

SOUTHWESTERN WILLOW FLYCATCHER 2001 SURVEY AND NEST MONITORING REPORT

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Technical Report 191
Nongame and Endangered Wildlife Program
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2221 West Greenway Road
Phoenix, Arizona 85023-4399
March 2002

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Smith, A.B., C.E. Paradzick, A.A. Woodward, P.E.T. Dockens, and T.D. McCarthy. 2002. Southwestern willow flycatcher 2001 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 191. Arizona Game and Fish Department, Phoenix, Arizona.

ACKNOWLEDGMENTS

The 2001 survey was made possible through cooperation fostered by Arizona Partners in Flight. We thank all cooperating agencies, organizations, and landowners granting survey permission including: Arizona State Parks, ASARCO, BHP, Caithness Ranch, City of Cottonwood, City of Kearny, City of Scottsdale, Colorado River Indian Tribes, Philip DeNormandie, EEC Inc., Fort Yuma Tribe, Hualapai Tribe, Hope Jones, Jutta Kerne, Raymond and Lupe Leybas, Eva Lopez, Joe and Priscilla Morales, Don Morrow, The Nature Conservancy, Keith and Patricia Newman, Jeff Parker, Pima County Flood Control, Mary Ramirez, Alonzo and Minnie Ross, San Bernardino County Museum, Eric and Jean Schwennesen, Hobart Sharp, Mack and Carole Skeen, John and Mary Lou Smith, Warren Sonberg, SWCA Environmental Consultants, U.S. Bureau of Land Management, U.S. Bureau of Reclamation, U.S. National Park Service, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey Forest and Rangeland Ecosystem Science Center, Colorado Plateau Field Station at Northern Arizona University, and Glenn Wilt.

We thank all the cooperators and surveyors for the 2001 field season. Without their efforts, this report would not have been possible; Michael Addison, Janie Agyagos, Greg Beatty, Delia Berrouard, Damon Bowen, P. Brown, Bill Burger, Jorge Canaca, Scott Carroll, Max Castillo, Jean-Paul Charpentier, Kerry Christensen, Gregory Clune, Joshua Cochran, Lyn Crew, Scott Crozier, Russell Duncan, Neil Economy, S. Faulk, Tom Furgason, Pat Golden, Fiona Goodson, Cavetta Green, Sondra Grimm, Casey Hayes, Jeff Hedland, Mike Herder, Tom Hildebrandt, Joe Kahl, Joanne Kirchner, Diane Laush, Luara Lutz, T. Magarian, J. MacDonald, Bryce Marshall, Robert McKernan, Lisa Meister, Aaron Miller, G. Monks, Mimi Murov, M. Nolen, Shannon O'Connor, Teresa Olson, Sam Parsons, Lin Piest, Line Plourde, Barbara Raulston, M. Romich, Mike Ross, Beth Sabine, Erin Schuldheis, Susan Sferra, Teresa Shaffer, Albert Sillas, P. Shannon, Mark Sogge, Mike Sumner, John Swett, J. Tress, B. Twedt, Doug VanGosick, Russell Waldron, Paul Walema, Rick Ward, Todd Willard, Craig Woods, Brian Wooldridge, and Helen Yard.

The Arizona Game and Fish Department 2001 willow flycatcher crew's dedicated and conscientious effort was essential in completing the fieldwork and bringing the report data together. First, we are grateful to Danielle Gryskiewicz for her dedicated field supervision at the Winkelman Study Area. Thanks to Rick Alford, Tina Baker, Darren Bolen, Scott Durst, Rebecca Ekstein, Dan Evans, Jon Green, Heather Jaramillo, Marie-France Julien, Ben Keeler, John

Koloszar, Erik Kreitmeir, Todd Martin, Melanie Pilon, Stephanie Roberts, Meghan Rowe, Jean Schwennesen, Willie Sommers, Joelle Viau, and Micah White for a great field season.

We thank Darren Bolen for his effort in preparation of this report. We appreciate Susan Sferra, Henry Messing, Greg Beatty, Mark Sogge, and Eben Paxton for valuable advice. We thank Eben Paxton and Greg Beatty for assisting in training sessions. We appreciate Suzanne Cardinal, Phil Heavin, Kerry Kenwood, Tawna Morgan, and Patti Newell for information on bird and nest locations and cooperation throughout the field season. We appreciate the information for sites along the lower Colorado River from Robert McKernan. We thank John Wilson and Lin Piest for their help conducting surveys and nest monitoring at Alamo Lake. We thank Neil Gamble of ASARCO for property information along the Gila River. We appreciate Ben Clingan for his valuable assistance with access to ASARCO property. Thanks to Terry Myers, Vicente Ordoñez, and Linda WhiteTrifaro for assistance with Apache-Sitgreaves National Forest sites. We thank Jason Ekstein and Dave Harris of The Nature Conservancy for providing hospitality and facilities at the San Pedro River Preserve, Craig Woods and the Tonto National Forest for providing facilities at Roosevelt Lake, and Brian Crawford at Sipe White Mountain Wildlife Area. We thank Meghan Rowe for the drawing used on the cover.

PROJECT FUNDING

Funding for this project was provided by: voluntary contributions to Arizona's Nongame Wildlife Check-off; the Arizona Game and Fish Department's Heritage Fund (including Grant-in-Aid I93036); Project W-95-M under the Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act); Project E5 Job 27, under Section VI of the Endangered Species Act; Apache-Sitgreaves National Forest (Cooperative Agreement 0301-93-049); Bureau of Land Management (Cooperative Agreement A950-A2-0006); and the U.S. Bureau of Reclamation (Cooperative Agreement 98-FC-32-0050).

EXECUTIVE SUMMARY

Purpose. The southwestern willow flycatcher was federally listed as endangered in 1995. Probable factors contributing to population declines are: loss, alteration, and fragmentation of native riparian breeding habitat; loss of wintering habitat; nest predation; and brood parasitism by brown-headed cowbirds. Prompted by concern for population declines, statewide surveys for the southwestern willow flycatcher were initiated in 1993. Information was gathered in a standardized, systematic, interagency approach to provide a basis for management recommendations. Results of the 2001 survey and nest monitoring effort are summarized in this report.

Surveys, Detections, and Distribution. The Arizona Game and Fish Department (AGFD) and other cooperators spent 3289 hours surveying 177 sites covering approximately 225 linear km of riparian habitat. Surveyors detected 635 resident willow flycatchers at 46 sites. They located 346 flycatcher territories, in which 311 paired flycatchers were documented at 42 sites. Willow flycatchers were documented along 11 drainages. The major concentrations in low elevations (<1115 m) occurred in the Winkelman Study Area, (near the confluence of the Gila and San Pedro rivers), Roosevelt Lake (Salt River and Tonto Creek study areas), Alamo Lake, Gila River (near Pima), Big Sandy River, Topock Marsh, and lower Grand Canyon (river miles 246 to 272). Two high-elevation (>2400 m) sites with flycatchers were documented: 1 on the Little Colorado River (Greer River Reservoir) and 1 on the San Francisco River (Alpine Horse Pasture).

Nesting Attempts and Nest Success. Statewide surveyors documented 426 willow flycatcher nesting attempts at 40 sites throughout Arizona. Outcomes (success or failure) were determined for 305 nests within AGFD (Alamo Lake, Greer/Alpine, Roosevelt Lake, and Winkelman Study Area) and other cooperators' (Monkey's Head and Topock Marsh) nest monitoring study sites. Of these, 191 were successful (62%).

In AGFD study areas, Mayfield nest success was 65%. We estimated that 472 willow flycatcher young fledged from 183 successful nests. Eighty-two nests were depredated, 10 deserted, 6 parasitized, 2 failed due to weather, 2 failed due to other causes, and 12 infertile clutches were documented. Statewide, 17 flycatcher nests were parasitized; 15 were in nest monitoring sites. Brown-headed cowbirds were documented at all but 1 site where willow flycatcher nests or fledglings were observed. Cowbird trapping was conducted at 8 willow flycatcher breeding sites.

Video Nest Monitoring. Time-lapse video cameras were placed at 7 willow flycatcher nests to record nest predators and parasitism. Outcomes were recorded for 6 of these nests; 2 nests fledged young and 4 were depredated, 2 by Cooper's hawks and 1 each by a western screech owl and a common kingsnake. One camera was removed after set-up because the female did not return to the nest. However, once the camera was removed, the female returned and attended the nest.

Nesting Habitat Characterization. Tamarisk was the predominant nesting substrate (323 nests). Nests were also found in willow (79 nests), and cottonwood (2 nests). Mean nest height was 5.27 m (s = \pm 1.64; n = 185) at the Winkelman Study Area and 4.14 m (s = \pm 1.38; n = 161) at Roosevelt Lake Study Area.

Management/Recommendations. The highest conservation priority is protection of occupied habitat through partnerships with land management agencies and private landowners. Second highest is survey of potential areas of occurrence. Extensive surveys have been performed since 1993 to identify flycatcher populations, yet little or no survey data exist for some riparian areas where potentially suitable habitat exists. These areas must be identified and surveys implemented and coordinated through state, federal, Native American, and private partnerships.

Knowledge of habitat relationships and their influence on reproductive success must be a primary component of recovery, conservation, and management strategies. Only through detailed demographic research, surveys, nest monitoring, vegetation sampling, and habitat measurements can these relationships be described. Sharing of data will be needed to identify similarities and differences between local population characteristics. Conservation and recovery of the willow flycatcher is not only dependent on federal and state agency direction, but also on cooperation and support of private landowners, Native American nations and non-governmental organizations. Recovery goals should include the protection, restoration, and maintenance of riparian ecosystem integrity.

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Southwestern Willow Flycatcher 2001 Survey and Nest Monitoring Report

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INTRODUCTION

The willow flycatcher (*Empidonax traillii*) is a widely distributed summer resident of much of the United States and southern Canada (Brown 1988). The 4 (or 5) subspecies of willow flycatchers recognized in North America (Fig. 1) are distinguished from each other by subtle differences in color and morphology and breeding range (Phillips 1948, Aldrich 1953, Hubbard 1987, Unitt 1987, Browning 1993). The current breeding range of the southwestern willow flycatcher (*E.t. extimus*) includes Arizona, southern California, New Mexico, southern Nevada, southern Utah, and southwestern Colorado. There are only a few probable breeding records for extreme northwestern Mexico (Unitt 1987, Wilbur 1987).

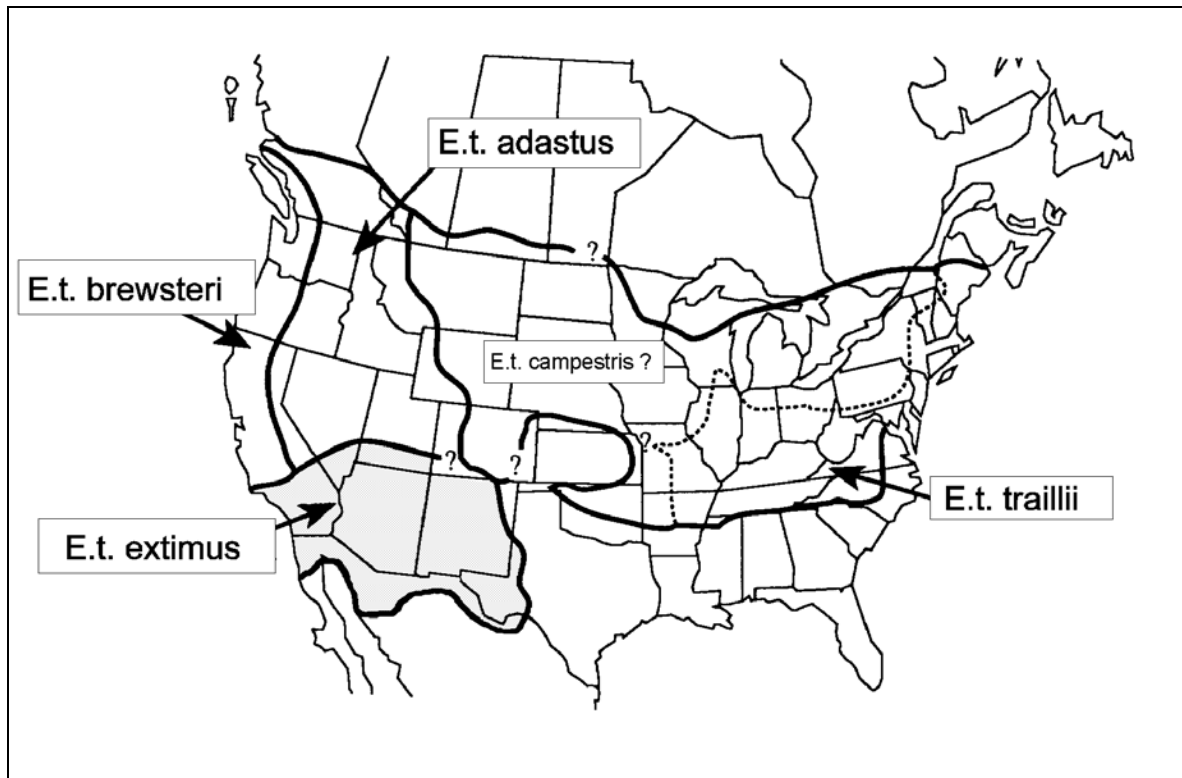


Figure 1. Distribution of willow flycatcher subspecies. Adapted from Unitt (1987) and Browning (1993).

