ. Utah Anthropol. Pap. 40 (Glen Canyon Series No. 7).
- Bent, A.C. 1960. Bent's Life Histories of North American Birds. Vol. II, Land Birds. Harper & Brothers, New York. 555 pp.
- Blake, E.R. 1953. *Birds of Mexico*. University of Chicago Press, Chicago, Illinois. 644 pp.
- Brittingham, M.C. and S.A. Temple. 1983. Have cowbirds caused forest songbirds to decline? *BioScience* 33:31-35.
- Brown, B.T. 1988. Breeding Ecology of a Willow Flycatcher Population in Grand Canyon, Arizona. *Western Birds* 19:25-33.
- Browning, M.R. 1993. Comments on the taxonomy of *Empidonax traillii* (willow flycatcher). *Western Birds* 24:241-257.
- California Department of Fish and Game. 1992. State and Federal endangered and threatened animals of California (Revised July 1992). California Department of Fish and Game, Natural Heritage Division, Sacramento, California. 13 pp.
- Corman, T.E., C.E. Paradzick, J.W. Rourke, S.J. Sferra, J.A. Spencer, and MW. Sumner. 1996. Arizona Partners In Flight southwestern willow flycatcher survey 1993-1996 summary report. Draft Technical Report. Nongame and Endangered Wildlife Program. Arizona Game and Fish Department, Phoenix, AZ. 97 pp.

- Davis, G.P., Jr. 1973. Man and wildlife in Arizona: The pre-settlement era, 1823-1864. Master's Thesis. University of Arizona, Tucson. 249 pp.
- Erhlich, P. R., D. S. Dobkin, and D. Wheye. 1992. Birds in jeopardy. The imperiled and extinct birds of the United States and Canada, including Hawaii and Puerto Rico. Stanford University Press, Stanford, California. 259 pp.
- Flett, M. A. and S. D. Sanders. 1987. Ecology of a Sierra Nevada population of willow flycatchers. *Western Birds* vol. 18 no. 1.
- Foppen, R. and R. Reijnen. 1994. The effects of car traffic on breeding bird populations in woodland. II. Breeding dispersal of male willow warblers (*Phylloscopus trochilus*) in relation to the proximity of a highway.; *Journal of Applied Ecology* 31:95-101.
- Gill, F.B. 1990. Ornithology. W.H. Freeman and Company, New York, New York. 660 pp.
- Gorski, L.J. 1969. Traill's Flycatchers of the "fitz-bew" songform wintering in Panama. *The Auk* 86:745-747.
- Griffith, J. T. and J. C. Griffith. 1994. 1994 brown-headed cowbird removal program on Marine Corps Base Camp Pendleton, California.; Final Report October 18, 1994, P. O. NO. M00-681-M4840. Griffith Wildlife Biology, Calumet, Michigan.
- Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. *Pac. Coast Avifauna* 27.
- Harris, J. H. 1991. Effects of Brood Parasitism by Brown-headed Cowbirds on Willow Flycatcher nesting success along the Kern River, California. *Western Birds* 22 (1):13-26.
- Harris, J. H., S. D. Sanders, and M. A. Flett. 1987. Willow Flycatcher surveys in the Sierra Nevada. *Western Birds* 18:27-36.
- Harrison, H.H. 1979. A field guide to western birds' nests of 520 species found breeding in the United States west of the Mississippi River. Houghton Mifflin Company, Boston, Massachusetts. 279 pp.
- Holmegren, M.A. and P.W. Collins. 1995. Distribution, breeding status, and habitat associations of several federal special-status bird species and brown-headed cowbirds at Vandenberg Air Force Base, Santa Barbara County, CA. Environmental Report No. 3. Museum of Systematics and Ecology, Department of Ecology, Evolution, and Marine Biology, University of California, Santa Barbara.
- Howell, S.N.G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press, New York, 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, Sante Fe, New Mexico. 29 pp.
- Hull, T. and D. Parker. 1995. The Gila Valley revisited: 1995 survey results of willow flycatchers found along the Gila River near Gila and Cliff. Grant County, New Mexico. Prepared by Applied Ecosystem Management, Inc. for the Phelps Dodge Corporation. 25 pp.
- Kepner, W. G. 1979. Aquatic inventory of the upper Bill Williams drainage Yavapai and Mohave Counties, Arizona. U. S. Department of the Interior, Bureau of Land Management. Technical Note 352, Phoenix, Arizona. 231 pp.
- King, J.R. 1955. Notes on the life history of Traill's Flycatcher (*Empidonax traillii*) in southeastern Washington. *The Auk* 72:148-173.
- Kus, J. 1995. The status of the least Bell's vireo and southwestern willow flycatcher at Camp Pendleton, California, in 1995. Department of Biology, San Diego State University, San Diego, California.
- Ligon, J.S. 1961. New Mexico Birds and where to find them. The University of New Mexico Press, Albuquerque, New Mexico.
- Mayfield, H. 1977. Brown-headed cowbird: agent of extermination? *American Birds* 31:107-113.
- Maynard, W.R. 1995. Summary of 1994 survey efforts in New Mexico for southwestern willow flycatcher (*Empidonax traillii extimus*). Contract # 94-516-69. New Mexico Department of Game and Fish, Sante Fe, New Mexico. 48 pp.
- McCabe, R.A. 1991. The little green bird: Ecology of the willow flycatcher. Palmer Publications, Inc., Amherst, Wisconsin. 171 pp.
- McDonald, K., J. Snider, L. Peterson, M. Germain, and S. Staats. 1995. Results of 1995 Southwestern willow flycatcher surveys in the Virgin River drainage and southern Utah. Publication No. 95-17.
- McGeen, D.S. 1972. Cowbird-host relationships. *The Auk* 89:360-380.
- Minckley, W.L. 1985. Native fishes and natural aquatic habitats in U. S. Fish and Wildlife Service Region II west of the continental divide. Arizona State University, Tempe, Arizona. 158 pp.
- Monson, G., and A. Phillips. 1981. Revised Checklist of Arizona Birds. University of Arizona Press, Tucson, Az. 240 pp.

