Southwestern Willow Flycatcher Surveys and Nest Monitoring along the Gila River between Coolidge Dam and South Butte, 2010

Prepared for

US Bureau of Reclamation, Phoenix Area Office

Prepared by

SWCA Environmental Consultants

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SOUTHWESTERN WILLOW FLYCATCHER SURVEYS AND NEST MONITORING ALONG THE GILA RIVER BETWEEN COOLIDGE DAM AND SOUTH BUTTE, 2010

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EXECUTIVE SUMMARY

The Southwestern willow flycatcher was federally listed as endangered in 1995. Probable factors contributing to population declines were believed to be loss, alteration, and fragmentation of native riparian breeding habitat, loss of wintering habitat, and brood parasitism by brown-headed cowbirds (*Molothrus ater*; USFWS 1995). Prompted by concern for population declines, from 1997 to 2007 surveys and nest monitoring were conducted along the Gila River by the Arizona Game and Fish Department under a cooperative agreement with the U.S. Bureau of Reclamation. From 2008 to 2010, Reclamation contracted SWCA Environmental Consultants to continue to survey and monitor the Gila River downstream of Coolidge Dam to document flycatcher abundance and distribution in relation to Coolidge Dam operations. Results of the 2010 survey and nest monitoring effort are summarized in this report.

In 2010, we used recorded broadcasts of willow flycatcher song and calls to elicit responses from willow flycatchers at 51 sites along the Gila River, Arizona, from Dripping Springs Wash to South Butte. We spent 193 hours surveying the sites covering approximately 92 linear km of riparian habitat. We detected 133 flycatcher pairs that had a total of 206 nesting attempts at 24 sites; 177 nests were monitored to determine annual flycatcher productivity. Of nests with known outcomes, 64% were successful. Mayfield nest success was 62%.

We estimated 176 young fledged from 110 nests. Average seasonal flycatcher fecundity was 2.82 and average seasonal productivity was 1.89. Brown-headed Cowbird parasitism was low (1%) and was documented for the second consecutive year after not being documented since 2004. Nesting substrate was documented for 202 nests, with tamarisk the primary nesting substrate documented (195 nests).

We continued and expanded upon streamflow analyses conducted from 1998 to 2009 by Weddle et al. (2007) and Graber and Koronkiewicz (2009, 2010). We found that increased streamflow positively correlated with flycatcher numbers within the study area. Specifically, we found that increased streamflow from April–May of the previous year and streamflow from the beginning of the previous monsoon season to the beginning of the flycatcher breeding season (July–April) had the strongest relationships to the number of flycatcher territories from 1998–2010 at the Gila River study area.

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INTRODUCTION

PROJECT HISTORY

The Southwestern willow flycatcher (*Empidonax traillii extimus*; hereafter, flycatcher) was listed as endangered in 1995 (USFWS 1995). Critical habitat—designated in 1997 (USFWS 1997) and again in 2005 (USFWS 2005)—is currently under review (Center for Biological Diversity 2010). A recovery plan was published in 2002 (USFWS 2002).

From 1996 to 2005, the Arizona Game and Fish Department (AGFD) conducted flycatcher surveys and nest monitoring along the Gila and San Pedro Rivers and Roosevelt Lake as part of a long-term demographic study under a cooperative agreement with the U.S. Bureau of Reclamation (Reclamation) regarding the 1996 Biological Opinion on Roosevelt Dam (USFWS 1996). At the request of Reclamation, this effort continued in 2006, with the exception that no studies were conducted along the San Pedro River and nest monitoring effort was reduced along the Gila River. In 2007, AGFD did not conduct studies along the San Pedro River or Roosevelt Lake, and nest monitoring effort along the Gila was similar to 2006. From 2008 to 2010, Reclamation contracted SWCA Environmental Consultants (SWCA) to continue to survey and monitor the Gila River downstream of Coolidge Dam to document flycatcher abundance and distribution in relation to Coolidge Dam operations. These surveys provide Reclamation with baseline flycatcher abundance and distribution data. Results of the 2010 survey and nest monitoring effort are summarized in this report.