The southwestern willow flycatcher is a riparian obligate breeder, restricted to dense, mesic vegetation. Concern over declining populations and degradation of native riparian habitat prompted Arizona Partners in Flight, an interagency program dedicated to conserving land birds, and AGFD, as the coordinating agency, to initiate statewide willow flycatcher surveys in 1993 (Muiznieks and others 1994). At that time, the primary objective was to survey suitable and/or historical riparian and wetland habitat, using standardized methods, to determine status of the flycatcher in Arizona. As a result of that survey effort, collection of habitat and nest productivity information was identified as important. In 1994, statewide surveys continued, but few breeding sites were documented and most of these were composed of 5 or fewer territories.

In 1995, the southwestern willow flycatcher was federally listed as endangered (the events leading to listing and designation of critical habitat are described in U.S. Fish and Wildlife Service 1991, 1992, 1993, 1995, 1996, and 1997). The flycatcher is also included in the AGFD list, *Wildlife of Special Concern in Arizona* (in prep). AGFD began an intensive nest monitoring effort to locate and monitor nests at 4 of the large breeding areas (Alamo Lake Study Area, Tonto Creek and Salt River study areas (Roosevelt Lake), and Winkelman Study Area) to collect detailed local population estimates and nest productivity data. During this time we also increased effort at the Greer/Alpine Study Area to locate active nests. This effort has continued through 2001.

This document serves as the AGFD summary report on 2001 activities. It also contains summaries of related work by cooperators, which falls into 2 categories: 1) the intensive effort to systematically search riparian habitat to record the presence of willow flycatchers in Arizona (surveys); and, 2) the intensive effort at a few select breeding areas to estimate nest success and productivity, and to record vegetation characteristics at some or all of the nests (monitoring).

Specifically, the 2001 AGFD objectives were as follows:

1. Coordinate survey and monitoring efforts with agency and private cooperators.
2. Survey habitat at Alamo Lake. Survey sites along the Little Colorado and San Francisco in the Greer/Alpine Study Area. Survey suitable and potentially suitable habitat within 40 km of occupied habitat at Roosevelt Lake. Survey suitable and potentially suitable habitat (where land owner permission was obtained) on the San Pedro River from Redington to its confluence with the Gila River and from Dripping Springs Wash upstream of Winkelman to 3 km downstream to the Florence-Kelvin Highway Bridge along the Gila River (Winkelman Study Area).
3. Monitor nests to determine nest success and productivity at 5 breeding areas: Alamo Lake, the Winkelman Study Area, Tonto Creek and Salt River study areas (Roosevelt Lake), and Greer/Alpine.
4. Band willow flycatchers at the Winkelman Study Area to allow for determination of female fecundity.
5. Record and report color-band information to U.S. Geological Survey Forest and Rangeland Ecosystem Science Center, Colorado Plateau Field Station at Northern Arizona University (CPFS), U.S. Bureau of Reclamation (USBR), and U.S. Fish and Wildlife Service (USFWS).

6. Document the presence or absence of brown-headed cowbirds (*Molothrus ater*) at survey sites and determine impacts of cowbird parasitism on nest success.
7. Characterize vegetation at nest sites.
8. Document predation and parasitism events using remote video cameras at Winkelman Study Area.
9. Compile statewide data into an annual report.
10. Incorporate survey, monitoring, and geographical data into a comprehensive statewide database.
11. Develop management recommendations for the southwestern willow flycatcher.

As noted above, this report includes only the 2001 survey and monitoring data. More in-depth discussions on willow flycatcher natural history, demography, and associated threats can be found in Aldrich (1953), Barlow and McGillivray 1983), Flett and Sanders. Susan D. 1987), Brown (1988), Whitfield 1990), Sedgwick and Knopf 1992), Sferra and others 1995), Sogge and others 1995), USFWS (1995), Whitfield and Strong 1995), Paxton and Sogge 1996), Paxton and others 1996), Petterson and Sogge 1996), Skaggs 1996), Spencer and others 1996), Whitfield and Enos 1996), Braden and others 1997), Paxton and others (1997), Sferra and others (1997), Sogge and others 1997), SWCA, Inc., Environmental Consultants 1997), McCarthey and others 1998), McKernan and Braden 1998), McKernan and Braden 19989), and Paradzick and others (1999, 2000, and 2001). Our work complements that of CPFS (see Paxton and Sogge 1996, Langridge and Sogge 1997, Netter and others 1998, English and others 1999, Luff and others 2000, Kenwood and Paxton 2001), and other ongoing research projects.

METHODS

STATEWIDE SURVEYS

Prior to the breeding season, AGFD contacted cooperators and asked them to identify statewide survey sites (reaches of riparian habitat) that they intended to survey. We compiled this information and worked to coordinate surveys with agencies and organizations to limit overlap of areas. Additionally, we conducted a willow flycatcher training workshop in May, which all new surveyors were required to attend to receive a federal permit.

Surveys were to be performed according to established protocol (Sogge and others 1997). During surveys, the sites were designated by agency and private cooperators in the field on 7.5 minute topographical maps. At a minimum, 1 tape-playback survey was to be performed at each site in each of the following 3 periods: 15 May to 31 May, 1 June to 21 June, and 22 June to 10 July. Surveys had to be performed at least 6 days apart, from 1 hour prior to sunrise to 10:00 while birds were most active.

Willow flycatchers were considered territorial (or resident within a site) if they were detected between 15 June and 25 July, regardless of whether a possible or known mate was observed. Additionally, birds were considered territorial if observations of nesting activity or nests were found outside these dates. Willow flycatchers documented prior to 15 June, but not detected in

subsequent visits or the last survey period, were considered migrants. Birds detected after 25 July were also considered migrants. An “unknown” designation was given to birds if follow-up surveys were not completed according to protocol or if not enough information was available to determine resident or migrant status. AGFD and other cooperators with nest monitoring permits, performed intensive nest searches when willow flycatcher pairs were documented.

Willow flycatcher survey data was recorded on a standardized form (Appendix A) and returned to AGFD and USFWS. To keep site designations and reporting consistent in future years, all sites were geographically defined using a set of start and stop Universal Transverse Mercator coordinates in the AGFD database. This information was then compiled and entered into the Nongame and Endangered Wildlife Program Willow Flycatcher Database and electronically transferred to the Willow Flycatcher Information Management System. Willow flycatcher detection information was also entered into AGFD Heritage Data Management System.

AGFD SURVEY TECHNIQUES

All AGFD surveys were conducted according to established survey protocol (Sogge and others 1997). Additionally, when flycatchers were detected, repeat visits were conducted until pair status was confirmed. For resident adult willow flycatchers at AGFD sites, we assumed that pairs were monogamous, unless evidence from color-banded individuals indicated that polygyny was occurring. When time permitted, AGFD surveyors conducted nest searches and nest checks to document breeding activity.

AGFD NEST MONITORING TECHNIQUES

Nest monitoring methods applied by AGFD followed the Southwestern Willow Flycatcher Nest Monitoring Protocol (Rourke Draftand others 1999), a modification of the Breeding Biology Research and Monitoring Database (BBIRD) field protocol (Martin and others 1997). Nest searches were conducted from mid-May through August. Nests were primarily located by watching adults return to a nest or by systematically searching suspected nest sites. Nests were monitored every 2 to 4 days. During incubation, nest contents were observed directly using a mirror pole or miniature video camera. After hatching, the nestling number was also confirmed using these direct techniques. Once confirmed, nests were observed from a distance to reduce the risk of nest predation and the possibility of premature fledging of nestlings. If activity was not observed at a previously active nest, the nest was checked directly to identify nest contents and a search of the general area was conducted to locate possible fledglings.

We considered a nest successful if any of 4 conditions were documented: 1) one or more young were confirmed visually fledging from the nest or located near the nest; 2) adults were seen feeding fledglings; 3) parents behaved as if dependent young were nearby when the nest was empty (that is defensive behavior and/or adults agitated near the nest); or, 4) nestlings were observed in the nest within 2 days of the estimated fledge date. This assumption is based on observations by AGFD personnel of southwestern willow flycatchers fledging at 10 days of age.

This assumption might cause nest success calculations to be overestimated, however, excluding these nests may cause underestimation.

We considered a nest to have failed if any of 6 outcomes were documented: 1) the nest was found empty or destroyed more than 2 days prior to the estimated fledge date (depredated); 2) the nest fledged no willow flycatcher young but contained cowbird eggs or young (parasitized); 3) the nest was deserted with eggs remaining (deserted); 4) the nest was abandoned prior to egg laying (abandoned); 5) the nest was destroyed due to weather (weather); or, 6) the entire clutch of eggs was determined to be infertile when the female incubated for an excess of 20 days (infertile).

The method for selecting nest monitoring areas within the Roosevelt Lake and Winkelman Study areas changed in 2001. From 1995 – 2000, we monitored all flycatcher nests at a select number of sites within each area; these sites were designated as nest monitoring sites in the Roosevelt Lake Biological Opinion (USFWS 1996). In 2001, we selected females to monitor from all sites within the study areas, not just designated monitoring sites within each study area. The number of females selected per patch was a represented sample of the population located within the patch. All nests were monitored until color bands were either confirmed or the females selected were banded. At this time we concentrated effort on nests of the selected females, however additional nests were monitored as time permitted. Females were monitored for the entire breeding season, which allowed us to calculate individual female seasonal fecundity, a better indicator of population nest success and productivity (Pease and Grzybowski 1995, Thompson and others 2001). These changes in monitoring techniques must be accounted for when making comparisons with previous years. For example, the number of fledglings per study area cannot be compared directly without taking into account the number of nests monitored in that area.

AGFD NEST MONITORING STUDY AREAS

Four low-elevation (<1115 m) and 1 high-elevation (>2400 m) study areas were surveyed and monitored during 2001. These sites were located at: Alamo Lake, Roosevelt Lake (Salt River and Tonto Creek inflows), Winkelman Study Area, and Greer/Alpine.

Alamo Lake Study Area

Alamo Lake sites were located near the confluence of the Big Sandy, Bill Williams, and Santa Maria rivers in west-central Arizona at an elevation of approximately 350 m. Surveys were conducted on the Santa Maria River from the confluence with the Big Sandy River to 3 km upstream of this confluence. Big Sandy River surveys were conducted from the confluence with the Santa Maria River to approximately 1.6 km upstream of Whiterock. The Big Sandy and Santa Maria rivers form the headwaters of the Bill Williams River; from their confluence all riparian habitat was surveyed downstream to Alamo Lake. This area, Brown's Crossing, was also the focus of our nest monitoring efforts. The vegetation included associations of coyote willow (*Salix exigua*), Fremont cottonwood (*Populus fremontii*), Goodding willow (*S. gooddingii*), seep-willow (*Baccharis glutinosa*), and tamarisk (*Tamarisk* sp.). Patch height varied from 3 m to 10 m.

Roosevelt Lake Area

Roosevelt Lake Area included the Salt River and Tonto Creek inflows to the lake at approximately 640 m in elevation; both areas occurred on Tonto National Forest. Riparian habitat was surrounded by upland Sonoran desert as described by Brown (1994). Surveys were conducted within 40 km of the Salt River and Tonto Creek inflows; only suitable or potentially suitable habitat was surveyed.

Salt River Study Area. The Salt River Inflow study area has expanded in recent years as willow flycatchers were found in areas closer to the lake. Vegetation varied from monotypic tamarisk to nearly monotypic Goodding willow at one site. Patch height varied from 4 m to 10 m. The Salt River was perennial during the breeding season.

Tonto Creek Study Area. The Tonto Creek Inflow to Roosevelt Lake contained numerous patches of riparian habitat. Vegetation varied among patches and composition included a tamarisk-dominated understory with a patchy Fremont cottonwood and/or Goodding willow overstory. However, stands of monotypic tamarisk occurred in some areas. Patch height varied from 4 m to 12 m. This stretch of Tonto Creek flowed throughout the breeding season.

Winkelman Study Area

We surveyed and conducted nest monitoring along 68 km of suitable or potentially suitable riparian habitat (where landowner access was granted) on the San Pedro River from Redington downstream to the confluence with the Gila River; and from Dripping Springs Wash, upstream of Winkelman, to 3 km downstream of the Florence-Kelvin Highway Bridge along the Gila River. Elevation ranged from 695 m at Redington to 549 m at the Florence-Kelvin Highway Bridge. Riparian forests along this reach varied from monotypic tamarisk to stands of native Goodding willow and Fremont cottonwood. Patch height varied from 4 m to 15 m. Riparian habitat was surrounded by upland Sonoran desert as described by Brown (1994).

Greer/Alpine Study Area

Sites were located either on the Little Colorado or on San Francisco where suitable or potentially suitable high-elevation willow habitat existed. Vegetation at these sites was composed mainly of Geyer willow (*Salix geyeriana*) or Bebb willow (*S. bebbiana*) patches, interspersed with mountain alder (*Alnus tenuifolia*). Patch height varied from 4 m to 5 m. Open meadow and ponderosa pine (*Pinus ponderosa*) forest characterized the surrounding area for all high-elevation sites.

COOPERATOR NEST MONITORING

The San Bernardino County Museum monitored nests at Monkey's Head along the Bill Williams River and Topock Marsh along the lower Colorado River (for monitoring methods see McKernan and Braden 1999). Methods for nest monitoring by cooperators sometimes differed from AGFD protocol (Rourke and others 1999), making comparisons difficult; therefore, only outcomes for cooperator monitoring data are included.

