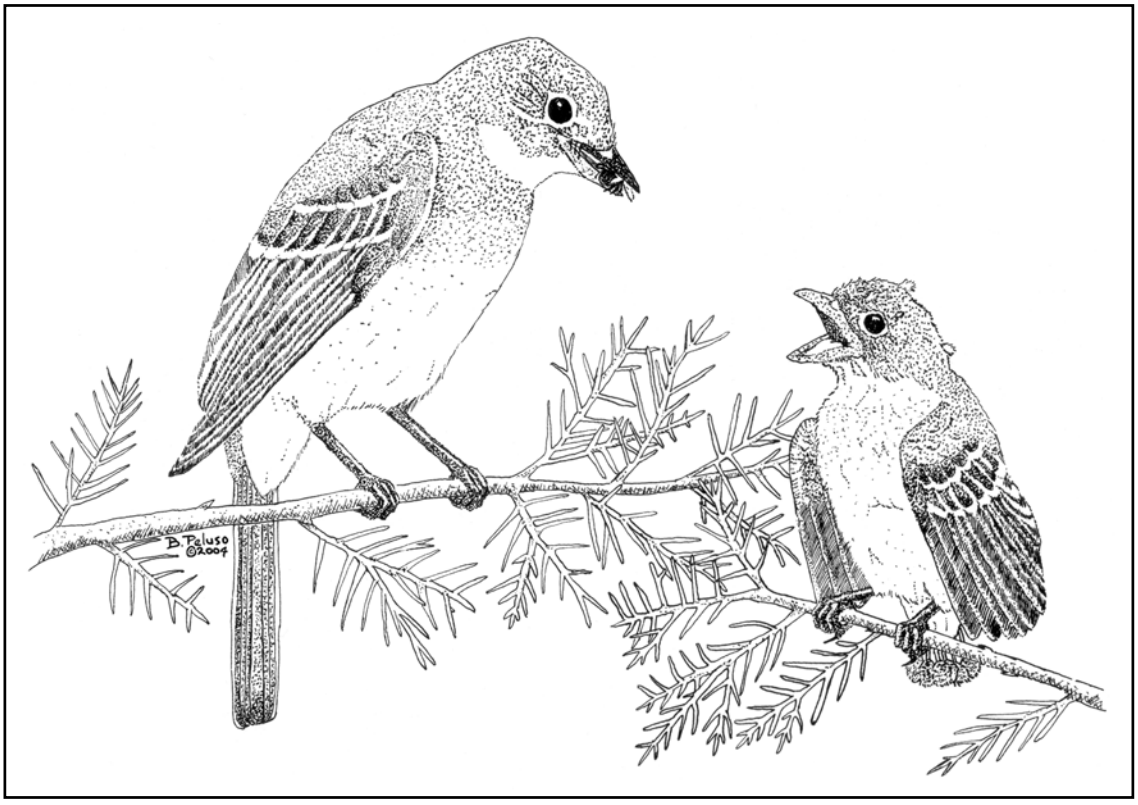
SOUTHWESTERN WILLOW FLYCATCHER
2003 SURVEY AND NEST MONITORING REPORT

Alexander B. Smith, Nongame Birds Biologist
Patrick E.T. Dockens, Nongame Birds Biologist
April A. Tudor, Southwestern Willow Flycatcher Coordinator
Heather C. English, Nongame Birds Biologist
Brian L. Allen, Nongame Birds Biologist

Nongame Branch, Wildlife Management Division
Arizona Game and Fish Department



Technical Report 233
Nongame and Endangered Wildlife Program
Program Chief: Terry B. Johnson
Arizona Game and Fish Department
2221 West Greenway Road
Phoenix, Arizona 85023-4399
March 2004

CIVIL RIGHTS AND DIVERSITY COMPLIANCE

The Arizona Game and Fish Commission receives federal financial assistance in Sport Fish and Wildlife Restoration. Under Title VI of the 1964 Civil Rights Act, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, the U.S. Department of the Interior prohibits discrimination on the basis of race, color, religion, national origin, age, sex, or disability. If you believe you have been discriminated against in any program, activity, or facility as described above, or if you desire further information please write to:

Arizona Game and Fish Department
Office of the Deputy Director, DOHQ
2221 West Greenway Road
Phoenix, Arizona 85023-4399

and

The Office for Diversity and Civil Rights
U.S. Fish and Wildlife Service
4040 North Fairfax Drive, Room 300
Arlington, Virginia 22203

AMERICANS WITH DISABILITIES ACT COMPLIANCE

The Arizona Game and Fish Department complies with all provisions of the Americans with Disabilities Act. This document is available in alternative format by contacting the Arizona Game and Fish Department, Office of the Deputy Director at the address listed above or by calling (602) 789-3290 or TTY 1-800-367-8939.

RECOMMENDED CITATION

Smith, A.B., P.E.T. Dockens, A.A. Tudor, H.C. English, and B.L. Allen. 2004. Southwestern willow flycatcher 2003 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 233. Arizona Game and Fish Department, Phoenix, Arizona.

ACKNOWLEDGMENTS

The 2003 surveys were made possible through cooperation fostered by Arizona Partners in Flight. We thank all cooperating agencies, organizations, and landowners granting survey permission including: Joe and Isabel Arbizo, Arizona Department of Transportation, ASARCO, William Atlee, Aztec Consulting, BHP Copper Inc., Douglas and Sharon Cardell, City of Winslow, Copper Basin Railway Inc., Ecoplan Associates, EEC Inc., Fort Yuma Tribe, Charles Gilliland Jr., Helen Yard Consulting, Hualapai Tribe, Hope Jones, Kearny Retail Center Corp., Logan Simpson Design Inc., Jose and Priscilla Morales, The Nature Conservancy, Navajo Tribe, Pima County Flood Control, Salt River Project, San Carlos Agency, Eric and Jean Schwennesen, Mack and Carole Skeen, John and Mary Lou Smith, Warren Sonberg, SWCA Environmental Consultants, Town of Kearny, Town of Marana, U.S. Bureau of Land Management, U.S. Bureau of Reclamation, U.S. Department of Agriculture, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey Southwest Science Center, Colorado Plateau Research Station at Northern Arizona University, U.S. National Park Service, M. S. and Lucy Wilkins, and Glenn Wilt Jr.

We thank all the cooperators and surveyors for the 2003 field season. Without the efforts of the following people, this report would not have been possible: Janie Agyagos, Erik Andersen, Tom Ashbeck, L. Aslinger, Jennifer Bowers, Bryan Brown, Bill Burger, J. Chapman, Greg Clune, Janene Colby, Cliff Cordy, Chris Dodge, C. Ellsworth, D. Fletcher, Sophia Fong, Jim Gacey, C. Garcia, G. Garett, John Ginter, Dan Godec, Patrick Gower, Erik Grant, C. Green, Jon Green, Dan Groebner, J. Hackman, Karl Harig, S. Hatch, M. Hedlund, Jim Hessil, Tom Hildebrandt, Shero Holland, J. Hoppmann, Kelly Huckins, Dennis Humphrey, Rebecca Imdieke, Denise Johnson, Glen Johnson, Joe Kahl, K. Kizer, Lance Koch, Tom Koronkiewicz, Josh Kreitzer, M. Kreitzer, N. Kreitzer, Diane Laush, J. Ledvina, Stephen LeFavier, Robert Magill, S. Manka, S. Martin, Greg Martinsen, Mary Ann Mcleod, Jason Mclure, J. McMilan, Henry Messing, Mimi Murov, Mike Myers, Janet Ng, D. Oliver, Theresa Olson, Charles Paradzick, Dennis Parker, Kelly Perkins, Lin Piest, Cristin Rapp, Lorraine Rhoads, Ginger Ritter, Joanne Roberts, John Roberts, Ben Robles, Cameron Rognan, Mike Ross, Susanne Rhodes, Beth Sabin, Todd Schipper, Justin Schofer, Susan Sferra, T. Sharp, Micheal Shirley, Carroll Smavik, Ilana Smith, Mark Sogge, Brett Solon, Janine Spencer, Katie Stumpf, Daryn Swisher, Ian Tackett, Jim Tress, Preston Tucker, Stuart Tuttle, C. Ulepic, Bob Vahle, Mathew Voisine, Tim Wade, Dave Ward, Melody Ward, Rick Ward, David Webb, Dan Whitcomb, Justin White, Todd Willard, Brenda Wilson, Fred Wong, Joe Yarchin, and Helen Yard.

The Arizona Game and Fish Department 2003 flycatcher crew's dedicated and conscientious effort was essential in completing the fieldwork and bringing the report data together. Thanks to Joe Barnes, Andrea Bowling, Christina Crabtree, Dolly Crawford, Jennifer DiMiceli, Danny Ferris, Jason Fischer, Kristina Folland, Sara Foster, Tom Genco, Leah Gibala, Lorelyn Johnson, Sara Kennedy, Jayme Knight, Brandi Kuhlman, Katherine Miller, Justin Miller, Dan Nelson, Jeffrey Ng, Beth Peluso, Mike Shrum, Fletcher Smith, Helen Sofaer, Erika Taecker, Devin Taylor, Terri Thompson, and Tyler VanVleet.

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, Caroline Causey, Scott Durst, Phil Heavin, Mark Gillilan, Katie Kauffman, Patti Newell, Mark Pollock, Amy Porter, Casey Richart, and Valerie Stein for coordination with our crew and for sharing information. We appreciate the information for sites along the lower Colorado River from Tom Koronkiewicz. We thank Stephen Ryan, Larry White, and John Wilson for their help conducting surveys and nest monitoring at Alamo Lake. We thank Jack Garrity for assistance with access and property information along the Gila River. We appreciate Gary Eide of the Town of Kearny, Elizabeth Hill of Pima County Flood Control, Jake Jacobsen of Copper Basin Railway Inc., Jeff Parker of BHP Copper Inc., Linda Searle of Southwest Rehabilitation and Education Foundation, and Ruth Valencia of Salt River Project for their assistance with access to their properties. Thanks to Terry Myers, Vicente Ordoñez, and Linda WhiteTrifaro for assistance with Apache-Sitgreaves National Forest sites. We thank Dave Harris and Doug Sprouse of The Nature Conservancy for providing hospitality and facilities at the San Pedro River Preserve and Brian Wakeling for use of a trailer for the Winkelman Study Area. We appreciate Heidi Plank, Craig Woods, and the Tonto National Forest for providing facilities at Roosevelt Lake. We thank Beth Peluso 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 State Trust Funds (Pittman-Robertson Act); Project E5 Job 27, under Section VI of the Endangered Species Act; 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 (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 flycatcher were initiated in 1993. Information was gathered in a standardized, systematic, interagency approach to provide a basis for management recommendations. Results of the 2003 survey and nest monitoring effort are summarized in this report.

Surveys, Detections, and Distribution. The Arizona Game and Fish Department and other cooperators spent 3260 hours surveying 185 sites covering approximately 202 linear km of riparian habitat. Surveyors detected 748 resident flycatchers at 44 sites. They located 410 flycatcher territories; in which 340 pairs were documented at 36 sites. 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), and Alamo Lake. Two high-elevation (>2400 m) sites with flycatchers were documented: 1 site 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 384 flycatcher nesting attempts at 33 sites throughout Arizona. Of these, 327 were monitored and contained eggs. Nest fate (success or failure) was determined for 310 nests within Arizona Game and Fish Department study areas (Roosevelt Lake and Winkelman) and other cooperators' nest monitoring study sites (Alamo Lake, Monkey's Head, Big Sandy River Downstream US 93, and Topock Marsh). Of the 310 nests with known outcomes, 205 (66%) were successful. Seventy-nine nests were preyed upon, 20 were deserted, 5 were infertile, and 1 failed due to brown-headed cowbird parasitism.

In nest monitoring study areas, we calculated Mayfield nest success for 308 nests. Mayfield nest success was 64%. Five hundred thirteen flycatchers fledged from 202 successful nests. Average seasonal productivity was 2.07 for the 88 females (109 nests) that Arizona Game and Fish Department intensively monitored for the breeding season. At monitoring sites, 7 flycatcher nests had documented parasitism. Brown-headed cowbirds were documented at 31 of 33 sites where flycatcher nests were observed. Cowbird trapping was conducted at 11 sites, 7 of which had breeding flycatchers.

Color Banding and Adult Movement. At the Winkelman Study Area we banded 56 flycatchers. Of these, 2 were recaptures that had only a Federal Bird Band and unique color bands were added. We detected 18 between-season movements in the Winkelman Study Area. Thirteen movements (averaging 12.9 kilometers) were within drainages. Five movements (averaging 75.9 kilometers) were between drainages. We also had 1 within-season movement of 29.2 kilometers on the San Pedro River drainage.

Nesting Habitat Characterization. Tamarisk was the predominant nesting substrate (252 nests). Nests were also found in willow (105 nests), cottonwood (13 nests), mesquite (2 nests), and buttonbush (1 nest). Mean nest height was 4.72 m (s = ± 1.75; n = 92) at the Winkelman Study Area and 4.10 m (s = ± 1.57; n = 77) at Roosevelt Lake.

Management/Recommendations. The highest conservation priority is protection of occupied habitat through partnerships with land management agencies and private landowners. The secondary conservation priority is surveying 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 studies, 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 flycatcher is dependent on the cooperation and support of federal and state agencies, as well as that of private landowners, Native American nations, and non-governmental organizations. Recovery goals should include the protection, restoration, and maintenance of riparian ecosystem integrity.

TABLE OF CONTENTS

FIGURES

TABLES

APPENDIXES

SOUTHWESTERN WILLOW FLYCATCHER
2003 SURVEY AND NEST MONITORING REPORT

Alexander B. Smith, Patrick E.T. Dockens, April A. Tudor,
Heather C. English, and Brian L. Allen

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 flycatcher 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*; flycatcher) includes Arizona, southern California, New Mexico, southern Nevada, southern Utah, and southwestern Colorado. There are few historical breeding records for extreme northwestern Mexico (Unitt 1987; Wilbur 1987).