- Muiznieks, B.D., T.E. Corman, S.J. Sferra, M.K. Sogge, and T.J. Tibbitts. 1994. Arizona Partners In Flight 1993 southwestern willow flycatcher survey. Technical Report 52. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix, Arizona. 25 pp.
- New Mexico Department of Game and Fish. 1988. Handbook of species endangered in New Mexico. Sante Fe, New Mexico.
- Oberholser, A. C. 1974. Traill's Flycatcher, *Empidonax traillii* (Audubon). The Bird Life of Texas.
- Paxton, E., J. Owen, and M.K. Sogge. 1996. Southwestern willow flycatcher response to catastrophic habitat loss. Colorado Plateau Research Station. U.S. Geological Survey Biological Resources Division. Northern Arizona University, Flagstaff, AZ. 12 pp.
- Peterson, 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, Grand Canyon, AZ, and National Biological Service Colorado Plateau Research Station/Northern Arizona University. 30 pp.
- Peterson, R.T. 1990. A field guide to western birds. 3rd ed. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.
- _____, and E. Chalif. 1973. A field guide to Mexican birds. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.
- Phillips, A.R. 1948. Geographic variation in *Empidonax traillii*. The Auk 65:507-514.
- _____, J. Marshall, and G. Monson. 1964. The birds of Arizona. University of Arizona Press, Tucson, Arizona. 212 pp.
- Pulliam, H.R. 1988. Sources, sinks, and population regulation. *American Naturalist* 132:652-661.
- Pulliam, H. R. and J. B. Dunning. 1994. Demographic processes: Population dynamics on heterogeneous landscapes. Pages 179-208, in G. K. Meffe and C. R. Carroll eds. Principles of Conservation Biology. Sinauer Associates, Inc., Sunderland, Massachusetts.
- Rea, A.M. 1983. Once a river: Bird life and habitat changes on the middle Gila. University of Arizona Press, Tucson.
- Reijnen, R. and R. Foppen. 1994. The effects of car traffic on breeding bird populations in woodland. I. Evidence of reduced habitat quality for willow warblers breeding close to a highway. *Journal of applied Ecology* 31:85-94