COLOR BANDING

AGFD personnel color banded willow flycatchers at the Winkelman Study Area while CPFS conducted banding at Roosevelt. AGFD coordinated closely with CPFS to resight previously banded birds and locate unbanded adults and nestlings, which could be uniquely color banded. For more information regarding the banding methods used and results of the CPFS project, see Kenwood and Paxton (2001).

VIDEO NEST MONITORING SYSTEM

Time-lapse video monitoring systems were used at selected willow flycatcher nests to identify nest predators at AGFD study areas. Equipment included a weatherproof camera (6 x 3 x 3 cm) and a VHS variable time-lapse video recorder (housed in a weatherproof case). The camera was attached to an adjacent tree at nest height, approximately 0.5 m from the nest. Modifications were made to the camera system to better camouflage it and to reduce possible nest abandonment. The video recorder was placed at least 10 m away to limit disturbance at the nest site while changing videotapes. Power was supplied by a 12-volt deep-cycle marine battery, which required replacement every 24 - 36 hours, or was continually charged by solar panels in the field. Infrared light-emitting diodes in the camera housing allowed activity to be recorded at night. A small video monitor, attached to the video recorder, allowed field workers to ensure proper camera placement and to monitor the nest while replacing the videotape and battery. Video footage was recorded at 20 frames per second, which allowed documentation of predation events and cataloging of behavior, but decreased frequency of tape replacement.

Cameras were placed at selected nests within the Winkelman Study Area. Nests that were at least 6 days into incubation or contained nestlings younger than 7 days old were considered for possible camera placement. The former limited the chance for abandonment, whereas the latter maximized video footage and reduced the possibility of force-fledging young. We further selected nests that met 3 requirements: 1) nest height was less than 5 m; 2) the density of vegetation around the nest allowed for minimal disturbance during camera placement; and, 3) the vegetation at nest height would not be disturbed by the camera and allow an unobstructed image. Although these restrictions bias results, they reduce disturbance to nesting flycatchers. If the female did not return to the nest within 1.5 hours of placement, the camera was removed and the nest was subsequently monitored to determine outcome.

COWBIRD TRAPPING

Cowbird trapping was coordinated and conducted by cooperators. Traps were placed at 9 sites within 4 study areas: Alamo Lake Study Area (Brown's Crossing), Greer/Alpine Study Area (Alpine Horse Pasture and Greer River Reservoir), Salt River Study Area (Lake Shore), and Winkelman Study Area (CB Crossing SE, Cook's Lake, Dudleyville Crossing, Indian Hills, and Kearny). These traps may have an effect on other breeding sites within close proximity to the trap site. Information regarding trapping can be obtained by contacting the respective agency:

Apache-Sitgreaves National Forest (Alpine Horse Pasture and Greer River Reservoir), Tonto National Forest (Lake Shore at Roosevelt Lake), USBR Phoenix Office (CB Crossing SE, Cooks Lake, Dudleyville Crossing, Indian Hills, and Kearny), and USBR Boulder City Nevada Office, (Alamo Lake-Brown's Crossing).

HABITAT CHARACTERISTICS

Vegetation at occupied willow flycatcher sites can be classified into 4 general types (Sogge and others 1997): 1) high-elevation Geyer willow, 2) low-elevation native broadleaf dominated (that is commonly willow and cottonwood), 3) low-elevation mixed native broadleaf and exotic tamarisk, and 4) low-elevation monotypic tamarisk.

General habitat characteristics (such as vegetation type, canopy height, and presence of water) were visually estimated and recorded on survey forms for all survey sites. AGFD personnel also measured habitat variables at nest sites; descriptive statistics were calculated where applicable.

RESULTS

SURVEYS, DETECTIONS, AND DISTRIBUTION

One hundred seventy-seven sites were surveyed covering approximately 225 linear km of riparian habitat (Table 1; Appendixes B, C). Sites ranged from 30 m to 2683 m in elevation and 0.03 km to 16.1 km in length. Fifty-two of the 177 sites were not surveyed according to protocol. This was due to time, funding limitations, or because unsuitable flycatcher habitat was found during the first survey. Twenty sites had not been surveyed previously; most new sites were located along the Colorado (9 sites) and Gila rivers (4 sites).

Six hundred thirty-five resident willow flycatchers were documented within 346 territories at 46 sites (Table 1; Appendixes B, C). AGFD personnel and statewide cooperators recorded 311 pairs. The male to female ratio was not 1:1 at all sites, since polygynous and unpaired birds were found at some sites. Also in some instances, insufficient survey effort and other factors may have precluded the documentation of pairs.

Table 1. Willow flycatcher survey effort, detection, and nesting attempt totals in Arizona, 2001.	
Survey hours	3289
Sites surveyed	177
Linear km of habitat covered	225
Sites with resident willow flycatchers	46
Sites with documented pairs	42
Sites with documented breeding	40
Resident willow flycatchers	635
Territories	346
Pairs	311
Nesting attempts	426
Sites with cowbirds detected	141
Breeding sites with cowbirds detected	38

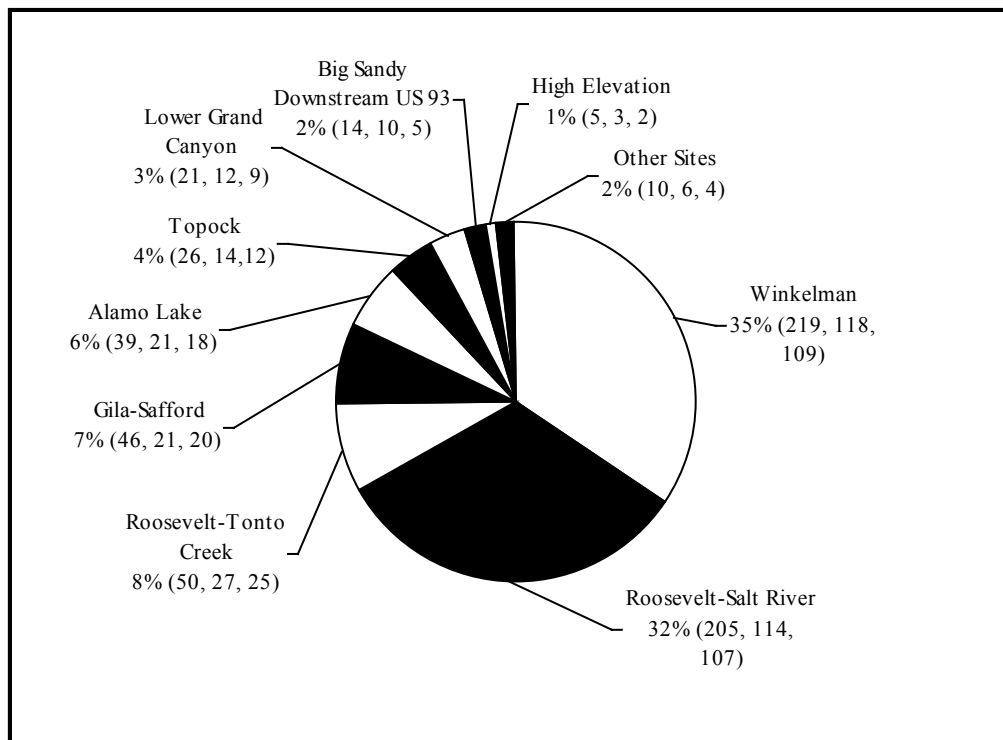


Figure 2. Southwestern willow flycatcher distribution in Arizona, 2001. Survey location, percent of willow flycatchers (number of resident willow flycatchers, number of territories, number of pairs). Proportions are based on total number of willow flycatchers (see table 2 for sites within each survey location).

Flycatchers were documented along 11 drainages. The greatest concentrations of willow flycatchers in Arizona were found at Roosevelt Lake, with 40% (Salt River 32% and Tonto Creek 8%) and Winkelman Study Area, with 35% (Fig. 2; Table 2). Resident willow flycatchers were detected for the first time at 5 sites that had been surveyed at least once in previous years: Catalina Wash, Cienega Creek, GRN009, Littlefield, and Miles 262.5 to 259.5 L GC. Cowbirds were documented at 141 sites including all but 2 of the flycatcher breeding sites, Fort Thomas-Geronimo and Lower Santa Maria River (Appendix C).

Table 2. Sites with willow flycatchers grouped by survey locations in Arizona, 2001 (see Fig. 2).

Winkelman Study Area	Roosevelt Lake		Lower Grand Canyon	Gila-Safford Area	Alamo Lake	Greer / Alpine	4 Other Sites
	Tonto Creek	Salt River					
<ul style="list-style-type: none"> ▶ GRN018 ▶ GRS018 ▶ Kearny ▶ GRS012 ▶ GRS011 ▶ GRN010 ▶ GRN009 ▶ GRS007 ▶ GRN004 ▶ CB Crossing Southeast ▶ Dudleyville Crossing ▶ Malpais Hill ▶ Cook's Lake Cienega/Seep ▶ Aravaipa Inflow North ▶ San Pedro/Aravaipa Confluence ▶ Aravaipa Inflow South ▶ Wheatfields ▶ Bingham Cienega ▶ Catalina Wash 	<ul style="list-style-type: none"> ▶ A-Cross Road South ▶ Tonto Creek Inflow ▶ Orange Peel 	<ul style="list-style-type: none"> ▶ Lake Shore ▶ School House Point South ▶ School House Point North ▶ Salt River Inflow 	Miles: <ul style="list-style-type: none"> ▶ 272-268 R GC ▶ 268-265 L GC ▶ 263.5-262.5 L GC ▶ 262.5-259.5 L GC ▶ 259.5 R GC ▶ 246.0 L GC 	<ul style="list-style-type: none"> ▶ Fort Thomas-Geronimo ▶ Pima East 	<ul style="list-style-type: none"> ▶ Lower Big Sandy River ▶ Alamo Lake-Brown's Crossing ▶ Lower Santa Maria River 	<ul style="list-style-type: none"> ▶ River Reservoir ▶ Alpine Horse Pasture 	<ul style="list-style-type: none"> ▶ Cienega Creek ▶ Duncan ▶ Littlefield ▶ Miles 51.5-50.5 L GC ▶ Monkey's Head

Migrant flycatchers were detected at 46 sites (Appendix C), 14 of which also had resident birds. Thirty-two flycatchers of unknown status were documented, 24 were at Pima East with the rest at Big Sandy River Downstream of US 93 - 2, Cascabel (San Pedro River), and Lower Big Sandy River.

Topock Marsh (lower Colorado River) (140 m) was the lowest elevation where territorial pairs and nesting was documented. Greer River Reservoir (2500 m) was the highest elevation where nesting was documented. However, resident flycatchers were not detected between 1350 m and 2400 m. Resident willow flycatchers were detected at only 2 high-elevation sites: Alpine Horse Pasture (2 flycatchers, 1 territory) and Greer River Reservoir (3 flycatchers, 2 territories).

NEST MONITORING

Statewide Effort

We documented 426 nesting attempts statewide at 40 sites (Appendix C). Of these, 329 were monitored; 191 (58%) fledged young, 114 (35%) failed, and 24 (7%) had unknown outcomes (Table 3). Predation was the major cause of nest failure (Table 4). The earliest willow flycatcher egg laying events were documented on 21 May at Dudleyville and San Pedro/Aravaipa Confluence. The first hatching date was 5 June at San Pedro/Aravaipa Confluence. The first flycatcher fledged on 20 June at Aravaipa Inflow North. The last documented fledging events occurred on 24 August at GRN018 and San Pedro/Aravaipa Confluence.

Table 3. Willow flycatcher nest monitoring results in Arizona, 2001.								
Site		Pairs ^a	Nests	Successful nests	Failed nests	Unknown outcome ^b	Parasitized nests ^c	
High Elevation ^d		2	2	2	0	0	0	
Low Elevation ^f	Roosevelt Lake	Tonto Creek	24	33	24	9	0	2
		Salt River ^e	56	80	43	17	20	0
		Total	80	113	67	26	20	2
	Winkelman Study Area ^e		99	170	100	69	1	7
	Alamo Lake ^e		14	24	14	7	3	0
	Topock Marsh		12	15	5	10	0	4
	Monkey's Head		2	5	3	2	0	2
	Total (all low-elevation sites)		207	327	189	114	24	15
All sites		209	329	191	114	24	15	

^a Number of pairs contributing to the number of monitored nests.

^b Nests monitored only for a portion of nesting cycle, were given unknown outcome.

^c Includes all parasitized nests, those that both fledged willow flycatcher young or failed.

^d Nests above 2400 m.

^e Cowbird trapping occurred in the area during the breeding season.

^f Nests below 1115 m.

Table 4. Causes of nest failure for willow flycatchers at monitoring areas in Arizona, 2001.

Site		Depredated ^a	Deserted	Parasitized ^b	Infertile clutches	Weather	Other	
High Elevation ^c		0	0	0	0	0	0	
Low Elevation ^e	Roosevelt Lake	Tonto Creek	6	0	1	2	0	0
		Salt River ^d	15	0	0	1	0	1
		Total	21	0	1	3	0	1
	Winkelman Study Area ^d		52	8	1	8	0	0
	Alamo Lake ^d		4	1	0	0	2	0
	Topock Marsh		5	0	3	1	0	1
	Monkey's Head		0	1	1	0	0	0
	Total (all low-elevation sites)		82	10	6	12	2	2
All sites		82	10	6	12	2	2	

^a Includes 3 parasitized nests that were later depredated.

^b Includes only those nests that failed directly due to cowbird parasitism (nests subsequently abandoned or fledged only cowbird young).

^c Nests above 2400 m.