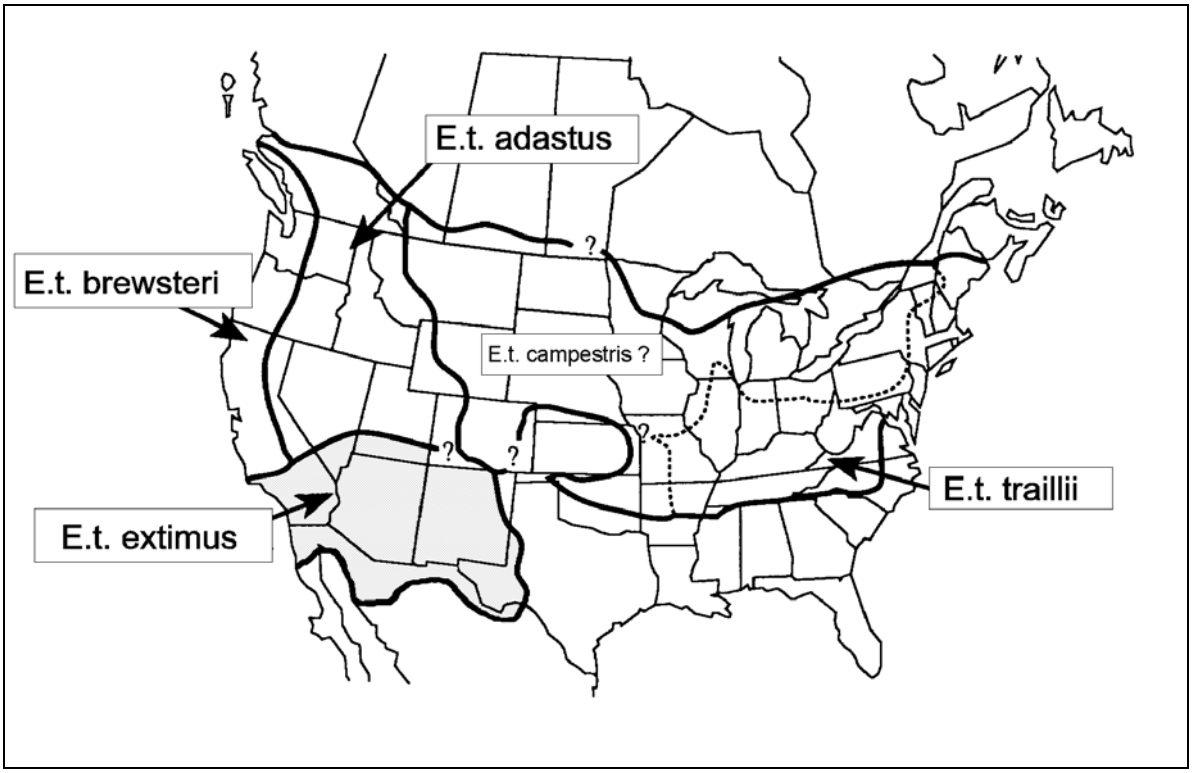


Figure 1. Distribution of willow flycatcher subspecies. Adapted from Unitt (1987) and Browning (1993).

The flycatcher is an obligate riparian breeder, restricted to dense, mesic habitats. Concern over declining populations and degradation of native riparian habitat prompted Arizona Partners in Flight, an interagency program dedicated to conserving land birds, and the Arizona Game and Fish Department (AGFD), as the coordinating agency, to initiate statewide 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 comprised of 5 or fewer territories.

In 1995, the flycatcher was federally listed as endangered (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]. On May 11, 2001 as a result of a court ruling, critical habitat was set aside for the flycatcher and currently is in the process of being redesignated. The flycatcher is also included in the AGFD list, *Wildlife of Special Concern in Arizona* (March 1996). AGFD began in 1997 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. This effort has continued through 2003 at Roosevelt Lake and the Winkelman Study Area as a result of the biological opinion regarding modifications to Roosevelt Dam (USFWS 1996).

This document serves as the AGFD summary report on 2003 activities. It also contains a summary of related work by cooperators, which fall into 1 of 2 categories: 1) the effort to systematically search riparian habitat to record the presence and number of flycatchers in Arizona (surveys); or, 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 2003 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 rivers in the Greer/Alpine 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 Soza Canyon to its confluence with the Gila River and on the Gila River from Dripping Springs Wash upstream of Winkelman to the Florence-Kelvin Highway Bridge. (Winkelman Study Area).
3. Monitor nests to determine nest success and productivity at 3 breeding areas: the Winkelman Study Area, and Tonto Creek and Salt River study areas (Roosevelt Lake).
4. Band 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 Southwest Science Center, Colorado Plateau Research 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.
7. Characterize vegetation at nest sites.
8. Compile statewide data into an annual report.
9. Incorporate survey, monitoring, and geographical data into a comprehensive statewide database.
10. Develop management recommendations for the flycatcher.

As noted above, this report includes only the 2003 survey and monitoring data. Prior Arizona survey and monitoring data can be found in Sferra and others (1995), Spencer and others (1996), Sferra and others (1997), McCarthey and others (1998), Paradzick and others (1999, 2000, and 2001), and Smith and others (2002 and 2003). Our work complements that of CPFS (see Newell and others 2003), and other ongoing research projects. More in-depth discussions on willow flycatcher natural history, demography, and associated threats can be found in Paxton and others (1996), SWCA, Inc., Environmental Consultants (1997), Whitfield and Enos (1996), Sogge and others (1997b), Finch and Stoleson (2000), Sedgwick (2000), and Owen and Sogge (2002).

METHODS

STATEWIDE SURVEYS

Prior to the breeding season, cooperators were asked to identify their intended survey sites. AGFD compiled this information and worked to coordinate surveys with agencies and organizations to limit overlap of areas. AGFD along with CPFS and USFWS conducted a 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 1997a). Survey sites were identified by agency and private cooperators in the field on 7.5-minute topographical maps or with Global Positioning System (GPS) units. 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. For areas requiring USFWS project clearance, a minimum of 5 surveys were performed. Surveys had to be performed at least 6 days apart, from 1 hour prior to sunrise to 10:00 AM while birds were most active.

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. However some birds that were detected only during the first few days of the “resident window” were considered migrants based on expert field observations. Additionally, birds were considered

territorial if observations of nesting activity or nests were found outside these dates. Flycatchers documented prior to 15 June, but not detected in subsequent visits or the last survey period, were considered migrants. Birds initially 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. When time permitted, AGFD and cooperators with nest monitoring permits performed intensive nest searches when flycatcher pairs were documented.

Flycatcher survey data were 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 (UTM) coordinates. This information was then compiled and entered into the Nongame and Endangered Wildlife Program Willow Flycatcher Database and made available for electronic transferal to the Willow Flycatcher Information Management System. Flycatchers and other species of concern detected during surveys were recorded in the AGFD Heritage Data Management System.

AGFD Survey Techniques

All AGFD surveys were conducted according to established survey protocol (Sogge and others 1997a). Additionally, when flycatchers were detected, repeat visits were conducted until pair status was confirmed. For resident adult flycatchers at AGFD sites, we assumed that pairs were monogamous, unless evidence from color-banded individuals indicated that polygyny was occurring. Polygyny was determined if a color-banded male was concurrently attending nests of 2 or more females.

AGFD Nest Monitoring Techniques

Nest monitoring methods used by AGFD followed the Southwestern Willow Flycatcher Nest Monitoring Protocol (Rourke and 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 located by watching adults return to a nest or by systematically searching suspected nest areas. Nests were monitored every 2 to 4 days after incubation was confirmed. 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 same techniques. Once nestlings were confirmed, nests were observed from a distance to reduce the risk of nest predation and the possibility of premature fledging. If no activity was 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 was documented: 1) one or more young were visually confirmed fledging from the nest or located near the nest; 2) adults were seen feeding fledglings; 3) parents behaved as if dependent young were nearby (defensive behavior and/or adults agitated) when the nest was empty; or, 4) nestlings were observed in the nest within 2 days of the estimated fledge date (12 days). This assumption is based on observations of

southwestern willow flycatchers fledging at 10 days of age. Assuming fledging when we were unable to confirm fledglings 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 was 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 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 was incubated unsuccessfully for more than 20 days (infertile).

The method for selecting nest monitoring areas within the Roosevelt Lake and Winkelman study areas was changed in 2001. From 1995 to 2000, we monitored all flycatcher nests at a select number of sites within each study area; these sites were designated as nest monitoring sites in the Roosevelt Lake Biological Opinion (USFWS 1996). In 2001, we began a 5-year study to more closely examine female productivity to be able to detect year to year differences as well as compare productivity between study sites. To accomplish this, we needed a set number of marked females to be monitored each year. To obtain a statistically valid sample, we needed to monitor 35 females in the Winkelman Study Area, 35 at Salt River Inflow, and 15 at Tonto Creek Inflow. Females were selected from all study sites and not just the nest monitoring sites used from 1995-2000. All nests were monitored until we were able to identify enough nesting females to meet our sample size. We selected females in an effort to optimize the number of years monitored and the age distribution. Additionally, we selected females only if we were able to monitor all nesting attempts in compliance with established protocol (Rourke and others 1999). This method of monitoring known females allowed us to calculate individual female seasonal fecundity, a better indicator of population nest success and productivity than nest-based measurements (Pease and Grzybowski 1995; Thompson and others 2001). Although we concentrated efforts on selected females, additional nests were monitored as time permitted. These changes in monitoring techniques must be accounted for when making comparisons with years prior to 2001. 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

Three study areas were surveyed and monitored by AGFD during 2003: the Salt River and Tonto Creek study areas at Roosevelt Lake and the Winkelman Study Area.

Roosevelt Lake

Both study areas (Salt River and Tonto Creek) are approximately 640 m elevation and within the Tonto National Forest. Riparian habitat was surrounded by Arizona Upland as described by Brown (1994). We surveyed suitable habitat within 40 km of the Salt River and Tonto Creek inflows.

Salt River Study Area. The Salt River Study Area has expanded in recent years, as flycatchers were found in habitat that developed as lake levels receded. Vegetation varied from monotypic tamarisk (*Tamarisk* spp.) to nearly monotypic Goodding's willow (*Salix gooddingii*). Canopy height varied from 4 m to 10 m. The Salt River is perennial.

Tonto Creek Study Area. The Tonto Creek Inflow to Roosevelt Lake contained numerous patches of riparian habitat. Vegetation varied from a tamarisk-dominated understory with patchy Fremont cottonwood (*Populus fremontii)* and/or Goodding's willow overstory to stands of monotypic tamarisk. Canopy height varied from 4 m to 12 m. Portions of the Tonto Creek Study Area had standing water through most of the breeding season.

Winkelman Study Area

We surveyed and conducted nest monitoring along 86 km of suitable habitat (where landowner access was granted) on the San Pedro River from Soza Canyon downstream to the confluence with the Gila River and on the Gila River from Dripping Springs Wash (upstream of Winkelman) to the Florence-Kelvin Highway Bridge. Elevation ranged from 549 m at the Florence-Kelvin Highway Bridge to 695 m at Cascabel. Riparian forests along this reach varied from monotypic tamarisk to stands of native Goodding's willow and Fremont cottonwood. Average canopy height varied from 4 m to 15 m. Riparian habitat was surrounded by Arizona Upland as described by Brown (1994). Due to decreased releases from San Carlos Reservoir, Gila River flows varied this season from flowing to only portions having standing water. Similar conditions existed along the unregulated San Pedro River.

COOPERATOR NEST MONITORING

SWCA Environmental Consultants (SWCA) monitored nests at Monkey's Head along the Bill Williams River and at Topock Marsh along the Colorado River. EcoPlan Associates monitored nests at Big Sandy River Downstream US 93. Methods for nest monitoring by cooperators sometimes differed from AGFD protocol (Rourke and others 1999), making comparisons difficult.

COLOR BANDING

AGFD personnel color banded flycatchers at the Winkelman Study Area, while CPFS personnel conducted banding at Roosevelt Lake. At Roosevelt Lake, AGFD coordinated closely with CPFS to resight previously banded birds, and to locate unbanded birds for future banding. For more information regarding the banding methods used and results of the CPFS project, see Newell and others (2003). Additionally SWCA conducted banding on the Colorado River. For more information regarding the banding methods used and results of the SWCA project, see Koronkiewicz and others (2004).

ADULT MOVEMENT

With the banding effort at the Winkelman Study Area we have begun to document flycatcher movements between patches. Movement may occur between or within study areas or years. Movements were measured using GIS from the flycatcher's last known territory to the territory it last occupied in 2003.

COWBIRD TRAPPING

Cowbird trapping was coordinated and conducted by cooperators. Traps were placed at 11 sites within 3 flycatcher breeding areas: Greer/Alpine area (Alpine Horse Pasture and Greer River Reservoir), Topock Marsh on the Colorado River, and Winkelman Study Area (Cook's Lake, Dudleyville Crossing, GRN09, Indian Hills, Kearny, Malpais, San Pedro/Aravaipa Confluence, and Wheatfields). Information regarding trapping can be obtained by contacting the respective agency: Apache-Sitgreaves National Forest (Greer/Alpine area), SWCA (Topock Marsh), and USBR Phoenix Office (Winkelman Study Area).

HABITAT CHARACTERISTICS

Vegetation at occupied flycatcher sites was classified into 4 general types according to Sogge and others (1997a): 1) high-elevation Geyer willow (*Salix geyeriana*), 2) low-elevation native broadleaf dominated (commonly willow and/or cottonwood), 3) low-elevation mixed native broadleaf and exotic tamarisk and, 4) low-elevation monotypic tamarisk.

General habitat characteristics (such as patch composition, average canopy height, and distance to water) were visually estimated and recorded on forms in the field for every survey. AGFD personnel also measured habitat variables at nest sites; descriptive statistics were calculated where applicable.