This document serves as a summary report for 2010 studies, including: 1) surveys and area searches: the systematic search of riparian habitat to record the presence/absence and abundance of flycatchers; and 2) nest monitoring: the estimation of flycatcher nest success and productivity. SWCA's contract specifies the following field tasks:

At approximately 50 sites, complete the following:

a. surveys of suitable and potentially suitable habitat (where landowner permission can be obtained);
b. presence/absence surveys, as recommended in the U.S. Fish and Wildlife Service (USFWS) Southwestern willow flycatcher survey protocol (USFWS 2000), and general survey methods outlined in Sogge et al. (2010);
c. resighting, determining whether flycatchers are color banded, and recording color combinations (as per permitting requirements);
d. nest searches (if territorial flycatchers are located) and monitoring; calculation of Mayfield nest success (Mayfield 1961, 1975) for the study area;
e. documentation of the presence/absence of brown-headed cowbirds (*Molothrus ater*) at survey sites;
f. general site descriptions for each site, recording and providing all required information on standardized survey and detection forms;
g. documentation of regeneration and/or loss of flycatcher habitat, highlighting the response of flycatchers to habitat change;
h. acquisition of photo points at a subset of known flycatcher breeding sites to further examine future losses and /or regeneration of habitat, and any corresponding fluctuations in flycatcher numbers; and
i. compilation of all data into an annual report.

SPECIES INTRODUCTION

The Southwestern willow flycatcher is one of four subspecies of willow flycatcher currently recognized (Unitt 1987), although Browning (1993) posits a fifth subspecies (*E. t. campestris*) occurring in the central portions of the United States (Figure 1). The Southwestern willow flycatcher breeds in dense, mesic riparian habitats at scattered, isolated sites in New Mexico, Arizona, southern California, southern Nevada, southern Utah, southwestern Colorado, and, at least historically, extreme northwestern Mexico and western Texas (Unitt 1987). While other subspecies of willow flycatcher may breed away from surface water (Bent 1942, King 1955, McCabe 1991), the Southwestern subspecies only breeds near surface water or saturated soil along rivers and streams, reservoirs, cienegas, and other wetlands (Sogge and Marshall 2000; USFWS 2002, 2005; Allison et al. 2003).