^d Cowbird trapping occurred in the area during the breeding season.

^e Nests below 1115 m

Parasitism

Fifteen nests were parasitized at nest monitoring areas (Tables 3, 5). One nest was abandoned due to cowbirds and is included in the parasitism totals in Tables 3, 4, and 5. Cowbirds may have caused, or contributed to, abandonment at other nests but direct evidence was not found. Nest parasitism was greatest at Monkey's Head (40%: 2 of 5 nests).

Table 5. Outcomes for parasitized willow flycatcher nests at monitoring areas in Arizona, 2001.

Outcome	Number of nests
Abandoned	1
Infertile	1
Depredated	4
Fledged both WIFL ^a and BHCO ^b young	3
Fledged only BCHO young	5
Fledged WIFL only	1
Total parasitized nests	15

^a WIFL = Willow flycatcher

^b BHCO = Brown-headed cowbird

AGFD Study Areas

Nest Success

Mayfield (1961, 1975) nest success for all AGFD nests combined was 65% (Table 6). A total of 108 renests was documented, including 10 within the same nest cup. We documented a female renesting in a nest cup from a previous year (Salt River Study Area). We also documented a color-banded female that nested in a different female's nest cup within this breeding season (Winkelman Study Area). Forty-three renests were initiated after a successful nest (double-brood attempt), 25 of which were successful (1 at Alamo, 6 at Roosevelt Lake, and 18 at Winkelman Study Area). Eight out of 15 third nesting attempts were successful, whereas the only fourth nesting attempt failed.

Nest Productivity

Four hundred seventy-two young fledged from 183 nests at AGFD study areas (Table 6). This does not include fledglings detected in 5 territories where no nest was found. Sixty-seven percent of young fledged were visually confirmed after leaving the nest. Mean clutch size (includes only complete clutches) was 2.88 (n = 309 nests).

Table 6. Willow flycatcher nest success and productivity of monitored nests at AGFD study areas in Arizona, 2001.						
Site		Mayfield nest success (No. of observation days)	Number of young fledged (n)	Mean number of young fledged per nest (n) ^a	Mean number young fledged per successful nests (n) ^a	
High Elevation ^{b,c}		100 (39)	4 (2)	2.00 (2)	2.00 (2)	
Low Elevation ^d	Roosevelt Lake	Tonto Creek	71.56 (744)	57 (33)	1.73 (33)	2.38 (24)
		Salt River ^c	75.23 (1651)	120 (60)	2.00 (60)	2.79 (43)
		Total	74.07 (2395)	177 (93)	1.90 (93)	2.64 (64)
	Winkelman Study Area ^c	58.38 (3560)	254 (169)	1.50 (169)	2.54 (100)	
	Alamo ^c	66.48 (475)	37 (21)	1.76 (21)	2.64 (67)	
	Total (all low elevation sites)	64.42 (6430)	468 (283)	1.65 (283)	2.59 (181)	
All sites		64.59 (6469)	472 (285)	1.66 (285)	2.58 (183)	

^a Nests that were parasitized but fledged an unknown number of young were excluded from the analysis.

^b Nests above 2400 m.

^c Cowbird trapping occurred in the area during the breeding season.

^d Nests below 1115 m.

Female Productivity

Eighty-nine females were followed through all of their nesting attempts (140) to determine female productivity at AGFD study areas. Average seasonal fecundity was 2.42; the average seasonal productivity was 1.76 (Table 7). Eighteen females failed to successfully fledge any young. Fifty-two percent had one nesting attempt (Table 8). Fifty-one renests were documented. Of these, there were 6 third nesting attempts and 1 fourth nesting attempt. Fifteen renests were initiated after a successful nest (double brood attempt); 10 of which were successful (5 at Roosevelt Lake and 5 at Winkelman Study Area).

Table 7. Female productivity at AGFD study areas, 2001.

Site		No. of females	Nests	Average seasonal fecundity ^a	Average seasonal prod. ^b	Double brood attempts	Percent double brood success (number successful)
Roosevelt Lake	Tonto Creek ^c	14	20	2.50	1.82	3	100.00 (3)
	Salt River	41	55	2.35	1.96	4	50.00 (2)
	Total ^c	55	75	2.39	1.93	7	71.43 (5)
Winkelman Study Area ^c		35	65	2.40	1.50	8	62.50 (5)
All Sites		89	140	2.42	1.76	15	66.67 (10)

^a Mean fledges per female

^b Mean fledges per nesting attempt per female

^c Includes 1 female that nested at Tonto Creek then nested at Winkelman

Table 8. Renesting attempts at AGFD study areas, 2001.

Site		No. of females	Percent of females with 1 nest (No. of females)	Percent of females with 2 nests (No. of females)	Percent of females with 3 nests (No. of females)	Percent of females with 4 nests (No. of females)
Roosevelt Lake	Tonto Creek	13	61.5 (8)	30.8 (4)	7.7 (1)	0
	Salt River	41	65.9 (27)	34.2 (14)	0	0
	Total	54	64.8 (35)	33.3 (18)	1.9 (1)	0
Winkelman Study Area		34	34.3 (12)	48.6 (17)	14.3 (5)	2.9 (1)
All Sites		89 ^a	51.7 (46) ^a	40.4 (36) ^a	6.7 (6)	1.1 (1)

^a Totals include 1 female that nested at Tonto Creek then nested at Winkelman and is not reflected in the site totals

COLOR BANDING

In 2001, we banded 17 flycatchers at the Winkelman Study Area to aid in our nest monitoring efforts (Table 9). Three were recaptures that had only a USFWS band, and unique color bands were added. For banding results at Roosevelt Lake see Kenwood and Paxton (2001).

Table 9. AGFD banding effort at the Winkelman Study Area, 2001. (D = Blue, G = Green, K = Black, O = Orange, R = Red, V= Violet, W= White, X = Silver, and Y = Yellow)

Site	Date banded	USFWS band number	Color band left leg	Color band right leg
Aravaipa North	05/23/01	2210-84001	D	YV
Aravaipa North	05/26/01	2240-84004	D	VG
Aravaipa North	05/26/01	2240-84003	D	DR
Aravaipa North ^a	05/29/01	1710-20363	WW	X
Aravaipa North	06/07/01	2240-84010	D	YK
Aravaipa North	06/07/01	2240-84009	WO	D
Aravaipa North ^a	06/18/01	1710-20543	DR	X
Dudleyville Crossing	05/25/01	2240-84002	D	OO
Dudleyville Crossing	06/08/01	2240-84011	WK	D
Aravaipa Inflow	05/28/01	2240-84005	D	WO
Aravaipa Inflow	05/28/01	2240-84006	VK	D
Aravaipa Inflow	05/28/01	2240-84007	GW	D
Aravaipa Inflow ^a	06/22/01	1710-20545	GY	X
Aravaipa Inflow	06/22/01	2240-84013	D	DO
GRS012	05/30/01	2240-84008	OG	D
GRS012	06/10/01	2240-84012	D	WV
CB Crossing SE	06/24/01	2240-84014	KO	D
CB Crossing SE	06/24/01	2240-84015	WY	D
Aravaipa South	07/04/01	2240-84016	D	KO

^a Recaptures where only color bands were added

VIDEO NEST MONITORING

We placed time-lapse video cameras at 7 willow flycatcher nests to record nesting behavior, predation, and parasitism. Approximately 2186 hours of video footage were recorded. Nest outcomes were recorded for 6 of the nests (Table 10). One female did not return to the nest after camera placement. However, the female resumed attending the nest after the camera was removed. Two nests were recorded fledging young. Four predation events were documented (at 4 nests): 2 by Cooper's hawks (*Accipiter cooperii*), 1 by a western screech-owl (*Otus kennicottii*), and 1 by a common kingsnake (*Lampropeltis getulus*).

Table 10. Willow flycatcher nest video camera results, 2001.

Site	Site habitat type	Nest outcome, Video date	Set-up date, Video ending date	Comments
Aravaipa Confluence	Mixed Riparian	Depredated 06/30/01	06/17/01 07/01/01	Cooper's hawk depredated 3 nestlings (9 days old).
Aravaipa Confluence	Mixed Riparian	Depredated 06/14/01	06/13/01 06/15/01	Western screech-owl depredated one egg (2 eggs and 1 nestling depredated prior to camera setup).
Aravaipa Confluence	Mixed Riparian	Depredated 6/26/01	06/13/01 07/01/01	Cooper's hawk depredated 3 nestlings (12 days old).
Aravaipa Confluence	Mixed Riparian	Fledged 08/04/01	07/16/01 08/07/01	Fledged 1 young.
Aravaipa Confluence	Mixed Riparian	Camera removed	07/18/01 07/18/01	Female did not return to nest, camera removed, female returned. The nest was later depredated.
GRS 12	Mixed Riparian	Depredated 08/12/01	07/28/01 08/12/01	Common kingsnake depredated 3 Wifl nestlings and 1 cowbird nestling (Nestlings 11 days old).
CB Crossing SE	Mixed Riparian	Fledged 06/30/01	06/15/01 07/01/01	Fledged 3 young.

HABITAT CHARACTERISTICS

Although vegetation composition varied, most sites where willow flycatchers were documented shared landscape characteristics. Occupied sites were in broad floodplains, where dense riparian habitat existed and where water (or saturated soil) was present at least early in the breeding season. In Arizona, these broad riparian areas occur frequently below 1115 m and above 2400 m.

Many sites within this mid-elevation band (1115–2400 m) were surveyed, but resident flycatchers were not detected. Vegetation at these elevations was often in narrow drainages with high-gradient streams prone to frequent scouring by flood. The vegetation occurs in narrow linear bands, often dominated by Arizona sycamore (*Platanus wrightii*) plant communities.

Most nesting sites (29 of the 38) were characterized as mixed native/exotic associations. However, the amount of tamarisk varied within and between sites. Four nesting sites (GRN018, GRS007, GRS018, and Wheatfields) were composed of dense monotypic stands of tamarisk, forming a nearly continuous closed canopy. Three sites (Cienega Creek, Lake Shore, and Pima East) were classified as native broadleaf dominated and 2 sites (Alpine Horse Pasture and Greer River Reservoir) were classified as high-elevation Geyer willow habitat.

Tamarisk was the primary nesting substrate at low-elevation nesting sites (Table 11). Geyer willow was the only substrate at high elevations. Mean nest heights at Roosevelt Lake and Winkelman study areas were 4.14 m ($s = \pm 1.38$; $n = 161$) and 5.27 m ($s = \pm 1.64$; $n = 185$), respectively (Appendix C).

Table 11. Tree species used for willow flycatcher nesting in Arizona, 2001.				
	<i>Populus fremontii</i>	<i>Salix geyeriana</i>	<i>Salix gooddingii</i>	<i>Tamarisk</i> spp.
No. of nests	2	2	77	323

DISCUSSION

SURVEYS

Annual statewide surveys provide critical information concerning the distribution and abundance of willow flycatchers in Arizona. This data allows agency resource managers, private organizations, and the public to make data driven decisions regarding present and future research and conservation efforts. Results from the 2001 breeding season were similar to those in 2000; most areas occupied in 2000 had similar abundance reports in 2001, with 76% of the flycatchers concentrated within two areas of the state (Roosevelt Lake and Winkelman). However, there were 4 areas that differed noticeably from previous years and there has been an increase in the statewide flycatcher population from 1993 – 2001.

Although birds had been reported breeding near Camp Verde each year from 1993 – 2000, these sites were not surveyed in 2001. We expect that birds still occurred there in 2001 since no significant impacts to habitat were known to have occurred from 2000 – 2001. Over the last 4 years the number of territories declined from 10 to 5. Due to concern over the decline of flycatchers, these sites should be surveyed in future years to determine their status and identify protection and recovery actions.

On the Gila River near Safford, surveyors documented 21 territories and an additional 24 unknown status birds (surveyors were unable to return to the site to confirm residency status) in 2001. These territories were documented at 2 sites. From 1993 – 2000 flycatchers have been detected at 7 additional sites between Fort Thomas to San Jose. This reach of river may contain a substantial concentration of flycatchers, but thorough surveys are needed to accurately determine distribution and abundance.

Resident flycatchers were documented in 2 drainages for the first time since protocol surveys began. Areas within these drainages have been surveyed annually from 1993 – 2000 (Paradzick and others 2000). Cooperators detected a resident flycatcher along the Virgin River, where no historical occurrence record exists in Arizona (Phillips and others 1964, Unitt 1987). Similarly, surveyors documented breeding flycatchers at Cienega Creek, a tributary of the Santa Cruz River, where Phillips and others (1964) reported the flycatcher absent by 1964. These colonizations yield evidence of habitat restoration potential along the Santa Cruz and Virgin rivers that can aid in recovery of the flycatcher.

Since 1993, surveyors have documented an increase of territorial flycatchers in Arizona (Fig. 3). This increase can be largely explained by: 1) a significant increase in survey effort to locate occupied habitat in 1996 – 1997, followed by 2) an intensive survey and nest monitoring effort at 3 areas in the state to closely monitor populations, and 3) a significant increase of territories at Roosevelt Lake. During the 1996 and 1997 breeding seasons, large projects were initiated by AGFD, CPFS, and USBR at Roosevelt Lake and Winkelman, and SBCM along the Colorado River (McKernan and Braden 1998); these, coupled with other ongoing statewide surveys, identified major concentrations of flycatchers.