RESULTS

SURVEYS, DETECTIONS, AND DISTRIBUTION

One hundred eighty five sites were surveyed covering approximately 202 linear km of riparian habitat (Table 1; Appendixes B, C). Sites ranged from 24 m to 2539 m in elevation and 0.04 km to 5.72 km in length. Forty of the 180 sites were not surveyed according to protocol. This was most likely due to time or funding limitations, or because habitat was determined unsuitable for flycatchers. Twenty-one sites were not surveyed previously. New survey sites were located along the Blue (1 site), Colorado (5 sites), Gila (3 sites), Hassayampa (1 site), Little Colorado (2 sites), San Francisco (3 sites), San Juan (1 site), San Pedro (1 site), Santa Cruz (1 site), Tonto (1 site), and Verde rivers (2 sites).

Seven hundred forty-nine resident flycatchers were documented within 411 territories at 44 sites (Table 1; Appendixes B, C). AGFD personnel and statewide cooperators recorded 340 pairs. The male to female ratio was not 1:1 at all sites, since polygynous and unpaired birds were detected at some sites. In some instances insufficient survey effort and other factors precluded the documentation of pairs.

Resident flycatchers were documented along 11 drainages. The greatest concentrations of flycatchers were found at Winkelman Study Area with 41% of the statewide birds, and at Roosevelt Lake with 34% (Salt River 28% and Tonto Creek 6%; Fig. 2; Table 2). Resident flycatchers were detected for the first time at 5 sites that were surveyed at least once in previous years: Earven Flat, GRS016, PZ Ranch West, Wheatfields South, and Bar-X Road. Additionally, flycatchers were documented at the Hoge on the lower Colorado River and the Miles 29.0 to 28.0 L GC site in the Grand Canyon, which were both surveyed for the first time this year. Cowbirds were documented at 147 survey sites including all but 2 (Miles 29.0 to 28.0 L GC and Miles 51.5 to 50.5 L GC) breeding sites (Appendix C).

Table 1. Willow flycatcher survey effort, detection, and nesting attempt totals in Arizona, 2003.

Survey hours	3260
Sites surveyed	185
Linear km of habitat covered	202
Sites with resident willow flycatchers	44
Sites with documented pairs	36
Sites with documented breeding	33
Resident willow flycatchers	748
Territories	410
Pairs	340
Nesting attempts	384
Sites with cowbirds detected	147
Breeding sites with cowbirds detected	31

Migrant flycatchers were detected at 54 sites (Appendix C), 22 of which also had resident birds. Two flycatchers of unknown status were documented (1 at Black Rock Gulch on the Virgin River and 1 at Mile 243.0 L GC in the Grand Canyon).

Topock Marsh (lower Colorado River) was the lowest elevation (140 m) where nesting was documented. Alpine Horse Pasture (upper San Francisco River) was the highest elevation (2414 m) where nesting was documented. However, resident flycatchers were detected without documented nesting at 2 lower elevation sites: Mittry Lake (49 m; 1 flycatcher, 1 territory) and Hoge (61 m; 1 flycatcher, 1 territory). No Resident flycatchers were detected between 951 m and 2414 m.

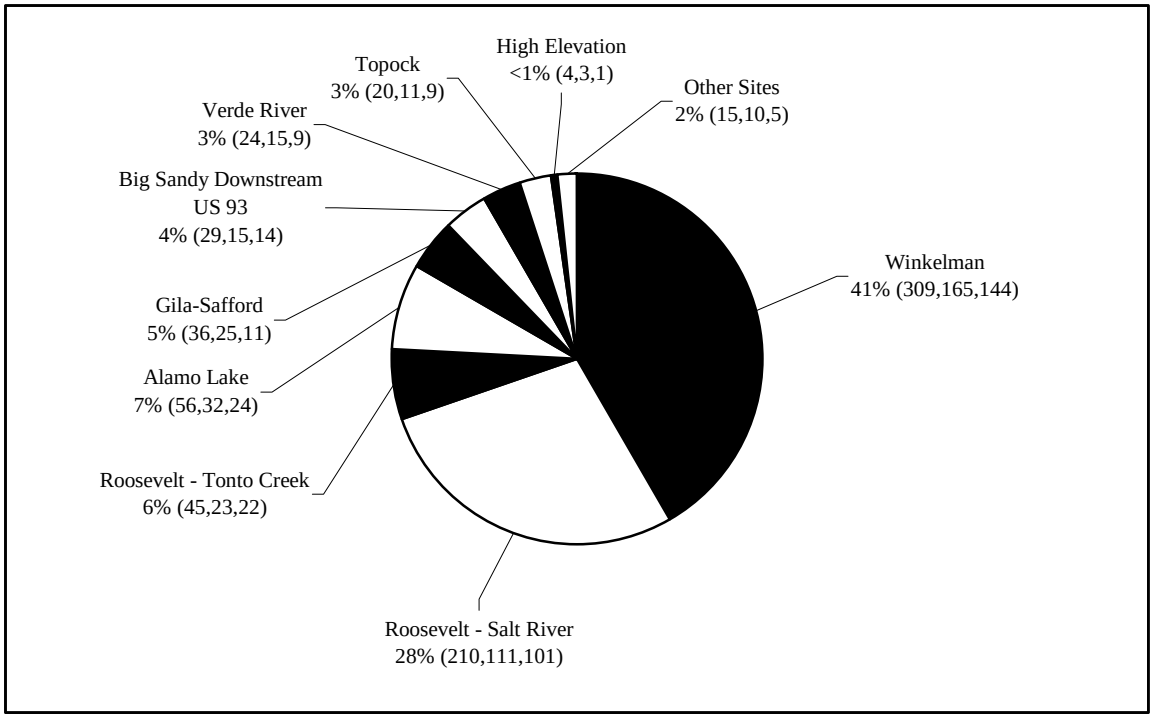


Figure 2. Southwestern willow flycatcher distribution in Arizona, 2003. Survey location, percent of known willow flycatchers (number of resident willow flycatchers, number of territories, number of pairs). Percentages are based on total number of willow flycatchers detected in 2003 (see Table 2 for sites within each survey location).

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

Winkelman Study Area	Roosevelt Lake		Gila-Safford Area	Alamo Lake	Verde River	High Elevation	Other Sites
	Salt River	Tonto Creek					
▸ GRN018 ▸ GRS018 ▸ GRS016 ▸ Kearny ▸ GRS012 ▸ GRS007 ▸ GRN004 ▸ Dudleyville Crossing ▸ Malpais Hill ▸ Cook's Lake Cienega / Seep ▸ PZ Ranch West ▸ Aravaipa Inflow North ▸ San Pedro / Aravaipa Confluence ▸ Aravaipa Inflow South ▸ Wheatfields ▸ Wheatfields South ▸ San Manuel Crossing ▸ Catalina Wash	▸ Salt River Inflow ▸ Lake Shore ▸ School House Point South ▸ School House Point North	▸ Bar-X Road ▸ Tonto Creek Inflow ▸ Orange Peel	▸ Fort Thomas – Geronimo ▸ Earven Flat ▸ Pima East	▸ Lower Big Sandy River ▸ Alamo Lake-Brown's Crossing ▸ Lower Santa Maria River	▸ Camp Verde ▸ Horseshoe North ▸ Davenport	▸ River Reservoir ▸ Alpine Horse Pasture	▸ Miles 51.5-50.5 L GC ▸ Miles 29.0 to 28.0 L GC ▸ Bill Williams River Delta – Marsh Edge ▸ Monkey's Head ▸ Hoge ▸ Mittry Lake

NEST MONITORING

Statewide Effort

We documented 384 nesting attempts statewide at 33 sites (Appendix C). Of these, 327 nests were monitored and contained eggs. Two hundred five (63%) monitored nests fledged young, 105 (32%) failed, and 17 (5%) had unknown outcomes (Table 3). Excluding unknown outcomes 66% of nests fledged and 33% failed. Predation was the major cause of nest failure (75%) followed by desertion at 19% (Table 4). The earliest documented occurrence of egg laying in 2003 was on 11 May at School House Point South. The first hatching date and the first fledging date were 31 May at the Salt River Inflow and 16 June at Aravaipa North, respectively. The last documented fledging occurred after 26 August at Orange Peel.

Table 3. Willow flycatcher nest monitoring results in Arizona, 2003.

Site		Pairs[a]	Nests	Successful nests	Failed nests	Unknown outcome[b]	Parasitized nests[c]
Roosevelt Lake	Tonto Creek	22	27	16	11	0	1
	Salt River	93	112	71	39	2	5
	Total	115	140	88	50	2	6
Winkelman Study Area[d]		117	146	90	42	14	0
Alamo Lake - Brown's Crossing		13	15	9	5	1	0
Big Sandy, South US 93 Bridge		14	17	10	7	0	0
Topock Marsh[d]		8	8	7	1	0	1
Monkey's Head		3	2	2	0	0	0
All sites		267	327	205	105	17	7

[a] Number of pairs contributing to the number of monitored nests.
[b] Nests monitored only for a portion of nesting cycle. Nest fate was unknown.
[c] Includes all parasitized nests, those that both fledged willow flycatcher young or failed.
[d] Cowbird trapping occurred in the area during the breeding season.

Table 4. Causes of nest failure for willow flycatchers at monitoring areas in Arizona, 2003.

Site		Depredated[a]	Deserted	Parasitized[b]	Infertile clutches
Roosevelt Lake	Tonto Creek	11	0	0	0
	Salt River	24	11	1	3
	Total	35	11	1	3
Winkelman Study Area[c]		33	7	0	2
Alamo Lake - Brown's Crossing		5	0	0	0
Big Sandy, South US 93 Bridge		6	1	0	0
Topock Marsh[c]		0	1	0	0
Monkey's Head		0	0	0	0
All sites		79	20	1	5

[a] Includes 3 parasitized nests that were later depredated.
[b] Includes only those nests that failed directly due to cowbird parasitism (nests subsequently abandoned with eggs or fledged only cowbird young).
[c] Cowbird trapping occurred in the area during the breeding season.

Parasitism

Seven nests were parasitized at nest monitoring areas (Tables 3, 5). Cowbirds may have caused, or contributed to, abandonment at other nests but direct evidence was not found. Nest parasitism was recorded at Roosevelt Lake (6) and Topock Marsh (1).

Table 5. Fate of parasitized willow flycatcher nests at monitoring areas in Arizona, 2003.

Outcome	Number of nests
Depredated	3
Fledged one BHCO	1
Fledged one flycatcher and one BHCO	2
Fledged one flycatcher	1
Total parasitized nests	7

AGFD Study Areas

Nest Success

We were able to calculate Mayfield (1961, 1975) estimates of nest success for 200 nests statewide (Table 6). Mayfield success for all nests combined was 64.44%. Mayfield nest success for Roosevelt and Winkelman study areas was 61.29% and 67.10%, respectively.

Table 6. Willow flycatcher nest success and productivity of monitored nests at study areas in Arizona, 2003.

Site		Mayfield nest success (No. of observation days)	Number of young fledged	Mean number of young fledged per nest (n)[a]	Mean number young fledged per successful nest (n)[a]
Roosevelt Lake	Tonto Creek	53.45 (444)	40	1.54 (26)	2.50 (16)
	Salt River	63.03 (2163)	178	1.66 (107)	2.51 (71)
	Total	61.29 (2607)	218	1.64 (133)	2.51 (87)
Winkelman Study Area [b]		67.10 (2638)	227	1.83 (124)	2.58 (88)
Big Sandy, South US 93 Bridge		53.01 (263)	26	1.73 (15)	2.89 (9)
Brown's Crossing		63.71 (246)	18	1.38 (13)	2.00 (9)
Monkey's Head		100.00 (34)	6	3.00 (2)	3.00 (2)
Topock[b]		87.36 (204)	18	2.25 (8)	2.57 (7)
All sites		64.44 (5992)	513	1.74 (295)	2.54 (202)

[a] n = number of nests
[b] Cowbird trapping occurred in the area during the breeding season.

Nest Productivity

Five hundred thirteen young fledged from 202 nests, where Mayfield estimates were calculated (Table 6). This total does not include 4 additional fledglings, 2 each at the Salt River Study Area and Topock, which were detected in areas where no nests were found. Sixty-nine percent of young that fledged were confirmed after leaving the nest, the rest were presumed fledged based on activities at nest or confirmed fledging of siblings. Mean clutch size (includes only complete clutches) was 2.84.

Female Productivity

Eighty-eight females were followed through all nesting attempts (n=109) to determine female productivity at AGFD study areas. Average seasonal fecundity and average seasonal productivity were 2.36 and 2.07 respectively (Table 7). Fourteen females failed to successfully fledge any young (9 at Roosevelt Lake and 5 at Winkelman). Seventy-seven percent had only one nesting attempt (Table 8). Twenty-one renests were documented, of these 1 was a third nesting attempt. Seven nests were initiated after a successful nest (double brood attempt); 5 of which were successful (3 at the Salt River Study Area and 2 at the Winkelman Study Area).

Table 7. Female productivity at AGFD study areas, 2003.					
Site		No. of females	Nests	Average seasonal fecundity[a]	Average seasonal productivity[b]
Roosevelt Lake	Tonto Creek	13	17	1.85	1.73
	Salt River	40	47	2.39	2.10
	Total	53	64	2.25	2.01
Winkelman Study Area		35	45	2.53	2.15
All Sites		88	109	2.36	2.07

[a] Mean fledges per female
[b] Mean fledges per nesting attempt per female [Average of (# Fledges /# Nests for each female)]

Table 8. Renesting attempts at AGFD study areas, 2003.					
Site		No. of females	Percent of females with 1 nest (n)[a]	Percent of females with 2 nests (n)[a]	Percent of females with 3 nests (n)[a]
Roosevelt Lake	Tonto Creek	13	69.2 (9)	30.8 (4)	0
	Salt River	40	82.5 (33)	17.5 (7)	0
	Total	53	79.2 (42)	20.8 (11)	0
Winkelman Study Area		35	74.3 (26)	22.9 (8)	2.9 (1)
All Sites		88	77.3 (68)	21.6 (19)	1.1 (1)

[a] n = number of nests

COLOR BANDING

In 2003, we captured 71 flycatchers including: 54 new-banded birds, 8 banded recaptures, and 9 males that were released unbanded due to our limited supply of color-bands. We placed color bands on 56 of the 71 flycatchers captured to aid in our nest monitoring efforts at the Winkelman Study Area (Appendix D). Of these, 2 were recaptures that had only a Federal Bird Band, and unique color-bands were added. In addition to our work, USGS banded 4 birds at the Winkelman Study Area. Of these, 3 were recaptures where the Federal Bird Band was replaced and color bands were added (Appendix D).