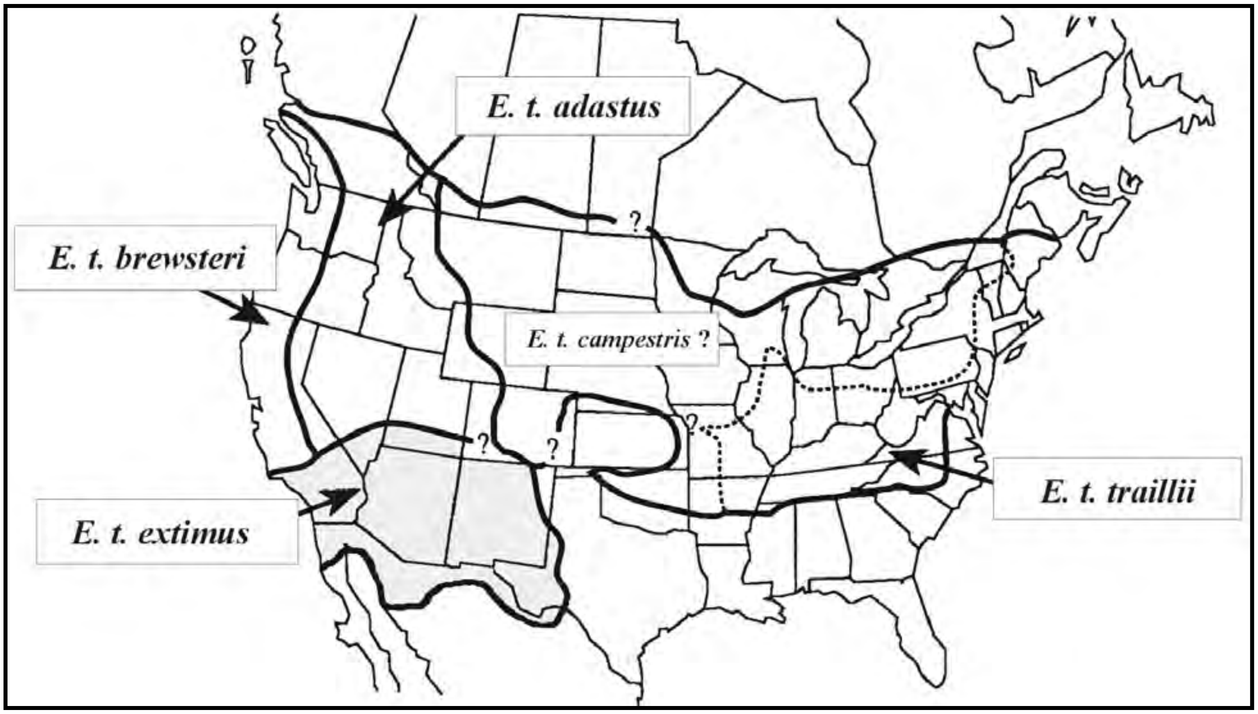

Figure 1. Breeding distribution of willow flycatcher subspecies. Question marks represent areas where actual location of the subspecies boundary is unknown. Adapted from Unitt (1987), Browning (1993), and Paxton (2008).

In the Southwest, most willow flycatcher breeding territories are found within small breeding sites containing five or fewer territories. As of 2007, 1,300 territories were estimated—distributed among 280 sites (Durst et al. 2008). One of the last long-distance Neotropical migrants to arrive in North America in spring, southwestern willow flycatchers have a short, approximately 100-day breeding season, with individuals typically arriving in May or June and departing in August or September (Sogge et al. 2010). All four subspecies of willow flycatchers spend the non-breeding season in portions of southern Mexico, Central America, and northwestern South America (Stiles and Skutch 1989, Ridgely and Tudor 1994, Howell and Webb 1995, Unitt 1997), with wintering ground habitat similar to the breeding grounds (Lynn et al. 2003). Willow flycatchers have been recorded on the wintering grounds from central Mexico to southern Central America as early as mid-August (Stiles and Skutch 1989, Howell and Webb 1995), and wintering, resident individuals have been recorded in southern Central America as late as the end of May (Koronkiewicz et al. 2006*b*).

METHODS

STUDY AREA

The Gila River study area (Figures 2, 3 and 4) is located approximately 20 km below San Carlos Reservoir, extending from Dripping Springs Wash (upstream of the town of Winkelman) approximately 71 km downstream to South Butte and the Ashurst-Hayden Diversion Dam. Flows are variable on the Gila River, regulated by releases from Coolidge Dam and natural inflows from the San Pedro River. The Gila Water Commissioner is appointed by the U.S. District Court to administer the Globe Equity 59 Decree which controls use of the waters of the Gila River in the reach from above Virden, New Mexico downstream to the confluence with the Salt River west of Phoenix. The San Carlos Irrigation Project controls releases from Coolidge Dam based on downstream water orders. Flycatcher breeding season (April–August) streamflow below Coolidge Dam averaged 525 cubic feet per second (cfs) from 1996–2001, but from 2002–2004 periods of little or no streamflow (average of 81 cfs) were recorded due to drought conditions and Central Arizona Project water exchanges (Weddle et al. 2007). From 2005 to present, streamflow has averaged 591 cfs during the breeding season (USGS 2010). Riparian habitat within the study area varies from monotypic tamarisk (*Tamarix* spp.) to mixed exotic/native vegetation (primarily tamarisk, Goodding's willow [*Salix gooddingii*], and Fremont cottonwood [*Populus fremontii*]). Riparian habitat is surrounded by Arizona Upland, a subdivision of the Sonoron Desertscrub biome (Turner and Brown 1994). The study area is subdivided into survey sites of distinct habitat patches 0.18–9.69 km in length. Elevation at survey sites range from 485 m to 622 m and average canopy height ranges from 5 to 9 m.