Survey coverage and effort has varied from year to year. From 1997 – 2001, at Roosevelt Lake and in the Winkelman Study Area, AGFD identified sites with unsuitable flycatcher breeding habitat and removed them from survey routes in subsequent years. The most pronounced reduction in survey area was along the Gila and San Pedro rivers, which accounted for approximately 70% of the decline in survey km from 1999 – 2001 (Fig. 3). This change of effort culminated in a modification of our research methods in 2001. We conducted protocol surveys to locate occupied sites, but then intensively nest searched and monitored occupied sites to determine abundance. While we continued to determine flycatcher abundance through monitoring, this modification caused survey hours to decline between 2000 and 2001 (Fig. 3). The large spike in survey hours in 1999 was due to additional AGFD surveys along the Gila River west of Phoenix and along the Santa Cruz River and an increase of survey hours reported by SBCM for sites along the Colorado River.

From 1997 – 2001, the population of flycatchers at Roosevelt Lake has increased more than in other parts of the state. Surveyors documented a statewide increase of 156 territories, 102 occurred at Roosevelt Lake. Much of the increase occurred in the Salt River delta of the reservoir. Riparian habitat has reestablished as reservoir levels have receded exposing floodplain sediments suitable for willow and tamarisk germination and growth. AGFD and CPFS through surveys, nest monitoring, and color banding, have tracked the increase of population and the colonization of these newer habitats.

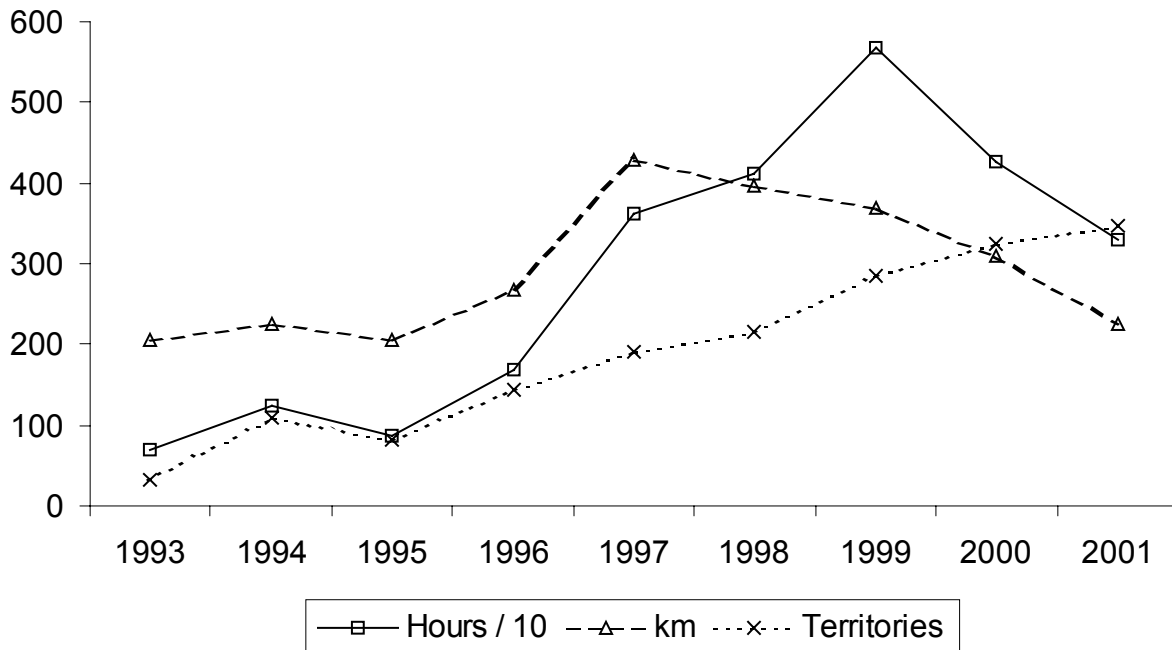


Figure 3. Southwestern willow flycatcher annual survey results (number of survey hours divided by 10, survey km, territories) in Arizona, 1993 – 2001.

NEST MONITORING

In 1995, AGFD began monitoring nests to record and evaluate factors affecting nest success and document habitat attributes influencing productivity. Since 1995, we have recorded differences in annual estimates of nest success and productivity. The 2001 field season either equaled or surpassed productivity estimates for the study areas since 1995. Mayfield nest success was the highest ever recorded (75%, 58%) at our 2 largest study areas (Salt River Study Area and Winkelman Study Area, respectively) and equaled the highest (72%) at the Tonto Creek Study Area. Nest success at the Salt River Study Area has increased yearly from 28% in 1997 to 75% in 2001. In 2001, the Salt River Study Area had the highest productivity (2.0 young fledged per nest) in the history of this project. Increases in productivity over this seven-year period appear to be at least loosely associated with years of higher winter rainfall, such as 1998 and 2001. We will explore these relationships as the project continues. The annual and site variation in some, or all, of these demographic parameters identifies the need for long-term monitoring data. This information can be integrated to assess health and status of populations and to develop management strategies.

Since 1997, AGFD has also been documenting nest predators using remote time-lapse video cameras. We have placed a total of 37 cameras at willow flycatcher nests and documented over 16 predation events. The primary predators we have recorded at nests are Cooper’s hawks and

common kingsnakes, with one predation event each attributed to a gopher snake (*Pituophis melanoleucus*) and yellow-breasted chat (*Icteria virens*). During the 2001 field season, we recorded our newest flycatcher nest predator, the western screech-owl. The screech-owl was recorded removing a single egg from a nest in which a nestling and second egg were depredated prior to camera placement.

HABITAT

The southwestern willow flycatcher occupies a wide variety of riparian habitat across its range (Skaggs 1996, Whitfield and Enos 1996, McCarthy and others 1998), and a large proportion of seemingly suitable habitat remains unoccupied. Habitat variables at numerous scales may affect flycatcher selection and reproduction. Landscape-level factors such as patch area, arrangement of patches, general habitat type, and varying local and regional water regimes may also be predictors of site occupancy.

The rapid growth of habitat and concomitant increase of flycatchers at Roosevelt, and a similar pattern of riparian regeneration and colonization of sites along the main channel of the lower San Pedro River (Paradzick and others 2001), highlight the dynamic link between riparian habitat and flycatcher movements. Regeneration of suitable breeding habitat occurred within 5 - 6 years. Luff and others (2000) found flycatchers readily move <30 km within drainages. Flycatcher distribution is not static and conservation efforts must incorporate the dynamic nature of riparian habitats.

MANAGEMENT

The highest priority for willow flycatcher conservation is the protection of occupied willow flycatcher habitat and the corresponding environmental conditions and ecosystem processes that allows the habitat to persist. This can only be accomplished through partnerships with land management agencies as well as private landowners to protect, restore, and maintain riparian ecosystem integrity. However, identification of occupied habitat is limited by gaps in survey area. Riparian areas with little or no survey data need to be identified and surveys must be coordinated through state, federal, Native American, and private partnerships. Recovery will require protection of extant populations as well as allowing future population expansion through identification, protection, and restoration of potential riparian habitat.

Suitable habitat has not been defined quantitatively. Knowledge of habitat relationships and their influence on reproductive success must be a primary component of recovery, conservation and management strategies for the flycatcher. Only through detailed demographic research, nest monitoring, surveys, vegetation sampling, and habitat measurements can these parameters be described. Sharing of data will be needed to identify similarities and differences between local populations. These parameters will affect management decisions on the local and range-wide level. Conservation and recovery success of the willow flycatcher is not only dependent on federal and state agency direction, but also must include cooperation and support of nongovernmental organizations, private landowners, and Native American nations.

RECOMMENDATIONS

SURVEYS

1. Conduct statewide surveys in areas which:
 - a. have not been surveyed but appear to have suitable habitat
 - b. contain previously occupied habitat
 - c. are adjacent to occupied habitat
 - d. were previously determined to be unsuitable habitat but have had recent vegetation growth
2. Multiple years of surveys are needed to adequately describe between-year fluctuations of occupied habitat.
3. Priority areas for more intensive or continued survey effort include:
 - a. Alamo Lake/ lower Big Sandy River/lower Santa Maria River
 - b. Gila River from Duncan to the Kelvin Bridge
 - c. Gila River from the Salt River inflow to Gillespie Dam
 - d. Havasu Creek drainage
 - e. Little Colorado River and tributaries where suitable habitat exists
 - f. Lower Colorado River between river mile 260 and Yuma
 - g. Salt River and Tonto Creek upstream from Roosevelt Lake
 - h. San Pedro River from Redington to its confluence with the Gila River
 - i. Santa Cruz River from Tubac to Rio Rico
 - j. Verde River from Cottonwood to the confluence with the Salt River
 - k. White River drainage
4. Encourage federal, state, tribal, and private partners to maintain or increase funding for statewide surveys and develop partnerships with private landowners to survey suitable habitat.
5. Continue training workshops to improve surveyor knowledge of survey techniques, and also to standardize data reporting, protocol adherence, and interagency communication.

NEST MONITORING

1. Continue to monitor nests at small and large populations of flycatchers to evaluate reproductive success, productivity, cowbird parasitism, predation, and impacts of other disturbances (human and other).

RESEARCH NEEDS

1. Develop and implement quantitative vegetation analysis at the site, patch, territory, and nest scales.
2. Develop and analyze habitat differences between occupied and unoccupied areas at the patch and/or site scale.
3. Investigate habitat effects (structural and floristic) on nesting success and productivity.

4. Continue banding willow flycatchers to investigate between and within site movement, site fidelity, survivorship, polygamy, and genetic variation between populations.
5. Continue to provide data to the USFWS Recovery Team.

MANAGEMENT

1. Protect areas with extant flycatcher populations.
2. Minimize impacts of land uses (for example grazing, water diversion, and inundation) on willow flycatcher breeding habitat.
3. Monitor areas where regeneration of riparian vegetation is occurring and consider these for future surveys.
4. Continue trapping cowbirds at the Salt River and Tonto Creek inflows to Roosevelt Lake, and Winkelman Study Area,. Initiate trapping at high-risk areas or occupied breeding sites unless there is no evidence of parasitism. Investigate trapping options at corrals, feedlots, and roost sites near willow flycatcher breeding sites.
5. Encourage and create private/public partnerships for fencing and habitat restoration through federal, state, and non-government programs (for example USFWS Partners for Wildlife, and the AGFD Stewardship Program).
6. Continue and increase communication with federal and state agencies, and private organizations conducting willow flycatcher surveys, monitoring, and research, to develop region-wide conservation strategies.

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Appendix A. Survey and detection form for Arizona willow flycatcher surveys, 2001.

Willow Flycatcher Survey and Detection Form (rev. 4/98)

Site Name _____ Was site surveyed in previous year? Yes No
 If yes, what site name was used? _____

County _____ State _____ USGS Quad
 Name _____

Is copy of USGS map marked with survey area and WIFL sightings attached (as required)? Yes No

Site Coordinates: Start: N _____ E _____ UTM
 Stop: N _____ E _____ UTM Zone _____
 Elevation _____ feet / meters (circle one)

**** Fill in additional site information on back of this page ****

Survey # Observer(s)	Date (m/d/y) Survey time	Number of WIFLs Found	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N	Cowbirds Detected? Y or N	Presence of Livestock, Recent sign Y or N	Comments about this survey
1 _____ _____	Date start stop total hrs _____							
2 _____ _____	Date Start Stop total hrs _____							
3 _____ _____	Date Start Stop total hrs _____							
_____ _____	Date Start Stop total hrs _____							
_____ _____	Date start stop total hrs _____							
Overall Site Summary (Total only resident WIFLs) Total survey hrs _____		Adults	Pairs	Territories	Nests	Were any WIFLs color-banded? Yes No If yes, report color combination(s) in the comments section on back of form		

Name of Reporting Individual _____ Date Report completed _____

Submit the original of this form. Retain a copy for your records.

Appendix A (continued). Survey and detection form for Arizona willow flycatcher surveys, 2001.

Fill in the following information completely. Submit original form. Retain copy for your records.

Name of reporting Individual _____ Phone # _____

Affiliation _____ Email _____

Site Name _____

Did you verify that this site name is consistent with that used in previous years? Yes No (circle one)

Management Authority for Survey Area (circle one): Federal Municipal/County State Tribal Private

Name of Management Entity or Owner (for example, Tonto National Forest) _____

Length of area surveyed: _____ (specify units, for example, miles=mi, kilometers=km, meters=m)

Did you survey the same general area during each visit to this site this year? Yes/No If no, summarize in comments.
If site was surveyed last year, did you survey the same general area this year? Yes/No If no, summarize in comments.