ADULT MOVEMENT

With the banding effort at the Winkelman Study Area we have documented movements of flycatchers between patches. The most common type of movements were between year, within study area movement. In 2003, we documented 16 movement events (Table 9). Fifteen individuals moved from the site where they were last detected (1999 – 2002) to a different site in 2003 within the same study area. The average distance moved was 14.6 km with a range of 1.2 – 43.9 km. Two of these movements were between drainages within the Winkelman Study Area, from the Gila to the San Pedro River. We also documented 1 adult flycatcher that moved 29.2 km between patches along the San Pedro River within the 2003 breeding season. In addition, we detected 3 flycatchers that moved between study areas and years, from the Roosevelt Study Area

to the San Pedro River in 2003. The average distance moved between study areas was 109.5 km with a range of 91.8 – 123.2 km. No movements were detected from San Pedro River to the Gila River or from Winkelman Study Area to Roosevelt Lake.

Table 9. Willow Flycatcher movement detected in 2003.

Last Detected in		Site Detected in 2003	Distance Moved (km)	Federal Bird Band Number	Color Band[a]		Age[b] 2003	Sex[c]
Site	Year				Left Leg	Right Leg		
Between study area between year movement								
Orange Peel	2001	San Pedro / Aravaipa Confluence	113.6	1710-20466	ZZ	YKY	ATY	F
Lakeshore	2002	San Manuel Crossing	123.2	1740-51713	VG	XX	ASY	F
Salt River Inflow	2002	Aravaipa Inflow North	91.8	1740-51792	RO	XX	TY	M
Within study area between year movement								
San Pedro / Aravaipa Confluence	1999	Malpais Hill	7.6	1710-20477	VY	ZZ	A5Y	M
	2001	San Manuel Crossing	29.1	2240-84013	DD	DO	ATY	F
	2001	Wheatfields	2.8	2240-84005	DD	WO	ATY	F
	2001	Aravaipa Inflow North	1.2	2240-84006	VK	DD	ATY	F
Aravaipa Inflow North	2001	PZ Ranch West	3.7	1590-97556	ZZ	GW	A6Y	M
Malpais Hill	2002	Aravaipa Inflow North	6.2	2240-84032	VG	DD	ASY	F
	2002	PZ Ranch West	2.9	2240-84034	DD	DZ	ASY	M
Dudleyville Crossing	2001	San Manuel Crossing	37.9	2240-84002	DD	OO	ATY	U
	2002	Catalina Wash	43.9	2240-84009	WO	DD	ATY	U
	2002	Aravaipa Inflow North	8.8	2240-84025	OY	DD	ASY	F
	2002	Malpais Hill	1.7	1710-20450	DD	WY	A4Y	F
CB Crossing SE	2001	Wheatfields	17.9	1710-20377	DK	DD	A4Y	M
Kearny	2002	Aravaipa Inflow North	28.2	1710-20216	ZZ	WW	A5Y	F
	2002	Malpais Hill	22.8	1710-20453	ZZ	OY	A4Y	F
GRN010	2000	GRS007	4.1	1740-91888	DD	YG	A5Y	M
Within study area movement during 2003								
San Manuel Crossing	San Pedro / Aravaipa Confluence		29.2	2240-84049	OD	DD	ASY	M

[a] D = Blue, G = Green, K = Black, O = Orange, R = Red, V= Violet, W= White, X = Silver, Y = Yellow, Z = Gold
[b] 3rd year, ASY = 3rd year or older, ATY = 4th year or older, A4Y = 5th year or older, A5Y = 6th year or older, A6Y = 7th year or older
[c] F = female, M = male, U = unknown

HABITAT CHARACTERISTICS

Although vegetation composition varied, most sites where flycatchers were documented shared landscape characteristics. Occupied sites were in broad floodplains where dense riparian habitat existed and water or saturated soil was present sometime during the breeding season.

Sites within a mid-elevation band (1115–2400 m) were surveyed, but resident flycatchers were not detected (see Appendix C). Riparian vegetation at these intermediate elevations was often in narrow bands along high-gradient streams prone to frequent scouring by flood, and was often dominated by an overstory of Arizona sycamore (*Platanus wrightii*).

Most nesting sites (24 of the 33) were characterized as mixed native/exotic associations. However, the amount of tamarisk varied within and between sites. Seven nesting sites (GRS007, GRS016, GRS018, Miles 29.0 to 28.0 Left Grand Canyon, School House Point South, Topock Marsh, and Wheatfields) were composed of dense monotypic stands of tamarisk, forming a nearly continuous closed canopy. Three sites (Alpine Horse Pasture, Catalina Wash, and Davenport) were classified as native broadleaf dominated.

Tamarisk and Goodding willow were the primary nesting substrates in Arizona. Two nests were documented using mesquite as a substrate one each at: San Manuel Crossing on the San Pedro River and Davenport on the Verde River. These were the third and fourth nesting records in mesquite for the state. Mean nest height at Roosevelt Lake and Winkelman study areas were 4.72 m (s = ± 1.75; n = 92) and 4.10 m (s = ± 1.57; n = 77), respectively (Appendix D).

Table 10. Tree species used for willow flycatcher nesting in Arizona, 2003.

Substrate	No. of nests
common buttonbush *(Cephalanthus occidentalis)*	1
Fremont cottonwood *(Populus fremontii)*	13
mesquite *(Prosopis* spp.)	2
Geyer willow *(Salix geyeriana)*	1
Gooding willow *(Salix gooddingii)*	104
Tamarisk *(Tamarisk* spp.)	252
Total	373

DISCUSSION

SURVEYS

Annual statewide surveys provide critical information concerning the distribution and abundance of flycatchers in Arizona. These data allow agency resource managers and private organizations to make science-based decisions regarding present and future research and conservation efforts. During the 2003 survey, 75% of flycatchers were concentrated within 2 areas of the state (Roosevelt Lake and Winkelman). Most occupied areas had similar abundance reports to last year. However, the 2003 breeding season did show a slight statewide decrease in overall abundance (410 territories compared to 430 in 2002; Smith and others 2003). At some sites there were notable changes in abundance.

Alamo Lake and Horseshoe Lake were 2 areas of the state with population increases. The Alamo Lake population had the largest relative increase of territories from 13 in 2002 to 32 in 2003. Horseshoe Lake increased from 6 territories in 2002 to 11 territories this year. These increases were mostly a result of colonization of new habitat that developed in the lakebeds over the last several years as water levels receded, similar to the conditions at Roosevelt Lake since 1999.

Although the Winkelman Study Area stayed relatively stable with respect to the overall number of territories, there were dramatic changes within individual sites. Continuing regeneration of habitat along the San Pedro River and increased surveyor effort resulted in an increase of flycatcher detections at the Catalina Wash and San Manuel Crossing sites (from 2 in 2002 to 13 in 2003, and 7 in 2002 to 35 territories in 2003, respectively). There was a notable decline in flycatchers at the Dudleyville Crossing site from 26 territories in 2002 to 7 in 2003. This decline occurred mainly on the San Pedro River Preserve (17 territories in 2002 to 2 in 2003). Although there was little change in the vegetation on the Preserve, the site only had following water early in the 2003 season and became dry. Conversely, during 2002 there was flowing or standing water for the entire breeding season.

As in 2002, the lower Grand Canyon area of the Colorado River (miles 246 to 272) had no residents. This was a decrease from 12 territories in 2001 and the second consecutive year without residents since surveys began in 1997. Since 2000 Lake Mead has dropped 27m, with many areas of formally suitable habitat becoming dry (Koronkiewicz and others 2004).

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. During 2003 statewide productivity recovered from the low levels of 2002.

Arizona's 2 largest populations (Winkelman and Salt River study areas) rebounded from the lows of 2002 with the highest and second highest nest success recorded. Nest success at the Winkelman Study Area rebounded from a low of 33% in 2002 to 67% this season, surpassing the previous high of 64% in 2001 (Figure 3). The Salt River Study Area showed a similar rebound from a low of 16% in 2002 to 63% in 2003; this is the second highest success on record for this area, with previous high of 75% in 2001.

Average seasonal fecundity at the Salt River Study Area (2.38) was more consistent with 2001 seasonal fecundity (2.35) than the low of 0.07 in 2002. Fecundity at the Tonto Creek Study Area increased from 0 in 2002 to 1.85. For AGFD monitored females, 21.6% attempted to renest in 2003 whereas in 2002 only 4% renested.

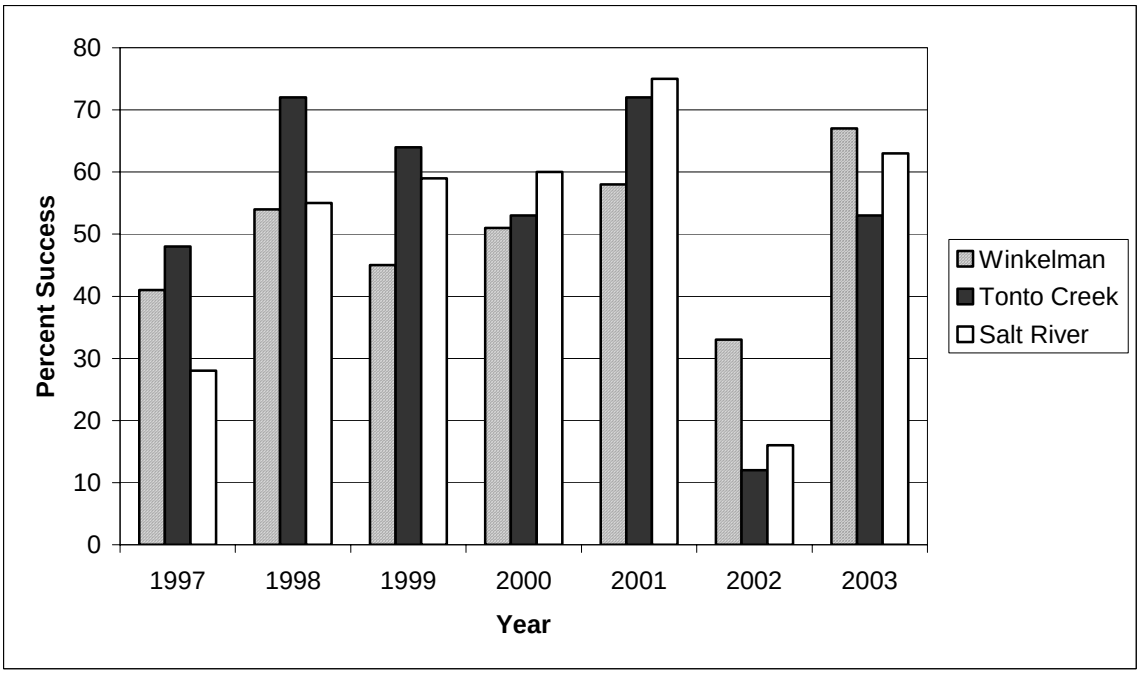


Figure 3. Mayfield nest success at Winkelman, Tonto Creek, and Salt River study areas, 1997-2003.

Nest parasitism at Roosevelt Lake dropped from 37% in 2002 to 4% in 2003, closer to historic levels of 2-4%. The elimination of cowbird trapping in 2002 at Roosevelt Lake may have caused the increase in parasitism during 2002, but this seems unlikely. As a result of the drop in parasitism this year, the second year with no trapping, we suspect that the 2002 spike was due to other factors as discussed in Smith and others (2003). Trapping was first scaled back in 2001 with no subsequent increase in parasitism recorded (Smith and others 2002). Continued monitoring is needed to explore this completely.

BANDING AND ADULT MOVEMENT

This was our third and most successful year of banding at the Winkelman Study Area. We focused on banding females, allowing us to continue monitoring specific individuals for productivity. Of the 71 flycatchers captured we color-banded 56. Of these, 34 were sexed as females in the hand by observation of a brood patch. Fifty-two percent of nesting females at the Winkelman Study Area were banded.

This is the first season we investigated movements in the Winkelman Study Area. Of the 19 movements detected, 84% (16) were within study area movements. This type of movement is not unusual on the San Pedro and Gila rivers because habitat patches are close together. These movements support USGS findings that the Winkelman Study Area is a single population due to frequent movement within the area (Eben Paxton, pers. com). Of the 16 within study area movements, 2 flycatchers moved between years from the Gila River to the San Pedro River and

1 moved along the San Pedro within 2003. The 3 remaining movements were between study areas and years, from Roosevelt Lake to the Winkelman Study Area.

HABITAT

The flycatcher occupies a wide variety of riparian habitats across its range (Skaggs 1996; Whitfield and Enos 1996; McCarthey and others 1998). The majority of occupied sites are mixed native/exotic vegetation with tamarisk being an important component. The importance of riparian vegetation for this species has continuously been at the forefront of recovery discussions. The variety of occupied habitats suggests that flycatchers may rely on structure of vegetation as much as, or more than, particular species of vegetation. A recent study conducted by USGS suggested that, on a physiological level, native and exotic habitats do not greatly differ in quality for flycatchers (Owen and Sogge 2002).

With the low precipitation levels of the last several years, many of the state's reservoirs have receded exposing previously inundated lakebeds. Vegetation suitable for flycatchers has rapidly colonized these areas. This year continued to highlight the importance of this new habitat. In 2003, 41% (168 of 409) of flycatcher territories in Arizona were in exposed lakebed habitats. Flycatchers at Roosevelt Lake have continued to colonize farther into the lakebed each year since 1999. In 2003, territorial flycatchers within the Salt River Study Area occupied habitat over 800 m further down in the exposed lakebed than in 2002 (AGFD unpublished data). Flycatchers were also detected occupying newly developed habitat in larger numbers at Horseshoe and Alamo lakes. Flycatchers at Alamo have moved further into the exposed lakebed and increased to 32 territories from a previous high of 21 in 2001. Additionally, since 2000 Lake Mead has dropped 27m exposing sections of the formally inundated lakebed (Koronkiewicz and others 2004). Many of these areas are now being colonized by new riparian vegetation and may become suitable for flycatchers in future years.