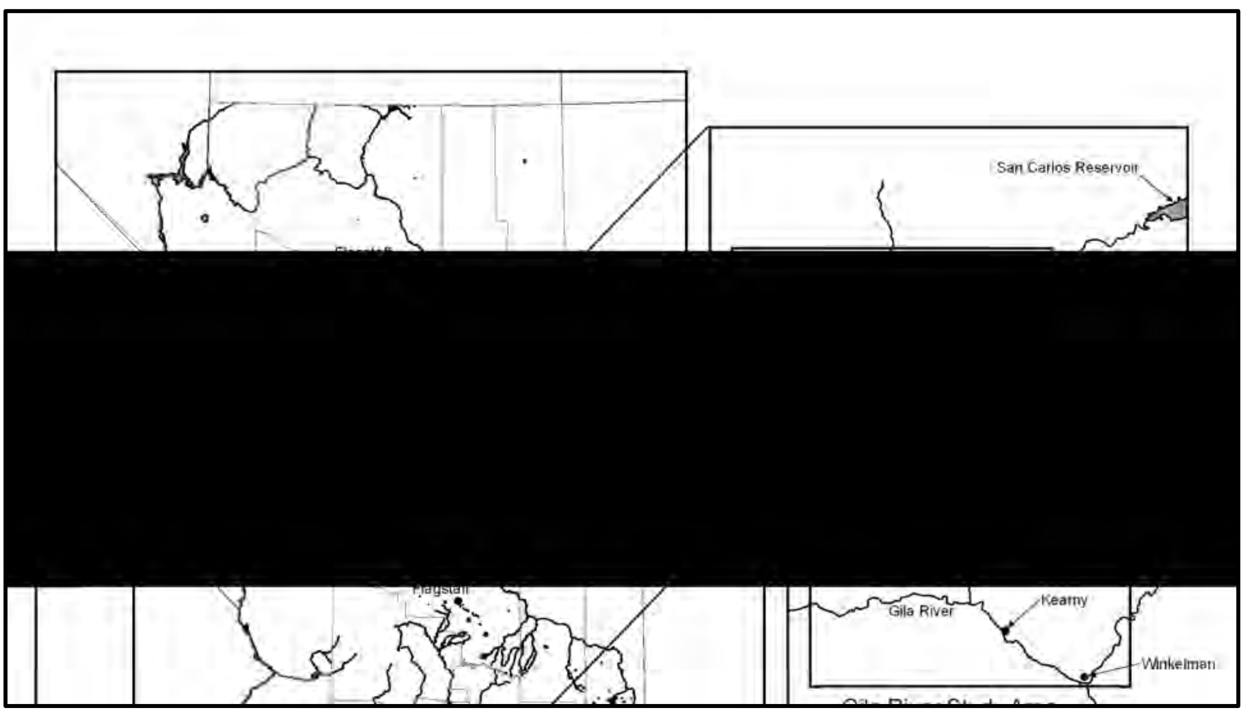

Figure 2. Project Area for 2010 Southwestern Willow Flycatcher Surveys, Gila River, Arizona.