Vegetation Characteristics:

Overall, are the species in tree/shrub layer at this site comprised predominantly of (check one):

- Native broadleaf plants (entirely or almost entirely) Mixed native and exotic plants (mostly native)
 Mixed native and exotic plants (mostly exotic) Exotic/introduced plants (entirely or almost entirely)

Identify the 2-3 predominant tree/shrubs species: _____

Average height of canopy: _____ (specify units)

Was surface water or saturated soil present at or adjacent to the site? Yes No (circle one)

Distance from the site to surface water or saturated soil: _____ (specify units)

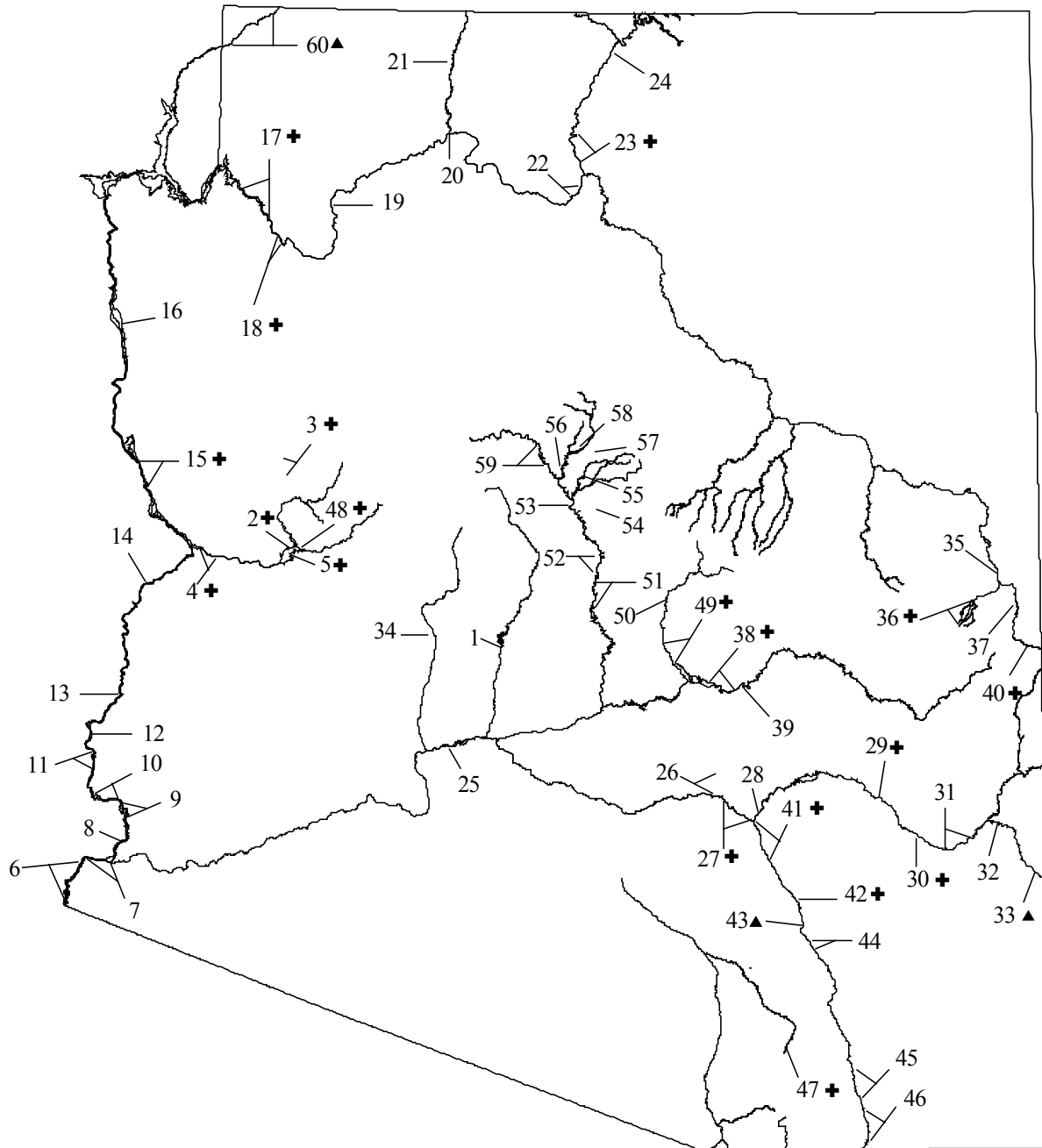
Did hydrological conditions change significantly among visits (did the site flood or dry out)? Yes No (circle one)

If yes, describe in comments section below.

Remember to attach a xerox copy of a USGS quad/topographical map (REQUIRED) of the survey area, noting the survey site and location of WIFL detections. You may also include a sketch or aerial photograph showing details of site location, patch shape survey route in relation to patch, and location of any willow flycatchers or willow flycatcher nests detected. Such sketches or photographs are welcomed, but DO NOT substitute for the required USGS quad map.

Comments (attach additional sheets if necessary):

Appendix B. Map of sites in Arizona and sites along adjoining water bodies surveyed for willow flycatchers, 2001. (see Appendix C for site names);
+ = Resident willow flycatchers detected and breeding documented, ▲ = Resident willow flycatchers detected (no breeding documented).



Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Agua Fria River										
Waddell Dam Maricopa, 439, 4.75	1	05/31/01 06/21/01 07/03/01	0 0 0	0	0	0	0	0	0	Y
Morgan City Maricopa, 445, 4.75	1	05/31/01 06/21/01 07/03/01	0 0 0	0	0	0	0	0	0	Y
Big Sandy River										
Lower Big Sandy River Mohave, 357, 34.5	2	05/19/01 05/23/01 05/31/01 06/05/01 06/16/01 06/20/01 06/27/01 07/16/01	5 6 7 6 6 5 7 5	5	3	2	4	2	2	Y
Gray Wash #2 Mohave, 543, 5	3	05/15/01 06/20/01	0 0	0	0	0	0	0	0	N
Gray Wash Mohave, 543, 3	3	05/15/01	0	0	0	0	0	0	0	N
BSR Dack Mohave, 543, 5	3	05/16/01 06/20/01	0 0	0	0	0	0	0	0	N
BSR Downstream US93 - 2 Mohave, 543, 15.4	3	05/16/01 06/19/01 06/20/01	0 5 0	0	0	0	0	5	0	N

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Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Big Sandy River Downstream US 93 Mohave, 545, 32.25	3	05/17/01	9	14	5	10	5	0	0	Y
		05/18/01	4							
		06/14/01	6							
		06/15/01	6							
		07/02/01	5							
		07/02/01	2							
		07/10/01	5							
		07/17/01	14							
Big Sandy River Upstream US 93 Mohave, 545, 17.85	3	05/18/01	0	0	0	0	0	0	0	Y
		06/15/01	0							
		07/03/01	0							
Bill Williams River										
Bill Williams River Delta - Marsh Edge La Paz, 163, 28.42	4	05/19/01	2	0	0	0	0	0	2	Y
		05/20/01	2							
		05/23/01	2							
		05/29/01	2							
		05/31/01	2							
		06/05/01	2							
		06/05/01	1							
		06/11/01	2							
		06/11/01	1							
		06/15/01	2							
		06/19/01	2							
		06/27/01	0							
		07/11/01	0							
		07/13/01	0							
		07/16/01	0							
		08/02/01	0							
08/10/01	0									
08/17/01	0									
Monkey's Head La Paz, 143, 102.96	4	Monitored 05/01 to 08/01	N/A	4	2	2	5	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Gemini La Paz, 152, 38	4	05/21/01	0	0	0	0	0	0	0	Y
		05/22/01	0							
		05/30/01	0							
		06/02/01	0							
		06/17/01	0							
		07/01/01	0							
		07/16/01	0							
		08/12/01	0							
		08/16/01	0							
		08/17/01	0							
Cave Wash I Mohave, 39.75, 173	4	06/12/01	6	0	0	0	0	0	6	Y
		06/28/01	0							
		07/05/01	0							
		07/09/01	0							
		07/11/01	0							
		07/18/01	0							
		07/23/01	0							
		08/01/01	0							
		08/11/01	0							
		08/16/01	0							
Buckskin La Paz, 174, 6	4	06/26/01	0	0	0	0	0	0	0	Y
Alamo Lake - Brown's Crossing Mohave, 348, 51	5	Monitored 05/01 to 08/01	N/A	31	16	15	24	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Colorado River										
Hunter's Hole Yuma, 30, 20.3	6	05/22/01	4	0	0	0	0	0	5	Y
		05/28/01	5							
		06/06/01	5							
		06/15/01	3							
		06/19/01	0							
		06/25/01	0							
		07/02/01	0							
		07/06/01	0							
		07/19/01	0							
		08/02/01	0							
Gadsden Bend Yuma, 30, 21.5	6	05/21/01	1	0	0	0	0	0	5	Y
		05/28/01	3							
		06/06/01	5							
		06/12/01	5							
		06/15/01	3							
		06/19/01	0							
		06/25/01	0							
		07/02/01	0							
		07/06/01	0							
		07/19/01	0							
08/02/01	0									
County 13th St. to County 12th St. Yuma, 35, 4.2	6	05/23/01	4	0	0	0	0	0	4	Y
		06/15/01	0							
		07/01/01	0							
County 12th St. to County 11th St. Yuma, 30, 3.2	6	05/23/01	1	0	0	0	0	0	1	Y
		06/15/01	0							
		07/01/01	0							

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Lower Yuma Division #2 Yuma, 37, 18.75	6	05/21/01	0	0	0	0	0	0	1	Y
		05/22/01	0							
		05/28/01	0							
		06/06/01	0							
		06/12/01	1							
		06/19/01	0							
		06/25/01	0							
		07/02/01	0							
		07/09/01	0							
		07/19/01	0							
08/01/01	0									
Yuma Division Yuma, 30, 42.7	7	05/22/01	0	0	0	0	0	0	1	Y
		05/23/01	1							
		06/12/01	0							
		06/19/01	0							
		06/26/01	0							
		07/02/01	0							
		07/06/01	0							
		07/16/01	0							
Fort Yuma 1 & 2 Yuma, 38, 33.12	7	05/22/01	0	0	0	0	0	0	2	Y
		05/31/01	2							
		06/07/01	0							
		06/14/01	2							
		06/21/01	0							
		06/28/01	0							
		07/03/01	0							
		07/09/01	0							
		07/18/01	0							
		07/24/01	0							
08/01/01	0									

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Gila/Colorado Confluence 3 Yuma, 40, 13	7	05/24/01	1	0	0	0	0	0	1	Y
		05/31/01	1							
		06/07/01	1							
		06/14/01	0							
		06/21/01	0							
		06/30/01	0							
		07/03/01	0							
		07/06/01	0							
		07/13/01	0							
		07/18/01	0							
		07/24/01	0							
Gila/Colorado Confluence 1 Yuma, 40, 42.95	7	05/22/01	0	0	0	0	0	0	3	Y
		05/24/01	3							
		05/31/01	2							
		06/07/01	3							
		06/14/01	0							
		06/21/01	2							
		06/30/01	0							
		07/03/01	0							
		07/05/01	0							
		07/06/01	0							
		07/13/01	0							
		07/18/01	0							
		07/24/01	0							

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Mittry Lake Yuma, 49, 69.5	8	05/27/01	1	0	0	0	0	0	2	Y
		05/30/01	0							
		06/07/01	0							
		06/14/01	2							
		06/21/01	0							
		06/26/01	0							
		07/08/01	0							
		07/13/01	0							
		07/16/01	0							
		07/27/01	0							
		07/30/01	0							
Martinez Lake Yuma, 62, 21.05	9	05/27/01	0	0	0	0	0	0	2	Y
		05/30/01	0							
		06/07/01	0							
		06/08/01	0							
		06/13/01	2							
		06/13/01	1							
		06/20/01	2							
		06/24/01	0							
		07/08/01	0							
		07/12/01	0							
		07/20/01	0							
		07/26/01	0							
		08/10/01	0							

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Triangle Yuma, 61, 10.75	9	05/31/01	1	0	0	0	0	0	1	Y
		06/06/01	0							
		06/13/01	0							
		06/19/01	0							
		07/01/01	0							
		07/08/01	0							
		07/12/01	0							
		07/20/01	0							
		07/26/01	0							
		08/10/01	0							
Ferguson Lake (CA) Yuma, 61, 20	9	05/23/01	0	0	0	0	0	0	6	Y
		05/28/01	0							
		06/04/01	6							
		06/13/01	1							
		06/20/01	0							
		06/29/01	0							
		07/12/01	0							
		07/18/01	0							
		07/20/01	0							
		08/03/01	0							
Clear Lake La Paz, 61, 20.25	9	05/23/01	0	0	0	0	0	0	2	Y
		05/28/01	1							
		06/04/01	2							
		06/13/01	2							
		06/20/01	0							
		07/12/01	0							
		07/18/01	0							
		07/20/01	0							
		08/03/01	0							
		08/14/01	0							

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Picacho East (Island Lake) La Paz, 76, 23.3	10	06/03/01	3	0	0	0	0	0	4	Y
		06/05/01	0							
		06/13/01	3							
		06/20/01	3							
		06/26/01	0							
		07/11/01	0							
		07/19/01	0							
		07/27/01	0							
		07/31/01	0							
		08/11/01	2							
		08/14/01	4							
		08/18/01								
		Picacho West La Paz, 61, 48.2	10							
06/03/01	3									
06/05/01	0									
06/13/01	2									
06/13/01	3									
06/20/01	3									
06/26/01	0									
07/11/01	0									
07/19/01	0									
07/27/01	0									
07/31/01	0									
08/10/01	0									
08/11/01	2									
08/14/01	2									
08/18/01	4									
08/23/01	1									
08/24/01	1									

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Adobe Lake La Paz, 61, 16.15	10	06/03/01	2	0	0	0	0	0	2	N
		06/05/01	1							
		06/12/01	0							
		06/19/01	0							
		06/29/01	0							
		07/11/01	0							
		07/19/01	0							
		07/27/01	0							
		07/31/01	0							
		08/10/01	0							
Draper Lake (CA) Imperial, 67, 19.3	11	05/30/01	0	0	0	0	0	0	1	N
		06/04/01	1							
		06/12/01	0							
		06/19/01	1							
		06/29/01	0							
		07/05/01	0							
		07/17/01	0							
		07/25/01	0							
		07/26/01	0							
		08/01/01	0							
Clip Wash Mine La Paz, 64, 20	11	06/04/01	3	0	0	0	0	0	3	Y
		06/12/01	0							
		06/19/01	0							
		06/29/01	0							
		07/17/01	0							
		07/25/01	0							
		07/26/01	0							
		08/01/01	0							
		08/15/01	0							
		08/16/01	0							