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. This information will affect management decisions on both the local and range-wide level. Conservation and recovery success of the 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 that:
    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 unsuitable habitat but have developed into potentially suitable habitat
2. Conduct multiple years of surveys to adequately describe between-year population fluctuations.
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 the New Mexico border 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 with suitable habitat
    f. Lower Colorado River between river mile 260 and Yuma
    g. Lower Grand Canyon area of the Colorado River between miles 246 and 272
    h. Salt River and Tonto Creek upstream from Roosevelt Lake
    i. San Francisco River from the New Mexico border to Clifton
    j. San Pedro River from Cascabel to its confluence with the Gila River
    k. Santa Cruz River from Tubac to Rio Rico
    l. Verde River from Cottonwood to the confluence with the Salt River
    m. White River and tributaries with suitable habitat
4. Encourage federal, state, Native American, 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 within small and large populations of flycatchers to evaluate reproductive success, productivity, cowbird parasitism, predation, and impacts of human and other disturbances.

MANAGEMENT

1. Protect areas with extant flycatcher populations.
2. Create and enforce exclosures on flycatcher breeding areas where feasible to eliminate or minimize impacts of land uses (for example: grazing, water diversion and inundation, and OHV use) on flycatcher breeding habitat.
3. Monitor and protect areas where regeneration of riparian vegetation is occurring.

4. Initiate cowbird trapping at breeding areas with high cowbird abundance unless there is no evidence of parasitism. Investigate trapping options at corrals, feedlots, and roost sites near flycatcher breeding sites impacted by parasitism.
5. Work with the Arizona Bird Conservation Initiative (a multi-agency association dedicated to the conservation of all birds in Arizona) to encourage and create private/public partnerships for fencing and habitat restoration through federal, state, and non-government programs (for example USFWS Partners for Wildlife, the AGFD Stewardship Program, and the Federal Landowner Incentive Program).
6. Continue and increase communication with federal and state agencies, Native American tribes, and private organizations conducting flycatcher surveys, monitoring, and research, to develop region-wide conservation strategies.

LITERATURE CITED

Aldrich, J.W. 1953. Habitats and habitat differences in two races of Traill's Flycatcher. Wilson Bulletin 65:8-11.

Arizona Game and Fish Department (AGFD). March 1996. *Wildlife of Special Concern in Arizona*. Arizona Game and Fish Department Publication. Phoenix, Arizona.

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

Brown, D.E. 1994. Biotic communities southwestern United States and northwestern New Mexico. University of Utah Press, Salt Lake City, Utah.

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

Finch, D.M. and S.M. Stoleson. 2000. Status, ecology, and conservation of the southwestern willow flycatcher. Gen. Tech Rep. RMRS-GTR-60. Ogden,UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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

Koronkiewicz, T.J., M.A. McLeod, B.T. Brown, and S.W. Carothers. 2004. Southwestern western willow flycatcher surveys, demography, and ecology along the lower Colorado River and its tributaries, 2003. Annual report submitted to U.S. Bureau of Reclamation, Boulder City, NV. SWCA Enviormental Consultants, Flagstaff, AZ. 124 pp.

Martin, T.E., C. Paine, C.J. Conway, W.M. Hochachka, P. Allen, and W. Jenkins. 1997. BBIRD Field Protocol. Biological Resources Division, Montana Cooperative Wildlife Research Unit. Missoula, Montana. 64 pp.

Mayfield, H.F. 1961. Nesting success calculated from exposure. Wilson Bulletin 73:255-261.

_____. 1975. Suggestions for calculating nest success. Wilson Bulletin 87:456-466.

McCarthey, T.D., C.E. Paradzick, J.W. Rourke, M.W. Sumner, and R.F. Davidson. 1998. Arizona Partners in Flight southwestern willow flycatcher 1997 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 130. Arizona Game and Fish Department, Phoenix, Arizona. 81 pp.

Muiznieks, B.M., T.E. Corman, S.J. Sferra, M.K. Sogge, and T.J. Tibbitts. 1994. Arizona Partners in Flight 1993 southwestern willow flycatcher survey. Nongame and Endangered Wildlife Program Technical Report 52. Arizona Game and Fish Department, Phoenix, Arizona. 29 pp.

Newell, P.J., E.H. Paxton, and M.K. Sogge. 2003. Survivorship and movements of southwestern willow flycatchers at Roosevelt Lake, Arizona – 2003. U.S. Geological Survey Report to the U.S. Bureau of Reclimation, Phoenix, Arizona. 53pp.

Owen, J.C. and M.K. Sogge. 2002. Physiological condition of Southwestern Willow Flycatchers in native and saltcedar habitats. USGS report to the Arizona Department of Transportation, Phoenix, Arizona. 27 pp.

Paradzick, C.E., R.F. Davidson, J.W. Rourke, M.W. Sumner, and T.D. McCarthey. 1999. Southwestern willow flycatcher 1998 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 141. Arizona Game and Fish Department, Phoenix, Arizona. 95 pp.

_____, R.F. Davidson, J.W. Rourke, M.W. Sumner, A. M. Wartell, and T.D. McCarthey. 2000. Southwestern willow flycatcher 1999 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 151. Arizona Game and Fish Department, Phoenix, Arizona. 93 pp.

_____, T.D. McCarthey, R.F. Davidson, J.W. Rourke, M.W. Sumner, and A.B. Smith. 2001. Southwestern willow flycatcher 2000 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 175. Arizona Game and Fish Department, Phoenix, Arizona. 93 pp.

Paxton, E., J. Owen, and M.K. Sogge. 1996. Southwestern willow flycatcher response to catastrophic habitat loss. U.S. Geological Survey report to the U.S. Bureau of Reclamation, Phoenix, Arizona. 12 pp.

Pease, C.M. and J.A. Grzybowski. 1995. Assessing the consequences of brood parasitism and nest predation on seasonal fecundity in passerine birds. Auk 112:343-363.

Phillips, A. 1948. Geographic variation in *Empidonax traillii*. Auk 65:507-514.

Rourke, J.W., T.D. McCarthey, R.F. Davidson, and A.M. Santaniello. 1999. Southwestern willow flycatcher nest monitoring protocol. Nongame and Endangered Wildlife Program Technical Report 144. Arizona Game and Fish Department. Phoenix, Arizona. 32 pp.

Sedgwick, J.A. 2000. Willow Flycatcher (*Empidonax traillii*). In: The Birds of North America, No. 533 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.

Sferra, S.J., T.E. Corman, C.E. Paradzick, J.W. Rourke, J.A. Spencer, and M.W. Sumner. 1997. Arizona Partners in Flight southwestern willow flycatcher survey: 1993-1996 summary report. Nongame and Endangered Wildlife Program Technical Report 113. Arizona Game and Fish Department, Phoenix, Arizona. 104 pp.

_____, R.A. Meyer, and T.E. Corman. 1995. Arizona Partners in Flight 1994 southwestern willow flycatcher survey. Nongame and Endangered Wildlife Program Technical Report 69. Arizona Game and Fish Department, Phoenix, Arizona. 46 pp.

Skaggs, R.W. 1996. Population size, breeding biology, and habitat of willow flycatchers in the Cliff-Gila Valley, New Mexico, 1995. New Mexico Department of Game and Fish. Glenwood, New Mexico. 38 pp.

Smith, A.B., C.E. Paradzick, A.A. Woodward, P.E.T. Dockens, and T.D. McCarthey. 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. 63 pp.

_____, A.B., A.A. Woodward, P.E.T. Dockens, J.S. Martin, and T.D. McCarthey. 2003. Southwestern willow flycatcher 2002 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 210. Arizona Game and Fish Department, Phoenix, Arizona. 49 pp.

Sogge, M.K., R.M. Marshall, S.J. Sferra, and T.J. Tibbitts. 1997a. A southwestern willow flycatcher natural history summary and survey protocol. National Park Service Cooperative Studies Unit. USGS Colorado Plateau Research Station – Northern Arizona University. NRTR-97/12. 36 pp.

_____, T.J. Tibbitts, and J.R. Petterson. 1997b. Status and breeding ecology of the southwestern willow flycatcher in the Grand Canyon. Western Birds 28:142-157.

Spencer, J.A., S.J. Sferra, T.E. Corman, J.W. Rourke, and M.W. Sumner. 1996. Arizona Partners in Flight 1995 southwestern willow flycatcher survey. Nongame and Endangered Wildlife Program Technical Report 97. Arizona Game and Fish Department, Phoenix, Arizona. 74 pp.

SWCA, Inc. Environmental Consultants. 1997. Interim 1996 report on behavior, ecology, and nest monitoring of southwestern willow flycatchers along the Verde River, Arizona. SWCA, Inc., Environmental Consultants. Salt Lake City, Utah.

Thompson, B.C., G.E. Knadle, D.L. Brubaker, and K.S. Brubaker. 2001. Nest success is not an adequate comparative estimate of avian reproduction. Journal of Field Ornithology 726:527-536.

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

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

_____. 1992. Notice of 90-day finding on petition to list the southwestern willow flycatcher as an endangered species. September 1, 1992. Federal Register 57:39664-39668.

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

_____. 1995. Final rule determining rule determining endangered species status for the southwestern willow flycatcher. February 17, 1995. Federal Register 60(38):10694-10715.

_____. 1996. Biological opinion on operation of modified Roosevelt Dam in Gila and Maricopa counties, Arizona. July 17, 1996. Federal Register AESO 2-21-95-F-462.

_____. 1997. Final determination of critical habitat for the southwestern willow flycatcher. July 22, 1997. Federal Register 62(140):39129-39147.

Whitfield M.J. and K.M. Enos. 1996. A brown-headed cowbird control program and monitoring for the southwestern willow flycatcher, South Fork Kern River, California, 1996 Final Report. Kern River Research Center, California. 18 pp.

Wilbur, S.R. 1987. *Birds of Baja California*. University of California Press, Berkley, California.

Appendix A. Survey and detection form for Arizona willow flycatcher surveys, 2003.

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, 2003.

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)

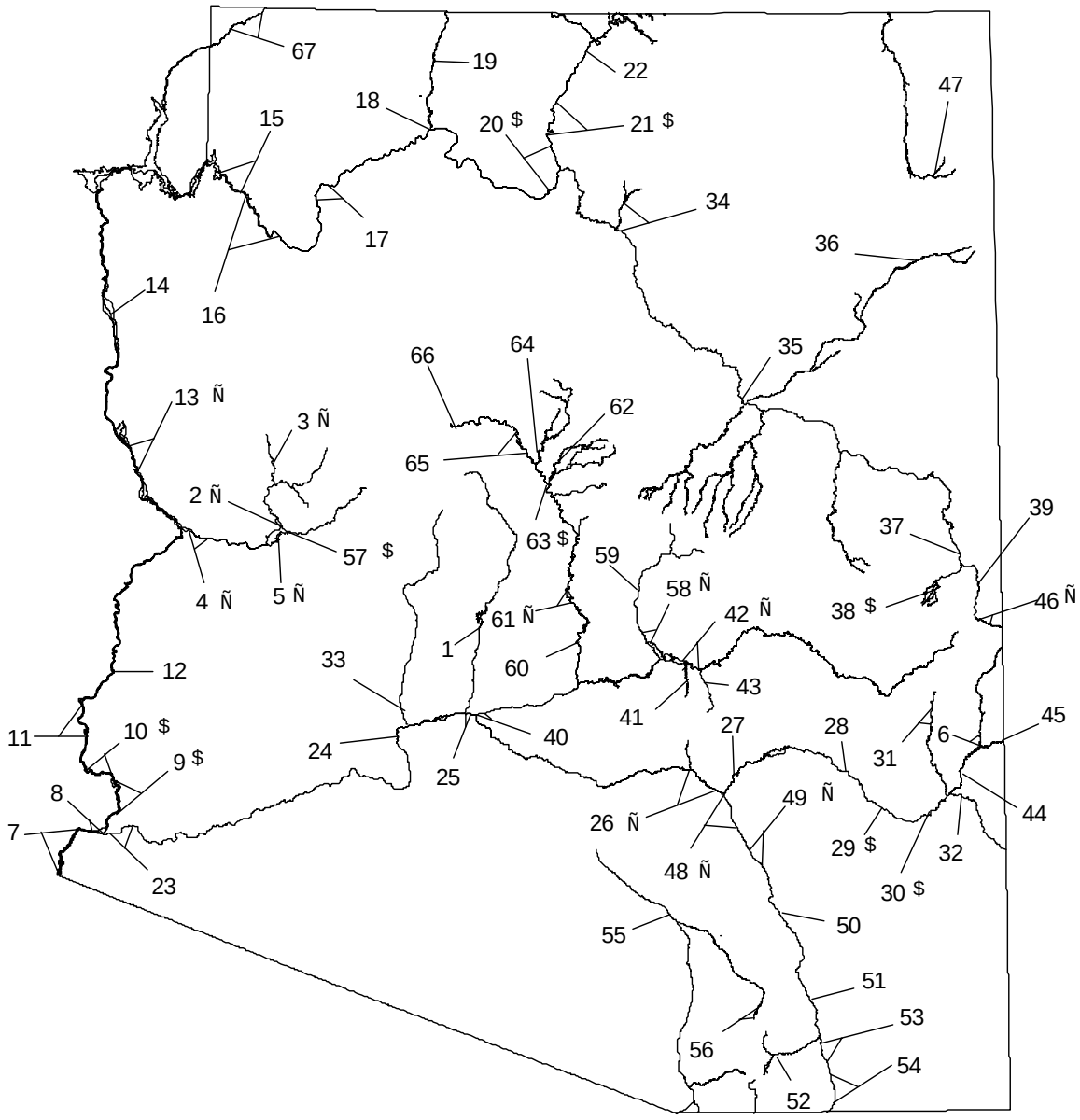
Was surface water or saturated soil present at or adjacent to the site? Yes No (circle one)
Distance from the site to surface water or saturated soil: _____ (specify units)