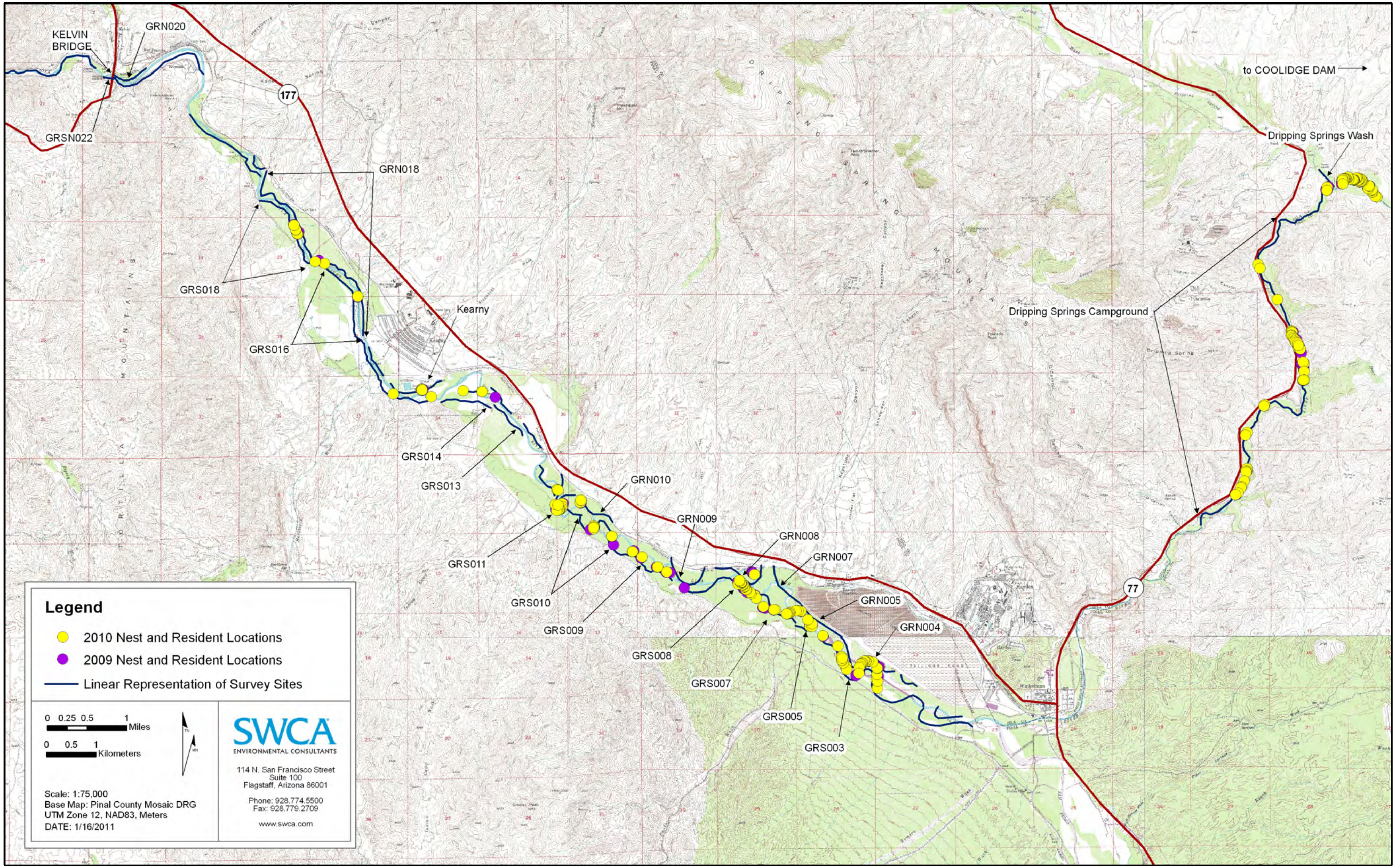

Figure 3. Gila River Study Area between Dripping Springs Wash and the Kelvin Bridge depicting 2009 and 2010 flycatcher nest and resident locations

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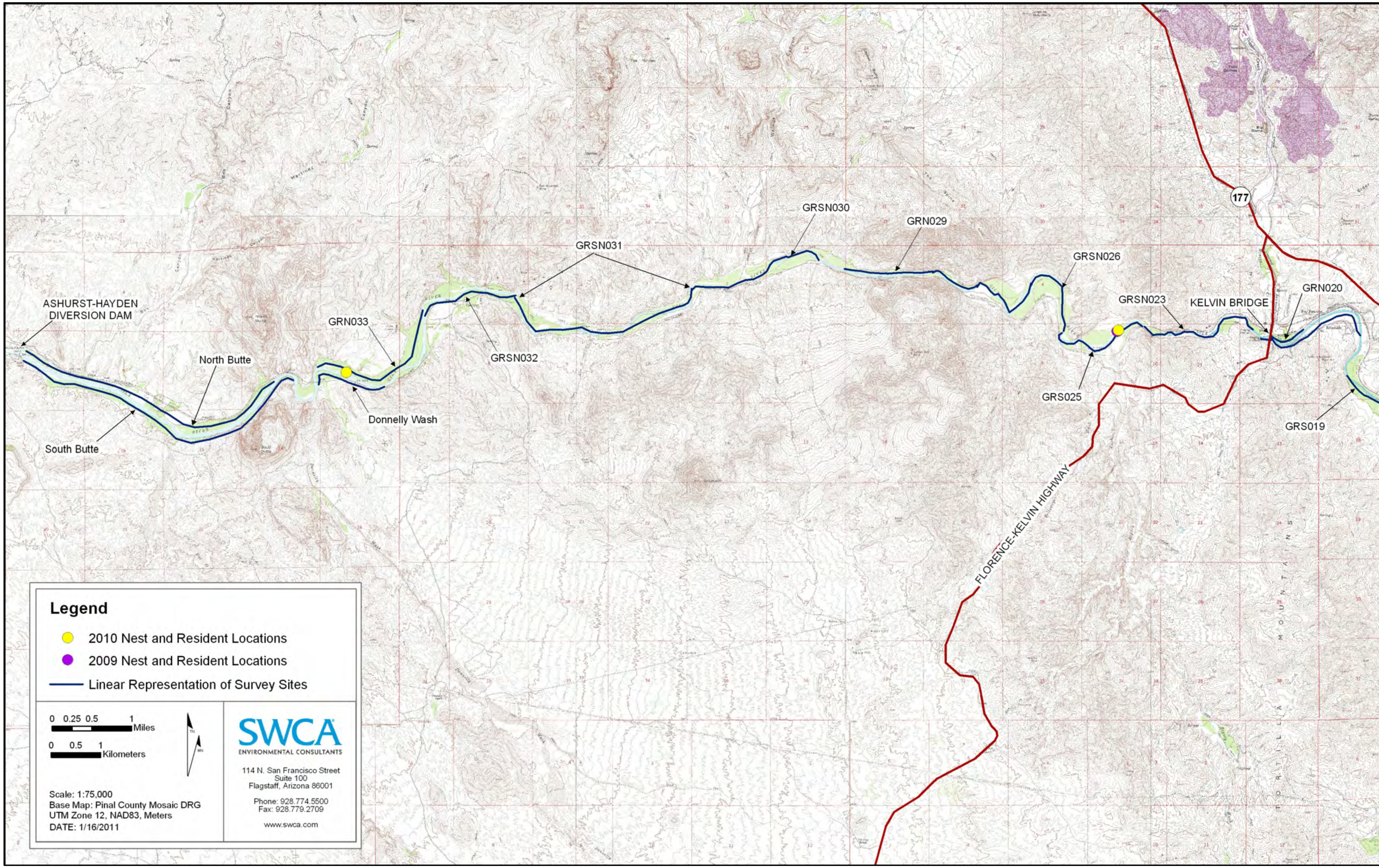