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Walker Lake (CA) Imperial, 64, 18.35	11	05/30/01	1	0	0	0	0	0	6	Y
		06/04/01	2							
		06/12/01	4							
		06/19/01	6							
		06/29/01	0							
		07/17/01	0							
		07/25/01	0							
		07/26/01	0							
		08/01/01	0							
Cibola Lake La Paz, 65, 22.4	11	05/26/01	0	0	0	0	0	0	1	Y
		05/29/01	0							
		06/05/01	1							
		06/11/01	0							
		06/18/01	0							
		06/28/01	0							
		07/12/01	0							
		07/16/01	0							
		07/24/01	0							
		08/02/01	0							
08/07/01	0									
Cibola #2 La Paz, 66, 23.5	11	05/29/01	1	0	0	0	0	0	1	Y
		05/31/01	0							
		06/05/01	0							
		06/11/01	0							
		06/18/01	0							
		06/28/01	0							
		07/12/01	0							
		07/16/01	0							
		07/24/01	0							
		08/02/01	0							
08/07/01	0									

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Cibola Restoration La Paz, 70, 11	12	05/26/01	0	0	0	0	0	0	0	Y
		05/28/01	0							
		06/05/01	0							
		06/11/01	0							
		06/18/01	0							
		06/28/01	0							
		07/12/01	0							
		07/16/01	0							
		07/24/01	0							
		08/02/01	0							
08/07/01	0									
Ehrenberg La Paz, 79, 21.85	13	05/29/01	0	0	0	0	0	0	1	Y
		06/06/01	1							
		06/11/01	1							
		06/18/01	0							
		06/30/01	0							
		07/04/01	0							
		07/10/01	0							
		07/17/01	0							
		07/25/01	0							
		08/07/01	0							
Ahakhav Preserve La Paz, 104, 38	14	05/20/01	1	0	0	0	0	0	10	Y
		06/02/01	1							
		06/04/01	10							
		06/08/01	10							
		06/30/01	0							
		07/05/01	0							
Neptune – North Lake Havasu Mohave, 140, 32	15	06/13/01	2	0	0	0	0	0	2	Y
		06/16/01	0							
		07/10/01	0							
Topock Marsh Mohave, 140, 344.74	15	Monitored 05/01 to 08/01	N/A	26	14	12	20	0	2	Y

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Waterwheel Cove Mohave, 195, 134.05	16	05/17/01	0	0	0	0	0	0	2	Y
		06/06/01	2							
		06/11/01	0							
		06/22/01	0							
		07/12/01	0							
		07/17/01	0							
		07/24/01	0							
		08/02/01	0							
		08/07/01	0							
Miles 272.0 to 268.0 R GC Mohave, 365, 81.5	17	05/18/01	0	4 ^f	2	2	0	0	0	Y
		05/21/01	0							
		05/22/01	0							
		05/30/01	0							
		06/04/01	0							
		06/17/01	1							
		06/18/01	0							
		06/25/01	0							
		07/06/01	0							
		07/10/01	0							
		07/12/01	0							
		07/13/01	2							
		07/18/01	0							
		07/23/01	3							
		07/30/01	1							
		08/03/01	3							
		08/06/01	0							
08/09/01	2									

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Miles 270.0 to 268.0 L GC Mohave, 372, 33.3	17	05/10/01	0	0	0	0	0	0	0	Y
		05/17/01	0							
		05/18/01	0							
		05/21/01	0							
		05/24/01	0							
		05/29/01	0							
		06/06/01	0							
		06/07/01	0							
		06/17/01	0							
		06/21/01	0							
		06/25/01	0							
		07/06/01	0							
		07/10/01	0							
		07/18/01	0							
		07/23/01	0							
		07/24/01	0							
07/27/01	0									
08/02/01	0									
08/06/01	0									
Miles 268.0 to 265.0 L GC Mohave, 366, 146.05	17	Surveyed 05/08/01 to 08/07/01	N/A	5	3	2	1	0	1	Y
Miles 268.0 to 264.0 R GC Mohave, 366, 28.05	17	05/21/01	0	0	0	0	0	0	0	Y
		05/28/01	0							
		05/30/01	0							
		06/20/01	0							
		06/21/01	0							
		06/26/01	0							
		07/06/01	0							
		07/20/01	0							
		08/06/01	0							
		08/07/01	0							

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Miles 265.0 to 263.5 L GC Mohave, 366, 20.5	17	05/08/01	0	0	0	0	0	0	1	Y
		05/23/01	0							
		05/28/01	0							
		06/06/01	0							
		06/19/01	0							
		06/26/01	0							
		07/06/01	0							
		07/17/01	0							
		07/20/01	0							
		08/02/01	1							
		08/07/01	1							
08/08/01	0									
Miles 263.5 to 262.5 L GC Mohave, 353, 64.3	17	05/23/01	0	2 ^f	1	1	1	0	0	Y
		05/28/01	0							
		06/06/01	0							
		06/07/01	1							
		06/20/01	0							
		06/26/01	0							
		06/27/01	1							
		07/05/01	1							
		07/12/01	1							
		07/19/01	0							
		07/20/01	0							
		08/01/01	0							
		08/02/01	1							
08/07/01	1									
Miles 262.5 to 259.5 L GC Mohave, 384, 15	17	07/07/01	1	2	1	1	2	0	1	Y
		07/09/01	0							
		07/13/01	1							
		07/15/01	0							
		07/18/01	0							
		07/19/01	0							
		08/01/01	2							
		08/08/01	3							

Appendix C. Arizona willow flycatcher survey results by site, 2001. (map numbers correspond to Appendix B.)										
Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Mile 260.0 R GC Mohave, 384, 2.25	17	05/23/01 06/06/01 06/20/01 07/04/01 07/17/01	0 0 0 0 0	0	0	0	0	0	0	N
Mile 260.0 L Quarter Master GC Mohave, 384, 4	17	05/23/01 06/06/01 06/20/01 07/04/01 07/17/01	0 0 0 0 0	0	0	0	0	0	0	N
Mile 259.5 R Waterfall Rapid GC Mohave, 353, 63.55	17	05/23/01 05/24/01 06/01/01 06/06/01 06/18/01 06/20/01 06/29/01 07/04/01 07/09/01 07/17/01 07/19/01 07/26/01 08/08/01	0 2 1 0 1 0 1 0 0 0 2 2 1	2	2	0	0	0	0	Y
Mile 249.0 L Lost Creek GC Mohave, 366, 2.5	18	05/22/01 06/05/01 06/19/01 07/03/01 07/17/01	0 0 0 0 0	0	0	0	0	0	0	N
Mile 248.3 R Surprise Canyon GC Mohave, 366, 2.5	18	05/22/01 06/05/01 06/19/01 07/03/01 07/17/01	0 0 0 0 0	0	0	0	0	0	0	N

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Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Mile 246.0 L GC Mohave, 372, 111.4	18	05/22/01	0	6 ^f	3	3	1	0	0	Y
		05/26/01	1							
		06/05/01	0							
		06/07/01	1							
		06/08/01	4							
		06/18/01	1							
		06/19/01	2							
		06/27/01	1							
		06/28/01	2							
		07/03/01	0							
		07/10/01	1							
		07/11/01	5							
		07/17/01	4							
		07/25/01	5							
07/31/01	2									
Mile 204.5 R Spring Canyon GC Mohave, 457, 2.45	19	05/15/01 06/15/01	0 0	0	0	0	0	0	0	N
Miles 143.5 to 143.0 R GC Mohave, 573, 0.25	20	06/09/01	0	0	0	0	0	0	0	N
Clear Water Spring - Kanab Creek Mohave, 1277, 5.5	21	06/15/01	0	0	0	0	0	0	0	N
		06/26/01	0							
		07/06/01	0							
		07/13/01	0							
Miles 71.3 to 71.0 L Cardenas GC Coconino, 854, 1.1	22	06/05/01 07/01/01	0 0	0	0	0	0	0	0	Y
		Mile 65.3 L Lava Chuar GC Coconino, 854, 2	22	06/05/01 07/01/01	0 0	0	0	0	0	0
Miles 56.5 to 56.0 R Kwagunt Marsh GC Coconino, 854, 1.2	23	06/04/01 06/30/01	0 0	0	0	0	0	0	0	N
		Miles 51.5 to 50.5 L GC Coconino, 854, 1.4	23	06/04/01 06/30/01	1 2	2	1	1	1	0

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Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Miles 46.9 to 46.6 R GC Coconino, 854, 2	23	06/03/01 06/29/01	0 0	0	0	0	0	0	0	N
Miles 43.8 to 38.8 L GC Coconino, 884, 1.25	23	06/02/01 06/28/01	0 0	0	0	0	0	0	0	N
Mile 5.2 R GC Coconino, 970, 1.1	24	05/31/01 06/26/01	1 0	0	0	0	0	0	1	N
Gila River										
West of Airport Road Maricopa, 259, 8.25	25	05/23/01 06/14/01 07/12/01	0 0 0	0	0	0	0	0	0	Y
GRSN023 Pinal, 537, 2.75	26	05/06/01 05/23/01 06/13/01 07/09/01	0 0 0 0	0	0	0	0	0	0	Y
Mineral Creek at Lake Flat Pinal, 668, 21.35	26	05/31/01 06/19/01 06/26/01 07/03/01 07/10/01	0 0 0 0 0	0	0	0	0	0	0	N
GRN020 Pinal, 549, 6.25	27	04/30/01 05/23/01 06/13/01 07/09/01	0 0 0 0	0	0	0	0	0	0	Y
GRN018 Pinal, 561, 17	27	Monitored 05/01 to 08/01	N/A	16	9	9	19	0	0	Y
GRS018 Pinal, 543, 11.5	27	05/17/01 06/18/01 07/09/01	0 0 4	4	2	2	1	0	0	Y

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Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
GRS015 Pinal, 555, 4.15	27	05/08/01 05/15/01 06/04/01 06/06/01 06/25/01 06/28/01	0 0 0 0 0 0	0	0	0	0	0	0	Y
GRN015 Pinal, 551, 3	27	05/16/01 06/02/01 06/27/01	0 0 0	0	0	0	0	0	0	Y
Kearny Pinal, 555, 18.75	27	Monitored 05/01 to 08/01	N/A	25	14	14	21	0	0	Y
GRS014 Pinal, 555, 1.02	27	05/17/01 05/18/01 06/06/01 06/28/01	0 0 0 0	0	0	0	0	0	0	N
GRS012 Pinal, 555, 3.3	27	Monitored 05/01 to 08/01	N/A	10	5	5	9	0	0	Y
GRS011 Pinal, 561, 3	27	Monitored 05/01 to 08/01	N/A	2	1	1	1	0	0	Y
GRN010 Pinal, 573, 6.75	27	Monitored 05/01 to 08/01	N/A	2	1	1	1	0	0	Y
GRS010 Pinal, 561, 3	27	05/08/01 05/15/01 06/09/01 07/06/01	0 0 2 0	0	0	0	0	0	2	Y
GRN009 Pinal, 579, 5.5	27	Monitored 05/01 to 08/01	N/A	2	1	1	1	0	1	Y

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Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
GRS008 Pinal, 567, 0.92	27	05/16/01 06/04/01 07/06/01	0 0 0	0	0	0	0	0	0	N
GRN008 Pinal, 579, 4	27	05/04/01 05/29/01	0 0	0	0	0	0	0	0	Y
GRS007 Pinal, 573, 14.1	27	Monitored 05/01 to 08/01	N/A	10	5	5	10	0	0	Y
GRN007 Pinal, 579, 3.25	27	04/30/01 05/30/01 06/27/01	0 0 0	0	0	0	0	0	0	Y
GRS004 Pinal, 601, 0.61	27	05/18/01 06/04/01 07/04/01	0 0 0	0	0	0	0	0	0	N
GRN004 Pinal, 585, 11.52	27	Monitored 05/01 to 08/01	N/A	4	2	2	0	0	0	Y
GRN002 Pinal, 585, 1.1	27	05/15/01 06/09/01 07/04/01	0 0 0	0	0	0	0	0	0	N
Dripping Springs Campground Pinal, 610, 3	28	05/17/01 05/17/01 06/11/01 06/11/01 06/25/01 06/25/01	0 0 0 0 0 0	0	0	0	0	0	0	Y
Fort Thomas – Geronimo Graham, 805, 3.45	29	05/15/01 06/08/01 07/10/01	21 18 19	18	7	6	2	0	3	N

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Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Pima East Graham, 857, 2	30	05/15/01 06/01/01 06/08/01 07/10/01 07/11/01	48 48 2 0 4	28	14	14	14	24	0	Y
San Jose Graham, 918, 12.45	31	05/31/01 06/14/01 06/29/01	0 0 0	0	0	0	0	0	0	Y
Earven Flat Graham, 942, 3.25	31	05/16/01 06/07/01 07/12/01	0 0 0	0	0	0	0	0	0	Y
Gutherie Greenlee, 1036, 1.5	32	05/16/01 06/11/01 07/12/01	0 0 0	0	0	0	0	0	0	Y
Duncan Greenlee, 1112	33	05/18/01 06/14/01 07/03/01 07/11/01 07/17/01	1 2 1 1 1	1	1	0	0	0	1	Y
Hassayampa River										
Hassayampa River Preserve Maricopa, 573, 11.25	34	05/25/01 06/08/01 06/22/01 06/29/01 07/06/01	0 0 0 0 0	0	0	0	0	0	0	N
Little Colorado River										
Wenima Ranch Apache, 2042, 6	35	05/15/01 05/30/01 06/14/01 07/10/01	0 0 0 0	0	0	0	0	0	0	Y