- Ridgely, R.S. and G. Tudor. 1994. The Birds of South America: Suboscine Passerines. University of Texas Press. Austin, Texas.
- San Diego Natural History Museum. 1995. *Empidonax traillii extimus* in California. The willow flycatcher workshop. 17 November 1995. 66 pp.
- Sanders, S. D. and Ma. A. Flett. 1989. Ecology of the Sierra Nevada population of willow flycatchers (*Empidonax traillii*), 1986-87. California Department of Fish and Game, Wildlife Management Branch Administrative Report 88-3.
- 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 90-1. 23pp.
- Schulz, T. and W. Leininger. 1990. Differences in riparian vegetation structure between grazed areas and exclosures. Journal of Range Management 43(4).
- Serena, M. 1982. The status and distribution of the willow flycatcher (*Empidonax traillii*) in selected portions of the sierra nevada. Wildlife Management Branch Administrative Report 82-5.
- 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.
- Skaggs, R.W. (1996). Population size, breeding biology, and habitat of willow flycatchers in the Cliff-Gila Valley, New Mexico 1995. Final Report. New Mexico Department of Game and Fish. 38 pp.
- Sogge, M.K. 1995a. 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, Flagstaff, Arizona. 20 pp.
- _____. 1995b. Southwestern willow flycatcher surveys along the San Juan River, 1994 - 1995. Final report to the Bureau of Land Management, San Juan Resource Area. National Biological Service Colorado Plateau Research Station/Northern Arizona University, Flagstaff, Arizona. 27 pp.
- _____. 1995c. Southwestern willow flycatchers in the Grand Canyon. Pages 89-91, In E.T. LaRoe, G.S. Farris, C.E. Puckett, P.D. Doran, and M.J. Mac eds. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. Department of the Interior, National Biological Service, Washington, DC.

- _____ 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. National Park Service Cooperative Park Studies Unit/Northern Arizona University, Flagstaff, Arizona. 43 pp.
- _____. 1994. Distribution and status of the southwestern willow flycatcher along the Colorado river in the Grand Canyon - 1994. Summary Report. National Biological Survey Colorado Plateau Research Station/Northern Arizona University, Flagstaff, Arizona. 37 pp.
- _____ 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., Flagstaff, Arizona. 69 pp.
- _____, C. van Riper III, and T.J. 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.
- 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 97, March 1996. Arizona Game and Fish Department, Phoenix, Arizona. 69 pp.
- Stafford, M. D. and B. E. Valentine. 1985. A preliminary report on the biology of the willow flycatcher in the central Sierra Nevada. Cal-Neva Wildlife Transactions 1985: 66-77.
- Stiles, F.G. and A.F. Skutch. 1989. A guide to the birds of Costa Rica. Comstock, Ithaca, New York. 364 pp.
- Strong, T. R. and C. E. Bock. 1990. Bird species distribution patterns in riparian habitats in southesastern Arizona. The Condor 92:866-885.
- Tibbitts, T. J., M. K. Sogge, and S. J. Sferra. 1994. A survey protocol for the southwestern willow flycatcher (*Empidonax traillii extimus*). Technical Report NPS/NAUCPRS/NRTR-94/04. National Park Service Colorado Plateau Research Station, Flagstaff, Arizona. 24 pp.
- U.S. Geological Survey. 1994. Water Resources Data, Arizona, Water Year 1994. USGS Water-Data Report AZ-94-1.
- U. S. Fish and Wildlife Service. 1989. Notice of review: Animal candidate review for listing as endangered or threatened species. Federal Register 54:554.

- _____. 1993. Notice of 12-month petition finding/proposal to list *Empidonax traillii extimus* as an endangered species, and to designate critical habitat. Federal Register 58:39495-39522.
- _____. 1995. Final rule determining endangered status for the southwestern willow flycatcher. Federal Register 60:10694-10715.
- Unitt, P. 1984. The birds of Sand Diego County. San Diego Soc. Nat. Hist. Memoir 13.
- _____. 1987. *Empidonax traillii extimus*: An endangered subspecies. Western Birds 18:137-162.
- Walkinshaw, L.H. 1966. Summer biology of Traill's flycatcher. Wilson Bulletin 78:31-46.
- Wheelock, I.G. 1912. Birds of California: An introduction to more than three hundred common birds of the state and adjacent islands. A.C. McClurg and Company, Chicago, Illinois.
- Whitfield, M.J. 1990. Willow flycatcher reproductive response to brown-headed cowbird parasitism. Masters Thesis, California State University, Chico, California State University, Chico, California.
- _____. 1993. Brown-headed cowbird control program and monitoring for willow flycatchers, South Fork Kern River, California. Draft report to California Department of Fish and Game, Contract #FG 2285., Weldon, California. 11 pp.
- _____. 1994. A brown-headed cowbird control program and monitoring for the southwestern willow flycatcher, South Fork Kern River, California, 1994. Prepared for the California Department of Fish and Game. Kern River Research Center, Weldon, California. 12 pp.
- _____. 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.
- Willard, F.C. 1912. A week afield in southern Arizona. The Condor 14:53-63.
- Willett, G. 1912. Birds of the Pacific slope of southern Clifornia. Pac. Coast Avifauna 21.
- _____. 1933. A revised list of the birds of southwestern Claifornia. Pac. Coast Avifauna 21.