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, 2003. (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, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Aqua Fria River										
Waddell Dam Maricopa, 439, 8	1	5/19/03 6/17/03 7/14/03	0 0 0	0	0	0	0	0	0	Y
Morgan City Maricopa, 445, 8	1	5/19/03 6/17/03 7/14/03	0 0 0	0	0	0	0	0	0	Y
Big Sandy River										
Lower Big Sandy River Mohave, 357, 15.33	2	5/20/03 6/17/03 7/15/03	11 12 6	12	7	5	3	0	0	Y
Big Sandy River Downstream US 93 Mohave, 555, 34.75	3	Monitored 5/03 to 8/03	N/A	29	15	14	17	0	1	Y
Bill Williams River										
Bill Williams River Delta - Marsh Edge La Paz, 143, 42.24	4	Monitored 5/03 to 8/03	N/A	1	1	0	0	0	1	Y
Monkey's Head La Paz, 143, 44.34	4	Monitored 5/03 to 8/03	N/A	8	5	3	2	0	1	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Gemini La Paz, 152, 10.77	4	5/14/03 5/17/03 6/5/03 6/12/03 6/16/03 6/27/03 7/1/03 7/5/03 7/12/03 7/17/03 7/22/03	0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Cave Wash 1 La Paz, 152, 28.45	4	5/15/03 5/16/03 6/4/03 6/5/03 6/12/03 6/16/03 6/18/03 6/27/03 7/1/03 7/1/03 7/5/03 7/11/03 7/17/03 7/22/03	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Cave Wash 2 La Paz, 152, 4.84	4	5/16/03 6/5/03 7/1/03	1 0 0	0	0	0	0	0	1	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Buckskin La Paz, 174, 24.62	4	5/16/03 6/6/03 6/13/03 6/19/03 6/27/03 7/1/03 7/5/03 7/12/03 7/17/03 7/22/03	0 1 0 0 0 0 0 0 0 0	0	0	0	0	0	1	Y
Alamo Lake - Brown's Crossing Mohave, 347, 30	5	5/19/03 5/21/03 6/16/03	26 30 43	43	24	19	15	0	0	Y
Blue River										
Confluence SF Greenlee, 1219, 2	6	5/15/03 5/20/03 6/24/03	0 0 0	0	0	0	0	0	0	Y
Pat Mesa Greenlee, 1326, 35.5	6	5/19/03 5/20/03 5/29/03 6/5/03 6/6/03 6/7/03 7/2/03 7/3/03	0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Colorado River										
Hunter's Hole Yuma, 24, 36.45	7	5/18/03 6/1/03 6/12/03 6/14/03 6/15/03 6/16/03 6/25/03 6/29/03 7/8/03 7/11/03 7/21/03 7/23/03	16 1 8 2 1 2 0 0 0 0 0 0	0	0	0	0	0	16	Y
Gadsden Pond Yuma, 26, 14.27	7	5/19/03 6/1/03 6/12/03 6/16/03 6/17/03 6/20/03 6/25/03 6/29/03 7/8/03 7/11/03 7/23/03	25 2 0 3 0 0 0 0 0 0 0	0	0	0	0	0	25	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Gadsden Bend Yuma, 30, 10.68	7	5/18/03 6/5/03 6/12/03 6/13/03 6/16/03 6/17/03 6/20/03 6/25/03 6/29/03 7/8/03 7/11/03 7/23/03	9 8 4 4 0 2 0 0 0 0 0 0	0	0	0	0	0	9	Y
County 13th St. to County 12th St. Yuma, 35, 1.7	7	5/31/03 6/17/03 7/2/03	2 0 0	0	0	0	0	0	2	Y
County 12th St. to County 11th St. Yuma, 35, 2.5	7	5/31/03 6/17/03 7/2/03	1 0 0	0	0	0	0	0	1	Y
Yuma Division Yuma, 37, 12	7	5/15/03 6/17/03 6/27/03 7/3/03 7/10/03	3 0 0 0 0	0	0	0	0	0	3	Y
Fort Yuma 1 & 2 Yuma, 38, 6.9	8	5/27/03 6/11/03	0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
2 East to Gila River Yuma, 38, 48.11	8	5/17/03 5/19/03 5/20/03 5/22/03 6/3/03 6/4/03 6/7/03 6/13/03 6/14/03 6/17/03 6/24/03 6/28/03 7/2/03 7/4/03 7/10/03 7/11/03 7/13/03 7/19/03 7/21/03 7/24/03	0 1 6 3 0 2 2 5 1 2 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	6	Y
Gila/Colorado Confluence 1 Yuma, 39, 13.4	8	5/19/03 6/3/03 6/13/03 6/24/03 6/28/03 7/3/03 7/11/03 7/14/03 7/17/03 7/24/03	1 0 1 0 0 0 0 0 0 0	0	0	0	0	0	1	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Mittry Lake Yuma, 49, 43.8	9	5/13/03 5/19/03 5/23/03 5/27/03 5/28/03 6/2/03 6/6/03 6/12/03 6/13/03 6/18/03 6/26/03 7/1/03 7/2/03 7/8/03 7/9/03 7/11/03 7/14/03 7/16/03 7/20/03 7/22/03 7/28/03 8/5/03	0 0 2 1 1 2 1 0 2 0 1 0 1 0 0 0 0 0 0 0 0 0	1[e]	1	0	0	0	2	Y
Senator Yuma, 73, 6.25	9	5/21/03 6/10/03 6/24/03 7/1/03 7/7/03	2 2 0 0 0	0	0	0	0	0	2	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Martinez Lake Yuma, 62, 57.1	9	5/15/03 5/21/03 6/2/03 6/10/03 6/11/03 6/19/03 6/27/03 6/30/03 7/3/03 7/5/03 7/8/03 7/11/03 7/13/03 7/17/03 7/22/03	1 7 0 1 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	7	Y
Cottonwood Nursery Yuma, 62, 7.5	9	5/12/03 6/2/03 6/11/03 6/14/03 6/19/03 6/26/03 6/30/03 7/3/03 7/8/03 7/11/03 7/13/03 7/17/03 7/22/03	0 0 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Clear Lake La Paz, 61, 25.3	10	5/21/03 6/2/03 6/3/03 6/11/03 6/16/03 6/26/03 6/28/03 7/1/03 7/9/03 7/15/03 7/18/03 7/22/03	1 1 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	1	Y
Picacho West La Paz, 61, 15	10	5/30/03 6/13/03 6/17/03 6/28/03 7/1/03 7/9/03 7/15/03 7/18/03 7/22/03	2 0 0 0 0 0 0 0 0	0	0	0	0	0	2	Y
Adobe Lake La Paz, 61, 22.1	10	5/29/03 5/30/03 6/12/03 6/17/03 6/25/03 6/28/03 7/2/03 7/9/03 7/16/03 7/18/03 7/22/03	2 2 3 1 0 0 1 0 0 0 0	0	0	0	0	0	1	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Hoge La Paz, 61, 12.3	10	5/29/03 5/30/03 6/12/03 6/17/03 6/26/03 6/29/03 7/2/03 7/9/03 7/10/03 7/15/03 7/18/03 7/23/03	2 2 3 1 0 0 1 0 0 0 0 0	1	1	0	0	0	1	Y
Cibola Lake La Paz, 65, 31.67	11	5/16/03 5/18/03 5/22/03 6/2/03 6/12/03 6/21/03 6/25/03 6/30/03 7/5/03 7/8/03 7/9/03 7/11/03 7/14/03 7/20/03 7/21/03 7/23/03 7/24/03 7/28/03	1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	1	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
SW of Landing Strip – Cibola La Paz, 64, 74.16	11	5/15/03 5/20/03 5/29/03 6/3/03 6/22/03 6/26/03 6/30/03 7/7/03 7/10/03 7/15/03 7/19/03 7/22/03	1 5 1 1 0 0 0 0 0 0 0 0	0	0	0	0	0	5	Y
Cibola Restoration La Paz, 70, 20	11	5/14/03 5/30/03 6/4/03 6/11/03 6/27/03 7/2/03 7/11/03 7/22/03 7/30/03 8/8/03	1 0 0 1 0 0 0 0 0 0	0	0	0	0	0	1	Y
Palo Verde La Paz, 67, 10.5	11	5/29/03 6/12/03 6/25/03 6/30/03 7/9/03	0 1 0 0 0	0	0	0	0	0	1	Y
Ehrenberg La Paz, 79, 9.49	12	5/17/03 6/20/03 6/25/03 6/30/03 7/5/03 7/9/03 7/14/03 7/20/03 7/23/03	1 0 0 0 0 0 0 0 0	0	0	0	0	0	1	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Neptune – North Lake Havasu Mohave, 136, 46.5	13	5/18/03 5/19/03 6/11/03 6/18/03 6/25/03 6/28/03 7/2/03 7/7/03 7/13/03 7/16/03 7/21/03 7/24/03	6 2 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	6	Y
Blankenship Mohave, 137, 32.9	13	5/20/03 5/29/03 6/4/03 6/11/03 6/19/03 6/25/03 6/30/03 7/10/03 7/15/03 7/22/03 7/30/03	0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Pulpit Rock Mohave, 183, 5	13	5/31/03 6/4/03 6/12/03 6/18/03 6/24/03 6/30/03 7/9/03 7/15/03 7/22/03 7/30/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Topock Marsh Mohave, 140, 209.4	13	Monitored 5/03 to 8/03	N/A	20	11	9	9	0	2	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Waterwheel Cove Mohave, 195, 83.15	14	5/14/03 5/22/03 6/5/03 6/10/03 6/17/03 6/18/03 6/27/03 7/10/03 7/17/03 7/18/03 7/25/03 8/6/03	0 0 2 0 0 0 0 0 0 0 0 2	0	0	0	0	0	2	Y
Lake Mead Delta Mohave, 366, 1.5	15	6/3/03	0	0	0	0	0	0	0	N
Miles 277.0 to 274.0 R GC Mohave, 366, 14.9	15	5/29/03 6/17/03 6/20/03 6/23/03 7/2/03 7/6/03 7/17/03 7/19/03 7/21/03 6/3/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Miles 277.0 to 273.5 L GC Mohave, 366, 15.3	15	5/22/03 5/29/03 6/3/03 6/11/03 6/17/03 6/19/03 6/20/03 6/23/03 7/2/03 7/6/03 7/17/03 7/19/03 7/21/03	0 0 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Miles 270.0 to 268.0 L GC Mohave, 372, 9.7	15	5/8/03 5/21/03 6/4/03 6/18/03 7/2/03	0 0 0 0 0	0	0	0	0	0	0	Y
Miles 268.0 to 265.0 L GC Mohave, 366, 46.3	15	5/6/03 5/7/03 5/8/03 5/20/03 5/21/03 5/31/03 5/17/03 6/3/03 6/4/03 6/5/03 6/17/03 6/18/03 6/20/03 6/23/03	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	N
Miles 268.0 to 264.0 R GC Mohave, 366, 4.4	15	7/6/03 7/9/03 7/17/03 7/19/03	0 0 0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Miles 265.0 to 263.5 L GC Mohave, 366, 8	16	5/6/03 5/20/03 6/3/03 6/17/03	0 0 0 0	0	0	0	0	0	0	Y
Miles 263.5 to 262.5 L GC Mohave, 353, 15.3	16	5/31/03 6/5/03 6/17/03 6/20/03 6/24/03 7/3/03 6/6/03 6/9/03 6/17/03 6/19/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Miles 261.2 to 260.5 R GC Mohave, 353, 4.7	16	5/30/03 6/4/03 6/18/03 6/21/03 6/24/03 7/3/03 7/7/03 7/15/03 7/19/03 7/21/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Mile 260.0 L Quartermaster GC Mohave, 384, 9.5	16	5/30/03 6/4/03 6/18/03 6/21/03 6/24/03 7/3/03 7/7/03 7/15/03 7/20/03 7/23/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Mile 259.5 R Waterfall Rapid GC Mohave, 1157, 22.15	16	5/15/03 5/31/03 6/5/03 6/18/03 6/20/03 6/21/03 6/24/03 7/3/03 7/4/03 7/7/03 7/15/03 7/20/03 7/23/03	0 0 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Miles 257.5 to 257.0 R GC Mohave, 353, 6	16	5/30/03 6/4/03 6/18/03 6/21/03 6/24/03 7/3/03 7/7/03 7/15/03 7/20/03 7/23/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Mile 252.3 R GC - Reference Point Rapid Mohave, 353, 9.6	16	5/30/03 6/2/03 6/18/03 6/21/03 6/25/03 7/4/03 7/7/03 7/18/03 7/20/03 7/22/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	N

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Mile 249.0 L Lost Creek GC Mohave, 366, 4.2	16	5/28/03 6/2/03 6/18/03 6/21/03 6/25/03 7/4/03 7/8/03 7/18/03 7/20/03 7/22/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	N
Mile 248.3 R Surprise Canyon GC Mohave, 366, 5	16	5/14/03 6/4/03 6/19/03 7/2/03	0 0 0 0	0	0	0	0	0	0	N
Mile 246.0 L GC Mohave, 372, 22.2	16	5/14/03 5/21/03 6/1/03 6/4/03 6/19/03 6/22/03 6/25/03 7/1/03 7/2/03 7/5/03 7/8/03 7/18/03 7/22/03	0 0 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	N