Figure 4. Gila River Study Area between the Kelvin Bridge and the Ashurst-Hayden Diversion Dam depicting 2009 and 2010 flycatcher nest land resident locations.

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SURVEYS

Site Selection

Prior to the initiation of field studies, Reclamation sends letters to private landowners requesting access prior to each flycatcher breeding season. Landowner permission was acquired for all survey sites prior to the 2010 breeding season.

In coordination with Reclamation, survey sites were evaluated and selected using a combination of existing knowledge, field reconnaissance, and high-resolution aerial photographs. Surveys were not conducted in habitat determined to be unsuitable for flycatchers after initial field reconnaissance. All sites within the project area were visited at least once, with habitat assessments conducted to determine suitability for flycatchers. Sites were determined to be unsuitable if vegetation clearly lacked the structural complexity necessary to support flycatchers (e.g., vegetation was dead or habitat was too narrow, such as 1–2 trees wide with sparse foliage). Sites consisting of mature native or exotic woody riparian vegetation with high canopy closure (>50%) and standing water or saturated soil under or adjacent to the vegetation were considered to be the most suitable habitats for flycatchers. Early successional stands of young riparian vegetation >3 m in height in proximity to surface water or saturated soil were also considered suitable flycatcher habitat.

Survey Technique

Unless sites were inaccessible by foot or boat (e.g., low streamflows, flooding), we completed a minimum of three broadcast surveys at each site deemed potentially suitable, as recommended in the USFWS Southwestern Willow Flycatcher Protocol (USFWS 2000), and general survey methods outlined in Sogge et al. (2010). We completed at least one survey between 15 and 31 May, at least one survey between 1 and 21 June, and at least one survey between 22 June and 17 July. All surveys were spaced a minimum of 5 days apart. We conducted additional site visits as needed to determine territory numbers and locations, and the presence of pairs.