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Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Benny Creek Apache, 2500, 7.5	36	05/15/01 05/29/01 06/14/01 07/10/01	0 0 0 0	0	0	0	0	0	0	Y
River Reservoir Apache, 2500, 17.2	36	05/16/01 05/30/01 06/13/01 06/15/01 07/12/01	1 2 2 2 3	3	2	1	1	0	0	Y
Greer Townsite Apache, 2539, 25	36	05/16/01 05/31/01 05/31/01 06/13/01 06/13/01 06/15/01 06/15/01 07/13/01	0 1 1 1 1 1 1 0	0	0	0	0	0	1	N
Sheep Crossing Apache, 2683, 4	36	05/15/01 05/29/01 06/14/01 07/10/01	0 0 0 0	0	0	0	0	0	0	N
Nelson Reservoir Apache, 2256, 3	37	05/15/01 05/31/01 06/12/01 07/11/01	0 0 0 0	0	0	0	0	0	0	Y
Salt River										
Lake Shore Gila, 640, 11.5	38	Monitored 05/01 to 08/01	N/A	37	20	19	23	0	1	Y
School House Point South Gila, 640, 12	38	Monitored 05/01 to 08/01	N/A	16	9	7	8	0	0	Y

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Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
San Francisco River										
Alpine Horse Pasture Apache, 2415, 8.4	40	05/15/01 05/29/01 06/12/01 07/11/01	0 1 0 2	2	1	1	1	0	0	Y
San Pedro River										
CB Crossing West Pinal, 595, 4.33	41	05/18/01 06/06/01 06/25/01 06/28/01 06/29/01	0 0 0 0 0	0	0	0	0	0	0	N
CB Crossing Southeast Pinal, 595, 9	41	Monitored 05/01 to 08/01	N/A	6	3	3	5	0	0	Y
Indian Hills Pinal, 604, 11.5	41	05/04/01 05/17/01 06/06/01 07/04/01	3 1 0 0	0	0	0	0	0	3	Y
Dudleyville Crossing Pinal, 604, 65.95	41	Monitored 05/01 to 08/01	N/A	27	14	13	21	0	0	Y
Malpais Hill Pinal, 634, 9.65	41	Monitored 05/01 to 08/01	N/A	3	2	1	2	0	0	N
PZ Ranch Pinal, 634, 1	41	05/16/01 06/03/01 07/04/01	0 0 0	0	0	0	0	0	0	N

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		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Cook's Lake Cienega / Seep Pinal, 643, 13.25	41	04/30/01 05/06/01 05/16/01 06/02/01 06/28/01	1 1 4 7 8	8	5	3	2	0	0	N
Aravaipa Inflow North Pinal, 662, 48	41	Monitored 05/01 to 08/01	N/A	42	22	20	34	0	0	N
San Pedro/Aravaipa Confluence Pinal, 659, 12	41	Monitored 05/01 to 08/01	N/A	15	8	8	17	0	4	Y
Aravaipa Inflow South Pinal, 659, 21	41	Monitored 05/01 to 08/01	N/A	12	7	5	9	0	0	Y
Wheatfields Pinal, 671, 26.75	41	Monitored 05/01 to 08/01	N/A	26	14	14	26	0	0	Y
Cabbage Wash Pinal, 2234, 2.16	41	05/16/01 06/11/01 07/04/01	0 0 0	0	0	0	0	0	0	N
Cronley Wash South Pinal, 681, 1.5	41	05/16/01 06/11/01 07/04/01	0 0 0	0	0	0	0	0	0	Y
Catalina Wash Pinal, 774, 9.38	42	05/18/01 06/20/01 07/16/01 07/21/01	1 2 4 4	4	2	2	2	0	0	Y
Bingham Cienega Pima, 689, 2.3	43	05/18/01 07/16/01 07/21/01	0 1 1	1	1	0	0	0	0	N

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		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Soza Wash Cochise, 915, 2.5	44	05/18/01	0	0	0	0	0	0	0	Y
Cascabel Cochise, 951, 2.25	44	05/18/01 06/23/01	0 1	0	0	0	0	1	0	Y
SPRNCA - Boquillas Cochise, 1189, 10.5	45	06/12/01 06/30/01 07/14/01	0 0 0	0	0	0	0	0	0	Y
Charleston Bridge North Cochise, 1189, 21	45	06/08/01 06/12/01 06/13/01 06/29/01 06/30/01 07/01/01 07/14/01	0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Escapula Wash North Cochise, 1220, 4.5	45	06/14/01 07/02/01 07/16/01	0 0 0	0	0	0	0	0	0	Y
Escapula Wash South Cochise, 1220, 4.5	45	06/14/01 07/02/01 07/16/01	0 0 0	0	0	0	0	0	0	Y
State Route 90 Bridge Cochise, 1238, 24.25	45	05/29/01 06/05/01 06/15/01 06/27/01 07/05/01 07/17/01	0 0 0 0 0 0	0	0	0	0	0	0	Y
SPRNCA - Carr to Hunter Cochise, 1250, 8.25	46	05/29/01 06/05/01 06/27/01	0 0 0	0	0	0	0	0	0	Y

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Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Hereford Bridge Cochise, 1265, 11.5	46	06/07/01	0	0	0	0	0	0	0	Y
		06/28/01	0							
		07/11/01	0							
SPRNCA - Palominas Cochise, 1280, 15	46	06/06/01	0	0	0	0	0	0	0	Y
		06/27/01	0							
		07/01/01	0							
Santa Cruz River										
Cienega Creek Pima, 1310, 0	47	Surveyed 06/28/01 to 07/01/01	N/A	2	1	1	1	0	0	Y
Santa Maria River										
Lower Santa Maria River Mohave, 1160, 21.5	48	05/20/01	4	3	2	1	2	0	2	N
		06/01/01	5							
		06/06/01	3							
		06/10/01	0							
		06/26/01	2							
		07/02/01	1							
07/17/01	3									
Tonto Creek										
Orange Peel Gila, 610, 31	49	Monitored 05/01 to 08/01	N/A	24	13	11	12	0	0	Y
Tonto Creek Inflow Gila, 640, 26.65	49	Monitored 05/01 to 08/01	N/A	22	11	11	21	0	1	Y
A-Cross Road South Gila, 677, 9	49	Monitored 05/01 to 08/01	N/A	6	3	3	4	0	1	Y
A-Cross Road North Gila, 677, 10.25	49	05/18/01	0	0	0	0	0	0	2	Y
		06/11/01	2							
		07/03/01	0							

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Bar-X Road Gila, 694, 22.5	49	05/18/01 06/11/01 07/03/01	0 0 0	0	0	0	0	0	0	Y
Gisela South Gila, 853, 1.75	50	06/17/01	0	0	0	0	0	0	0	Y
Verde River										
Ister Flat Yavapai, 610, 8.32	51	06/13/01 06/25/01	0 0	0	0	0	0	0	0	Y
Sycamore @ Sheep Bridge Yavapai, 646, 2.5	51	05/21/01 05/24/01 06/23/01 06/24/01 07/09/01	0 0 0 0 0	0	0	0	0	0	0	Y
Junkyard Yavapai, 646, 2.5	51	05/21/01 05/24/01 06/23/01 06/24/01 07/09/01	0 0 0 0 0	0	0	0	0	0	0	Y
Mile 16.5 L Yavapai, 671, 2.5	51	05/21/01 05/24/01 06/23/01 06/24/01 07/09/01	0 0 0 0 0	0	0	0	0	0	0	Y
Palo Verde Spring Yavapai, 686, 2.5	51	05/21/01 05/24/01 06/23/01 06/24/01 07/09/01	0 0 0 0 0	0	0	0	0	0	0	Y

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		Survey Date ^a	WIFL ^b	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL ^c	Migrant WIFL ^d	BHCO Present ^e
Red Creek Yavapai, 640, 2.5	51	05/21/01	0	0	0	0	0	0	0	Y
		05/24/01	0							
		06/23/01	0							
		06/24/01	0							
		07/09/01	0							
Pete's cabin Mesa L Yavapai, 707, 2.5	52	05/21/01	0	0	0	0	0	0	0	Y
		05/24/01	0							
		06/23/01	0							
		06/24/01	0							
		07/09/01	0							
Pete's Cabin Mesa R Yavapai, 713, 2.5	52	05/21/01	0	0	0	0	0	0	0	Y
		05/24/01	0							
		06/23/01	0							
		06/24/01	0							
		07/09/01	0							
Goat Camp Yavapai, 707, 2.5	52	05/21/01	0	0	0	0	0	0	0	Y
		05/24/01	0							
		06/23/01	0							
		06/24/01	0							
		07/09/01	0							
Mile 32.75 L Yavapai, 732, 2.5	52	05/21/01	0	0	0	0	0	0	0	Y
		05/24/01	0							
		06/23/01	0							
		06/24/01	0							
		07/09/01	0							
Squaw Butte R Yavapai, 732, 2.5	52	05/21/01	0	0	0	0	0	0	0	Y
		05/24/01	0							
		06/23/01	0							
		06/24/01	0							
		07/09/01	0							

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Mingus Ave – Rocking Chair Road Yavapai, 986, 14.83	59	05/17/01 06/11/01 07/04/01 07/09/01 07/17/01	0 0 0 0 0	0	0	0	0	0	0	Y
Dead Horse State Park Yavapai, 1000, 4	59	05/30/01 06/01/01 06/02/01 06/17/01	2 2 2 0	0	0	0	0	0	2	Y
Tuzigoot Bridge Yavapai, 1006, 0.5	59	06/17/01	0	0	0	0	0	0	0	Y
Tapco Yavapai, 1037, 2.5	59	05/15/01 06/04/01 07/05/01	0 0 0	0	0	0	0	0	0	Y
Verde @ Powerline Yavapai, 1061, 1.5	59	05/15/01 06/04/01 07/05/01	0 0 0	0	0	0	0	0	0	Y
Virgin River										
Little Bend Mohave, 518, 12.25	60	05/25/01 06/12/01 06/20/01 07/03/01	0 0 0 0	0	0	0	0	0	0	Y
Big Bend Mohave, 515, 10.83	60	05/24/01 06/11/01 06/19/01 07/02/01	0 0 0 0	0	0	0	0	0	0	Y
Corral Bluff Mohave, 524, 9.75	60	05/30/01 06/11/01 06/29/01 07/09/01	0 0 0 0	0	0	0	0	0	0	Y

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Littlefield Mohave, 579, 17.28	60	05/23/01	0	1	1	0	0	0	0	Y
		06/06/01	0							
		06/07/01	0							
		06/27/01	0							
		07/05/01	1							
Black Rock Gulch Mohave, 720, 24.06	60	05/21/01	0	0	0	0	0	0	0	Y
		05/22/01	0							
		05/29/01	0							
		06/08/01	0							
		06/15/01	0							
		06/18/01	0							
06/25/01	0									

^a Duplicate survey dates indicate different areas surveyed within sites and/or multiple surveys.

^b WIFL = adult willow flycatcher (*Empidonax traillii extimus*).

^c Estimated number of willow flycatchers that could not be classified as resident or migrant due to brief appearance at the site during the breeding season or lack of survey data.

^d Maximum number of migrant willow flycatchers detected during any single survey visit.

^e BHCO = Brown-headed cowbirds (*Molothrus ater*).

^f Discrepancies between number of WIFL found on individual surveys and number of WIFL in the Site Summary can be attributed to not all resident WIFL being seen on one day.

Appendix D. Habitat measurements recorded at willow flycatcher nests located at low-elevation (<1115 m) study areas in Arizona, 2001.				
	Nest height (m)	Nest substrate height (m)	Diameter of nest substrate main stem (cm)	Distance from nest to water (m)
Tonto Creek Study Area				
Number of nests ^a	37	15	15	15
Mean ± s	5.22 ± 1.76	8.38 ± 2.73	8.62 ± 5.55	114.20 ± 96.37
Median	4.9	7.3	5.4	79.0
Minimum	2.5	4.7	3.0	27.0
Maximum	8.6	12.9	19.8	296.0
Salt River Study Area				
Number of nests ^a	124	44	44	44
Mean ± s	3.81 ± 1.05	6.50 ± 2.02	5.67 ± 3.97	177.47 ± 111.18
Median	3.7	6.4	4.9	170.5
Minimum	1.6	3.1	1.5	7.3
Maximum	6.7	12.0	17.8	532.0
Roosevelt Lake Total				
Number of nests ^a	161	59	59	59
Mean ± s	4.14 ± 1.38	6.97 ± 2.34	6.42 ± 4.56	161.38 ± 110.35
Median	3.8	6.4	5.0	139.0
Minimum	1.6	3.1	1.5	7.3
Maximum	8.8	12.9	19.8	532.0
Winkelman Study Area				
Number of nests ^a	185	39	39	39
Mean ± s	5.27 ± 1.64	9.31 ± 3.45	11.43 ± 7.77	52.55 ± 99.49
Median	5.4	9.4	9.8	12.0
Minimum	1.9	2.1	2.1	0
Maximum	9.5	34.0	34.0	340.0

^a Number of nests used in calculation