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Mile 243.0 L GC Mohave, 384, 9.6	16	5/28/03 6/2/03 6/19/03 6/22/03 6/25/03 7/1/03 7/5/03 7/8/03 7/18/03 7/20/03 7/22/03	0 0 0 0 0 0 0 0 1 0 0	0	0	0	0	1	0	N
Separation Canyon R GC Mohave, 327, 12.1	16	5/28/03 6/2/03 6/19/03 6/22/03 6/25/03 7/1/03 7/5/03 7/8/03 7/18/03 7/21/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	N
Mile 204.5 R Spring Canyon GC Mohave, 457, 2.51	17	6/19/03 7/10/03	0 0	0	0	0	0	0	0	N
Miles 199.0 to 196.0 R Parashant Camp GC Mohave, 488, 2.12	17	6/18/03 7/9/03	0 0	0	0	0	0	0	0	N
Miles 198.0 to 196.0 L GC Coconino, 468, 1	17	7/8/03	0	0	0	0	0	0	0	
Miles 196.0 to 191.0 R GC Mohave, 488, 0.5	17	6/17/03 7/8/03	0 0	0	0	0	0	0	0	N

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Miles 194.9 to 191.2 L GC Coconino, 472, 0.15	17	7/8/03	0	0	0	0	0	0	0	
Miles 143.5 to 143.0 R GC Mohave, 573, 1	18	7/6/03	0	0	0	0	0	0	0	N
Clear Water Spring - Kanab Creek Mohave, 1277, 17	19	5/27/03 5/28/03 6/17/03 5/15/03	0 0 0 0	0	0	0	0	0	0	N
Miles 71.3 to 71.0 L Cardenas GC Coconino, 853, 1.3	20	6/10/03 7/2/03	0 0	0	0	0	0	0	0	
Mile 65.3 L Lava Chuar GC Coconino, 853, 1.12	20	6/10/03 7/1/03	0 0	0	0	0	0	0	0	
Miles 56.5 to 56.0 R Kwagunt Marsh GC Coconino, 853, 1.67	20	6/9/03 6/30/03	0 0	0	0	0	0	0	0	N
Miles 51.5 to 50.5 L GC Coconino, 853, 8.16	20	6/8/03 6/9/03 6/29/03 6/30/03 7/17/03	2 0 0 0 2	2	1	1	0	0	0	N
Miles 46.9 to 46.6 R GC Coconino, 853, 2	21	6/8/03 6/29/03	0 0	0	0	0	0	0	0	N
Miles 43.8 to 38.8 L GC Coconino, 884, 0.3	21	6/28/03	0	0	0	0	0	0	0	

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Miles 29.0 to 28.0 L GC Coconino, 886, 4.13	21	6/6/03 6/27/03	2 2	2	1	1	1	0	0	N
Mile 5.2 R GC Coconino, 969, 1.25	22	6/5/03 6/26/03	0 0	0	0	0	0	0	0	N
Gila River										
North Gila Valley Site 1 Yuma, 41, 11.99	23	5/17/03 5/20/03 6/3/03 6/13/03 6/19/03 6/24/03 6/28/03 7/1/03 7/10/03 7/13/03 7/19/03 7/27/03	3 3 1 4 0 0 0 0 0 0 0 0	0	0	0	0	0	4	Y
Fortuna Wash Yuma, 41, 19.28	23	5/19/03 5/20/03 6/4/03 6/11/03 6/18/03 6/20/03 6/24/03 6/26/03 6/28/03 7/2/03 7/10/03 7/11/03 7/13/03 7/19/03 7/24/03	1 1 3 16 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	16	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Fortuna North Yuma, 43, 17.96	23	5/20/03 6/3/03 6/4/03 6/12/03 6/19/03 6/24/03 6/28/03 7/10/03 7/13/03 7/17/03 7/19/03 7/24/03	3 5 4 4 0 0 0 0 0 0 0 0	0	0	0	0	0	5	Y
Dome Powerline Yuma, 51, 0.75	23	5/15/03 6/17/03 7/2/03	0 0 0	0	0	0	0	0	0	N
Arlington South Maricopa, 244, 18.75	24	5/16/03 6/10/03 6/27/03 7/8/03 7/17/03	0 0 0 0 0	0	0	0	0	0	0	
Dysart Road Maricopa, , 37.25	25	5/21/03 5/22/03 6/16/03 6/17/03 6/23/03 6/24/03 6/30/03 7/1/03 7/10/03 7/11/03	1 0 0 0 0 0 0 0 0 0	0	0	0	0	0	1	Y
Gila River 123rd to 107th Ave. Maricopa, 277, 4.5	25	5/27/03 6/3/03 6/27/03 7/3/03 7/14/03	0 0 0 0 0	0	0	0	0	0	0	N

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
GRSN022 Pinal, 527, 4.25	26	5/31/03 6/10/03 6/27/03 7/3/03 7/15/03	0 0 0 0 0	0	0	0	0	0	0	N
GRN020 Pinal, 549, 2.32	26	5/19/03 6/4/03 6/24/03	0 0 0	0	0	0	0	0	0	N
GRN018 Pinal, 561, 14.5	26	Monitored 5/03 to 8/03	N/A	9	5	4	5	0	2	Y
GRS018 Pinal, 543, 9	26	Monitored 5/03 to 8/03	N/A	8	4	4	3	0	0	Y
GRS016 Pinal, 549, 10.5	26	Monitored 5/03 to 8/03	N/A	2	1	1	1	0	0	Y
GRN015 Pinal, 550, 3.75	26	5/19/03 6/3/03	0 0	0	0	0	0	0	0	Y
Kearny Pinal, 555, 17.33	26	Monitored 5/03 to 8/03	N/A	18	9	9	12	0	1	Y
GRN013 Pinal, 558, 8.3	26	5/20/03 6/3/03 6/24/03	0 0 0	0	0	0	0	0	0	Y
GRS013 Pinal, 558, 0.75	26	5/18/03	0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
GRS012 Pinal, 555, 5.32	26	Monitored 5/03 to 8/03	N/A	1	1	0	0	0	0	Y
GRS011 Pinal, 555, 2.85	26	5/17/03 6/7/03 6/23/03	0 0 0	0	0	0	0	0	0	Y
GRN010 Pinal, 573, 7.8	26	5/16/03 6/3/03 6/23/03	0 0 0	0	0	0	0	0	0	Y
GRS010 Pinal, 573, 4.15	26	5/17/03 6/8/03 6/25/03	0 0 0	0	0	0	0	0	0	Y
GRN009 Pinal, 579, 5.84	26	5/16/03 6/1/03 6/23/03	1 1 0	0	0	0	0	0	1	Y
GRN008 Pinal, 579, 5	26	5/16/03 6/1/03 6/23/03	0 0 0	0	0	0	0	0	0	Y
GRS007 Pinal, 573, 15.02	26	Monitored 5/03 to 8/03	N/A	10	5	5	3	0	0	Y
GRN004 Pinal, 585, 15	26	Monitored 5/03 to 8/03	N/A	1	1	0	0	0	0	Y
Dripping Springs Wash Gila, 621, 4.75	27	5/20/03 6/3/03 6/23/03	0 0 0	0	0	0	0	0	0	N

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Fort Thomas – Geronimo Graham, 805, 5.25	28	5/30/03 6/24/03 7/8/03	41 31 30	30	22	8	0	0	11	Y
Pima East Graham, 856, 3.5	29	5/30/03 3/23/03 7/8/03	11 0 1	2[e]	1	1	0	0	9	Y
Earven Flat Graham, 951, 4	30	5/28/03 6/25/03 7/7/03	7 4 1	4	2	2	0	0	3	Y
Double Circle Greenlee, 1457, 28.5	31	5/21/03 5/27/03 6/16/03 6/17/03 6/30/03 1/1/03	0 0 0 0 0 0	0	0	0	0	0	0	Y
7 Cross A Greenlee, 1457, 28.5	31	5/21/03 5/27/03 6/16/03 6/17/03 6/30/03 7/1/03	0 0 0 0 0 0	0	0	0	0	0	0	Y
Eagle Creek Greenlee, 1567, 28.5	31	5/21/03 5/27/03 6/16/03 6/17/03 6/30/03 7/1/03	0 0 0 0 0 0	0	0	0	0	0	0	Y
Gutherie Greenlee, 1029, 3.5	32	5/28/03 6/23/03 7/7/03	0 0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Hassayampa River										
Johnson Road Maricopa, 300, 15	33	5/31/03 6/13/03 6/30/03 7/7/03 7/14/03	0 0 0 0 0	0	0	0	0	0	0	Y
Little Colorado River										
Moenkopi Wash Coconino, 1335, 15.25	34	5/23/03 6/12/03 6/26/03 7/2/03 7/10/03	0 0 0 0 0	0	0	0	0	0	0	Y
Cameron Coconino, 1250, 18.52	34	5/22/03 6/5/03 6/24/03 7/1/03 7/16/03	1 0 0 0 0	0	0	0	0	0	1	Y
SR 87 Bridge Navajo, 1490, 15	35	5/21/03 6/13/03 6/27/03 7/3/03 7/11/03	1 0 0 0 0	0	0	0	0	0	1	Y
Hubbell Apache, 1929, 13.9	36	5/20/03 6/14/03 6/28/03 7/8/03 7/14/03	0 0 0 0 0	0	0	0	0	0	0	Y
Wenima Ranch Apache, 2042, 12.3	37	5/27/03 6/20/03 7/8/03 7/10/03	0 0 0 0	0	0	0	0	0	0	N

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Benny Creek Apache, 2499, 5.17	38	5/27/03 6/15/03 7/8/03	0 0 0	0	0	0	0	0	0	Y
River Reservoir Apache, 2499, 7	38	5/26/03 6/17/03 7/8/03	1 1 2	2	2	0	0	0	0	Y
Greer Townsite Apache, 2539, 5.5	38	5/26/03 6/17/03 7/8/03	0 0 0	0	0	0	0	0	0	Y
Nelson Reservoir Apache, 2255, 0.9	39	5/27/03 6/15/03 7/9/03	0 0 0	0	0	0	0	0	0	Y
Salt River										
Salt River 91st to 107th Ave. Maricopa, 290, 26	40	5/23/03 5/30/03 6/12/03 6/18/03 6/25/03 6/27/03 7/10/03 7/11/03 7/16/03 7/18/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Salt River 83rd Ave Maricopa, 294, 7.75	40	5/27/03 6/3/03 6/27/03 7/3/03 7/14/03	0 0 0 0 0	0	0	0	0	0	0	N
Pinto Creek Gila, 732, 14.5	41	5/23/03 6/12/03 7/12/03	0 0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Lake Shore Gila, 640, 9.6	42	Monitored 5/03 to 8/03	N/A	18	9	9	9	0	1	Y
School House Point South Gila, 640, 27.5	42	Monitored 5/03 to 8/03	N/A	13	7	6	8	0	2	Y
School House Point North Gila, 640, 243.1	42	Monitored 5/03 to 8/03	N/A	97	52	46	55	0	3	Y
Salt River Inflow Gila, 640, 90.25	42	Monitored 5/03 to 8/03	N/A	82	43	40	51	0	3	Y
Cottonwood Acres II Gila, 652, 17.2	42	5/16/03 6/4/03 6/25/03	0 0 0	0	0	0	0	0	0	Y
Cottonwood Acres I Gila, 652, 16	42	5/15/03 6/3/03 7/2/03	0 0 0	0	0	0	0	0	0	N
Meddler Point Gila, 640, 4	42	5/17/03 6/5/03 6/30/03	0 0 0	0	0	0	0	0	0	Y
Eads Wash Gila, 661, 4	42	5/17/03 6/5/03 6/30/03	0 0 0	0	0	0	0	0	0	Y
Roosevelt Diversion Dam Gila, 664, 13	42	5/15/03 6/4/03 7/3/03	0 0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Salt River at State Route 288 Bridge Gila, 668, 10.5	42	5/15/03 6/4/03 7/3/03	0 0 0	0	0	0	0	0	0	Y
Horseshoe Bend to State Route 288 Gila, 670 2.25	42	5/19/03	0	0	0	0	0	0	0	N
Pinal Creek Gila, 853, 40	43	5/16/03 6/12/03 6/26/03 7/2/03 7/8/03	0 0 0 0 0	0	0	0	0	0	0	Y
San Francisco River										
Clifton Peak Greenlee, 1058, 32.5	44	5/28/03 6/11/03 6/27/03 7/3/03 7/9/03	0 0 0 0 0	0	0	0	0	0	0	Y
White Rock Greenlee, 1219, 2	45	5/15/03 5/20/03 6/24/03	0 0 0	0	0	0	0	0	0	Y
Dix Creek Greenlee, 1234, 31	45	5/15/03 5/22/03 5/23/03 6/10/03 6/11/03 6/12/03 7/8/03	0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Alpine Horse Pasture Apache, 2414, 3.3	46	5/28/03 6/16/03 7/9/03	0 2 1	2	1	1	1	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Triangle Patch Apache, 2499, 0.65	46	5/28/03 6/16/03 7/9/03	0 0 0	0	0	0	0	0	0	Y
San Juan River										
Canyon Del Muerto Apache, 1759, 6.7	47	5/21/03 6/12/03 6/30/03 7/9/03 7/17/03	0 0 0 0 0	0	0	0	0	0	0	N
San Pedro River										
CB Crossing Southeast Pinal, 594, 7.08	48	5/15/03 6/6/03 6/30/03	1 0 0	0	0	0	0	0	1	Y
Indian Hills Pinal, 604, 20	48	5/19/03 6/3/03 7/8/03	0	0	0	0	0	0	0	Y
Dudleyville Crossing[f] Pinal, 604, 28.2	48	Monitored 5/03 to 8/03	N/A	12	7	5	4	0	3	Y
San Pedro River Preserve[f] *Pinal, 604, 20*	48	Monitored 5/03 to 8/03	N/A	2	2	0	0	0	3	Y
Malpais Hill Pinal, 634, 8.6	48	Monitored 5/03 to 8/03	N/A	21	11	10	10	0	0	Y
PZ Ranch Pinal, 634, 8.75	48	5/16/03 6/14/03 6/30/03	0 0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
PZ Ranch West Pinal, 634, 7.75	48	Monitored 5/03 to 8/03	N/A	6	3	3	2	0	0	Y
Cook's Lake Cienega/Seep Pinal, 643, 17.5	48	5/24/03 6/9/03 7/9/03	7 14 9	14	10	4	1	0	0	Y
Aravaipa Inflow North Pinal, 661, 33.75	48	Monitored 5/03 to 8/03	N/A	53	28	25	35	0	5	N
San Pedro/Aravaipa Confluence Pinal, 658, 28	48	Monitored 5/03 to 8/03	N/A	14	7	7	11	0	1	N
Aravaipa Inflow South Pinal, 658, 26	48	Monitored 5/03 to 8/03	N/A	10	5	5	5	0	1	Y
Wheatfields Pinal, 671, 9	48	Monitored 5/03 to 8/03	N/A	36	18	18	23	0	1	Y
Wheatfields South Pinal, 621, 8.25	48	Monitored 5/03 to 8/03	N/A	4	2	2	3	0	0	Y
Capgage Wash Pinal, 681, 12.66	48	5/18/03 6/3/03 6/23/03	0 0 0	0	0	0	0	0	0	Y
San Manuel Crossing Pinal, 780, 15.08	49	Monitored 5/03 to 8/03	N/A	65	35	30	43	0	1	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Catalina Wash Pinal, 774, 16.75	49	5/18/03 5/20/03 6/10/03 6/11/03 6/24/03 7/2/03	13 11 13 11 13 10	25[e]	13	12	12	0	0	Y
Soza Wash Cochise, 914, 6.5	50	5/16/03 6/2/03 7/1/03	0 0 0	0	0	0	0	0	0	Y
Apache Powder Rd. Cochise, 1097, 32.25	51	5/15/03 5/16/03 6/12/03 6/13/03 6/26/03 6/27/03 7/8/03 7/9/03 7/14/03 7/15/03	0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y
Babocomari Cochise, 1402, 9.53	52	6/13/03 6/20/03 7/11/03	0 0 0	0	0	0	0	0	0	Y
SPRNCA – 9 Cochise, 1158, 14.67	53	6/10/03 6/23/03 7/2/03	0 0 0	0	0	0	0	0	0	Y
Charleston Bridge North Cochise, 1188, 19.13	53	6/5/03 6/10/03 6/11/03 6/18/03 6/24/03 7/1/03 7/2/03 7/3/03	0 0 0 0 0 0 0 0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Escapula Wash North Cochise, 1219, 9.17	53	6/6/03 6/19/03 7/10/03	0 0 0	0	0	0	0	0	0	Y
Escapula Wash South Cochise, 1219, 9.17	53	6/6/03 6/19/03 7/10/03	0 0 0	0	0	0	0	0	0	Y
State Route 90 Bridge Cochise, 1237, 36.83	53	6/4/03 6/9/03 6/17/03 6/26/03 7/7/03 7/8/03	0 0 0 0 0 0	0	0	0	0	0	0	Y
SPRNCA - Carr to Hunter Cochise, 1250, 17.83	54	6/9/03 6/26/03 7/7/03	0 0 0	0	0	0	0	0	0	Y
Hereford Bridge Cochise, 1265, 18.17	54	6/12/03 6/25/03 7/9/03	0 0 0	0	0	0	0	0	0	Y
SPRNCA – Palominas Cochise, 1280, 21.33	54	6/3/03 6/16/03 6/30/03	0 0 0	0	0	0	0	0	0	Y
Santa Cruz River										
Ina Bridge Pima, 658, 23	55	5/20/03 5/31/03 6/13/03 6/30/03 7/7/03 7/13/03	0 0 0 0 0 0	0	0	0	0	0	0	Y
Cienega Narrows Pima, 1227, 4	56	8/10/03	0	0	0	0	0	0	0	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Cienega Creek Pima, 1311, 21.5	56	8/1/03 8/2/03 8/3/03 8/4/03 8/6/03 8/7/03	0 0 0 0 0 0	0	0	0	0	0	0	Y
Santa Maria River										
Lower Santa Maria River Mohave, 354, 13.75	57	5/20/03 6/17/03 7/15/03	2 0 1	1	1	0	0	0	1	Y
Tonto Creek										
Orange Peel Gila, 610, 26.1	58	Monitored 5/03 to 8/03	N/A	30	15	15	20	0	1	Y
Tonto Creek Inflow Gila, 640, 39.7	58	Monitored 5/03 to 8/03	N/A	11	6	5	6	0	0	Y
A-Cross Road South Gila, 677, 11.7	58	5/16/03 6/16/03 6/25/03	0 0 0	0	0	0	0	0	0	Y
A-Cross Road North Gila, 677, 11.75	58	5/16/03 6/16/03 6/25/03	0 0 0	0	0	0	0	0	0	Y
Bar-X Road Gila, 694, 25.5	58	Monitored 5/03 to 8/03	N/A	4	2	2	2	0	0	Y
Del Shay Gila, 823, 2	59	5/24/03 5/31/03 6/3/03	2 0 0	0	0	0	0	0	2	Y