To minimize time-of-day effect (i.e., varying rates of detectability due to changes in activity levels or other behavioral traits) surveys were conducted primarily between 60 minutes before sunrise and 10:00 am and we used broadcasts of recorded conspecific vocalizations to elicit responses from flycatchers. The standard broadcast used for flycatcher surveys consisted of a series of *fitz-bew* (primary song) and *britt* calls. The call sequence at each survey point consisted of a 10-20 second pre-broadcast listening period, a 15-30 second broadcast period, and a 1-2 minute listening period. Additional vocalizations (*whitt*, *wheeo*, *brrr/kitter*, and interaction calls) were also included on the survey recording. These vocalizations were used to try to elicit a *fitz-bew* response, which was used to confirm the bird as a willow flycatcher, from *Empidonax* flycatchers that were silent or that had not given a diagnostic *fitz-bew* call (Sogge et al. 2010). Wherever possible, surveys were conducted from the interior of the site, with broadcasts occurring approximately every 30 meters. In the few cases where surveys within the site were difficult or inefficient because of extremely dense vegetation, surveys occurred along the periphery of the site.

Field personnel combined walking and boat (kayak) survey transects in all potentially suitable flycatcher habitats adjacent to and on the terrace above the Gila River. Sites away from the river's edge were surveyed by foot alone, sites with substantial interior habitat as well as habitat adjacent to the river were surveyed by foot and by boat, and sites consisting of only narrow and linear riparian vegetation (3–6 trees wide) along the river were surveyed by boat alone (for site locations see Appendix H enclosed on CD).

For broadcast surveys conducted by boat, fast-moving current in some areas precluded broadcasts every 30 meters; however, survey coverage was increased by increasing the number of site visits.

Although we attempted to locate all flycatchers within the Gila River study area, detection of all individuals is not the goal of the standardized survey protocol; the goal is to determine presence or absence and breeding status of flycatchers at a site. Detection probability may vary temporally, spatially, and with level of survey effort (Rosenstock et al. 2002, Thompson 2002). Therefore, our numbers may not reflect all individuals present in the population. By combining standardized surveys with territory/nest monitoring (see 'Nest Monitoring' methods below) with the expanded goal of determining distribution and abundance at the study area, our results are more detailed (i.e., higher detection probability) relative to the majority of other surveys conducted in the flycatcher's range. Combining methods allows for comparisons or territory, lone male, and pair numbers in 2010 with previous years of this study.

Flycatcher Residency and Breeding Status

When a willow flycatcher was detected, field personnel attempted to locate the bird visually, focusing on determining whether the bird had leg bands, and recording the band combination if the bird was banded. Field personnel also noted general behavior of the bird, focusing on documenting evidence of territorial and breeding behavior (e.g., extended, unsolicited song; counter-singing with a neighboring male; pair interaction twitter calls or presence of an unchallenged flycatcher within a known male territory [indicating female present]; soft *whitt* calls between two flycatchers; or any behavior that would indicate nesting, such as a flycatcher repeatedly *whitting* in a specific location or carrying nesting material or food). Field personnel recorded the GPS coordinates of each flycatcher detected, or, if the location of the flycatcher was not accessible, the location of the observer along with distance and direction to the responding bird; a flag was also placed in a visible location for ease in locating the territory in subsequent visits. Wherever a territorial flycatcher was detected, further visits to that area focused on territory and nest monitoring (see below). Broadcast surveys were not conducted in that immediate area to minimize disturbance to known territorial or breeding birds. We continued to survey portions of a site not determined to be occupied by territorial flycatchers.

Flycatchers were considered territorial or resident within a site if detected within the 15 June and 20 July "residency window", regardless of whether a possible or known mate was observed. Additionally, flycatchers were considered territorial if observations of nesting activity or nests were found before or after the "residency window". Flycatchers documented prior to 15 June, but not detected in subsequent visits were considered migrants[1]. Flycatchers detected during the first few days of the "residency window" were also considered migrants based on additional field observations (i.e., they were not seen on repeated visits). An "unknown" designation was given to birds if not enough information was available to determine resident or migrant status or if questions arose regarding inability to distinguish neighboring territories[2]. In instances where polygyny[3] was detected, we considered each female to be a distinct "territory".

[1] This definition for "migrant" could also include resident floaters (non-territorial adults) or adults that are later detected as residents in the study area at a different location after they settle at a site.
[2] This definition for "unknown" could also include resident floaters or territorial flycatchers detected outside the bounds of their known territory.
[3] Polygyny was defined as one male associated with two or more nesting females; the presence of only one male in the female territories was confirmed throughout multiple nest monitoring visits.