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Verde River										
Needle Rock Maricopa, 457, 5.25	60	5/16/03 6/4/03 7/2/03	0 0 0	0	0	0	0	0	0	Y
Davenport Maricopa, 576, 20.75	61	5/21/03 6/3/03 6/13/03 6/25/03 7/8/03	0 0 3 3 1	3	2	1	2	0	0	Y
Horseshoe North Yavapai, 604, 53.5	61	5/27/03 6/17/03 6/24/03 7/8/03	8 16 16 8	19[e]	11	8	5	0	0	Y
Ister Flat Yavapai, 610, 4	61	5/29/03	0	0	0	0	0	0	0	N
Stage Stop - Dry Beaver Creek Yavapai, 1103, 3.5	62	5/28/03 6/19/03 7/3/03	0 0 0	0	0	0	0	0	0	Y
Camp Verde Yavapai, 942, 1.95	63	6/10/03 6/24/03	1 2	2	2	0	0	0	0	Y
Sheepshead Canyon Yavapai, 1052, 3	64	5/29/03 6/18/03 7/2/03	0 0 0	0	0	0	0	0	0	Y
Mingus Ave - Rocking Chair Road Yavapai, 994, 10.97	65	5/23/03 6/12/03 6/24/03 7/9/03 7/16/03	0 0 0 0 0	0	0	0	0	0	0	N

Appendix C. Arizona willow flycatcher survey results by site, 2003 (map numbers correspond to Appendix B).

Sitename County, Elevation (m), Survey Hours	Map Number	Individual Surveys		Site Summary						
		Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
Tapco Yavapai, 1036, 1.33	65	5/29/03 6/15/03 6/28/03	0 0 0	0	0	0	0	0	0	N
Verde @ Powerline Yavapai, 1061, 2.75	65	5/31/03 6/17/03 7/4/03	0 0 0	0	0	0	0	0	0	N
Granite – Verde Yavapi, 1280, 9.75	66	5/15/03 5/19/03 7/10/03	0 0 0	0	0	0	0	0	0	Y
Virgin River										
Littlefield Mohave, 579, 54.9	67	5/19/03 5/21/03 6/6/03 6/10/03 6/11/03 6/18/03 6/26/03 7/3/03 7/8/03 7/15/03 7/20/03 7/25/03	1 0 0 1 0 0 0 0 0 0 0 0	0	0	0	0	0	1	Y
Black Rock Gulch Mohave, 719, 9	67	5/16/03 6/9/03 7/3/03	1 0 0	0	0	0	0	1	0	Y

[a] WIFL = adult willow flycatcher (*Empidonax trailii extimus*).

[b] 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.

[c] Maximum number of migrant willow flycatchers detected during any single survey event.

[d] BHCO = brown-headed cowbirds (*Molothrus ater*).

[e] 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. AGFD banding effort at the Winkelman Study Area, 2003

Site Banded	Date banded	Federal Bird band number	Color band left leg[f]	Color band right leg[f]	Age 2003[g]	Sex[h]
Dudleyville Crossing	05/30/03	2240-84058	WKW	DD	ASY	F
	05/30/03	2240-84059	DD	DRD	ASY	F
Malpais Hill	06/19/03	2240-84074	DD	VYV	ASY	F
PZ Ranch West	07/06/03	2240-84034[a]	DD	DZ	ASY	M
	07/09/03	2240-84086	DD	GYG	ASY	F
Aravaipa Inflow North	07/01/03	1710-20547[a]	KOK	XX	ASY	M
	05/14/03	2240-84046	DD	GY	ASY	U
	06/08/03	2240-84068	RYR	DD	ASY	F
	06/08/03	2240-84069	KYK	DD	ASY	F
	06/20/03	2240-84075	DD	DYD	ASY	F
	06/21/03	2240-84076	DD	RKR	ASY	F
	06/22/03	2240-84078	GWG	DD	ASY	F
	06/23/03	2240-84079	DD	GKG	ASY	F
	06/25/03	2240-84081	KZK	DD	ASY	F
	07/05/03	2240-84083	ZD	DD	ASY	F
	07/09/03	2240-84085	YGY	DD	ASY	F
	08/09/03	2240-84098	DZ	DD	ASY	M
Aravaipa Inflow	06/03/03	2240-84062	OKO	DD	AHY	F
	06/05/03	2240-84066	DD	KZ	AHY	F
	06/05/03	2240-84067	DD	RDR	AHY	F
	06/21/03	2240-84077	DD	KZK	ASY	F
	07/09/03	2240-84084	DD	YO	ASY	F
	07/16/03	2240-84093	DD	YZ	ASY	M
Aravaipa Inflow South	06/04/03	2240-84063	GRG	DD	SY	U
	06/04/03	2240-84064	DD	GWG	ASY	U
	06/04/03	2240-84065	KZ	DD	SY	U
	06/24/03	2240-84080	DD	KGK	ASY	F
	06/28/03	2240-84082	GKG	DD	SY	F
Wheatfields	05/15/03	2240-84047	DD	DV	SY	U
	05/24/03	2240-84054	DWD	DD	SY	F
	05/24/03	2240-84055	WRW	DD	SY	U
	05/26/03	2240-84056	DD	RYR	SY	U
	05/26/03	2240-84057	KRK	DD	ASY	F
	06/09/03	2240-84070	ZKZ	DD	ASY	F
	06/09/03	2240-84071	DD	RWR	SY	F
	06/14/03	2240-84072	DD	YVY	SY	F
	06/16/03	2240-84073	DD	GRG	ASY	F
	07/13/03	2240-84088	DD	RZ	ASY	M
	07/13/03	2240-84089	DD	ZD	ASY	M
	07/24/03	2240-84094	OZ	DD	SY	U
	08/13/03	2240-84099	RZ	DD	ASY	F
	05/17/03	2290-24269[b]	GKG	GG	AHY	U
Wheatfields South	07/12/03	2240-84087	DD	ZO	ASY	M
	08/07/03	2240-84097	DD	OWO	ASY	F
San Manuel Crossing	05/20/03	2240-84048	DD	RO	ASY	U
	05/20/03	2240-84049	OD	DD	ASY	U

Appendix D. AGFD banding effort at the Winkelman Study Area, 2003						
Site Banded	Date banded	Federal Bird band number	Color band left leg[f]	Color band right leg[f]	Age 2003[g]	Sex[h]
San Manuel Crossing	05/20/03	2240-84050	DD	VD	ASY	U
	05/20/03	2240-84051	DD	ZK	AHY	U
	05/20/03	2240-84052	DD	GZ	ASY	F
	07/15/03	2240-84090	DD	ZR	ASY	M
	07/15/03	2240-84091	YO	DD	ASY	F
	07/15/03	2240-84092	DD	ZWZ	ASY	M
	07/29/03	2240-84095	DD	ZG	ASY	F
	07/29/03	2240-84096	OK	DD	ASY	F
	05/20/03	1490-89859[c]	GKG	VV	AHY	U
Kearny Sewage Ponds	05/22/03	2240-84053	YVY	DD	ASY	U
	05/31/03	2240-84060	DD	YRY	ASY	F
GRN018	06/02/03	2240-84061	OV	DD	AHY	F
	06/28/03	2290-24294[d]	DRD	GG	AHY	M
	06/28/03	2290-24295[e]	GG	YDY	AHY	F

[a] Recapture by AZGF with a Federal Bird band, color bands were added, band number was not changed.
[b] Recapture by CPFS where the Federal Bird band was changed and color bands were added. Originally banded as 1590-97287.
[c] Recapture by CPFS where the Federal Bird band was changed and color bands were added. Originally banded as 1590-92788.
[d] Recapture by CPFS where the Federal Bird band was changed and color bands were added. Originally banded as 1590-97286.
[e] New captured by CPFS
[f] Color band color codes: D = Blue, X = Silver, G = Green, K = Black, O = Orange, R = Red, V= Violet, W= White, Y = Yellow, and Z = Gold
[g] Age: SY = 2 years, AHY = 2 years or older, ASY = 3 years or older
[h] Sex: F = female, M = male, U = unknown

Appendix E. Habitat measurements recorded at willow flycatcher nests located in AGFD study areas in Arizona, 2003.

	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]	26			
Mean ± s	4.94 ± 1.78	7.67 ± 2.15	8.07 ± 4.57	112.38 ± 108.84
Median	4.4	7.8	6.63	81.73
Minimum	2.6	4	2.5	0
Maximum	8.6	12.5	20.6	370
Salt River Study Area				
Number of nests [a]	51			
Mean ± s	3.67 ± 1.27	6.60 ± 2.41	5.52 ± 3.74	222.61 ± 139.10
Median	3.6	6.4	3.9	224.8
Minimum	1.8	2.5	1.6	7.5
Maximum	8.1	12.8	17.5	529.5
Roosevelt Lake Total				
Number of nests [a]	77			
Mean ± s	4.10 ± 1.57	6.96 ± 2.36	6.38 ± 4.19	185.39 ± 139.21
Median	4.0	6.6	5.2	186.8
Minimum	1.8	2.5	1.6	0.0
Maximum	8.6	12.8	20.6	529.5
Winkelman Study Area				
Number of nests [a]	92			
Mean ± s	4.72 ± 1.75	9.27 ± 9.36	9.46 ± 6.9	19.38 ± 64.03
Median	4.5	7.9	7.2	7.8
Minimum	1.7	3.2	1.6	0.0
Maximum	12.0	91.3	30.8	483.0

[a] Number of nests used in calculation