Site Descriptions

For each survey site, surveyors recorded and provided all required information on standardized USFWS-approved survey and detection forms (Sogge et al. 2010; Appendix A). Surveyors recorded the overall vegetation type of the site (native broadleaf, >90% native; mixed native and exotic, 50–90% native; mixed exotic and native, 50–90% exotic; or exotic, >90% exotic); management authority, entity, or owner of survey site; length of area surveyed; 2–3 predominant trees/shrubs; average canopy height; and potential threats to flycatcher habitat and breeding activities. Site descriptions included a detailed narrative description of the site and surrounding areas. Surveyors also noted potential threats to flycatcher habitat and breeding activities (e.g., presence of livestock, brown-headed cowbirds, or tamarisk beetles [*Diorhabda* spp.]).

Interim Survey Updates

At the end of each of the three survey periods, we submitted typewritten reports summarizing all field and post-field activities to Reclamation. These reports were in the form of an e-mail field update and summarized flycatcher detections, residency, and breeding data by site, as well as reporting notable bird sightings and any issues or concerns (e.g., loss of sites due to fire).

Survey Data

All survey data were recorded on standardized USFWS-approved survey and detection forms (Appendix A). Site names remained consistent with those used during previous years of the study, and all sites were geographically defined using start and stop UTM coordinates and previously used site codes and names. Copies of completed survey and detection forms were submitted to USFWS and AGFD (enclosed on CD; Appendix H).

NEST MONITORING

Nest Monitoring Technique

Once a territorial flycatcher was detected as part of surveys, territory and nest monitoring commenced following methods described by Rourke et al. (1999) and Martin et al. (1997). In general, territories consisting only of a lone male were monitored every 4 days, whereas territories consisting of pairs were monitored every 2-8 days, depending on nest stage and logistics. Nests were located primarily by observing adult flycatchers return to a nest or by systematically searching suspected nest sites (most often indicated by *whitts* or pair interaction twitter calls). Nest stage was generally determined by observing female behavior from a distance with binoculars—such observations allowed us to narrow down stages to early building, late building or laying, incubation, young nestling (< 8 days old), and old nestling (> 8 days old). Observing nests from afar reduced the risk of depredation (Martin et al. 1997), brood parasitism by the brown-headed cowbird, and premature fledging of young (Rourke et al. 1999). During incubation and after hatching, specific nest contents (i.e., number of eggs, number and age of nestlings) were observed directly using a telescoping mirror pole to determine nest contents and transition dates unless nestling(s) > 8 days old were expected based on previous nest monitoring visits or observed from afar when the nest was found. Nest monitoring during nest building and egg laying stages was limited—if the pre-incubation stage was unclear (i.e., late building or laying), nests were checked quickly when the female was out-of-sight—to reduce the chance of abandonment during these periods. Nests too high to be monitored with a mirror pole were observed with binoculars, and adult behavior, along with observation of any young in the nest, were used to determine nest stage. If no activity was observed at a previously occupied nest, the nest was checked directly to determine nest contents and cause of failure. If no activity was observed at a nest close to or on the estimated fledge date, we conducted a systematic search of the area to locate possible fledglings.

A nest was considered successful if any of four conditions were 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 (feeding trips, defensive behavior, and/or adults agitated) when the nest was empty; or 4) nestlings were observed in the nest within two days of the estimated fledge date (Rourke et al. 1999). Condition four was not upheld if subsequent visits to the territory provided evidence that fledging did not occur. Two of the four conditions for success (3 and 4) could lead to overestimates of nest success; however not including these conditions could lead to underestimates. To minimize differences between actual and predicted nest fates, we made every attempt to locate fledglings during follow up visits and planned visits around estimated fledge dates.

A nest was considered failed if any of six outcomes were documented: 1) depredated: the nest was found empty or destroyed more than two days prior to the estimated fledge date; 2) parasitized: the nest fledged no flycatcher young but contained cowbird eggs or young; 3) deserted: the nest was deserted with eggs remaining; 4) abandoned: the nest was abandoned prior to documented egg laying; 5) weather: the nest was destroyed, eggs addled, or nestlings dead due to storm, flooding, fire, or heat exposure; or 6) infertile: the entire clutch was incubated unsuccessfully for more than 20 days. An “unknown outcome” was designated if success or failure could not be determined. All failed nests were inspected to determine the condition of the nest and to record the presence of eggs, eggshells, or dead nestlings in or around the nest. These data were used to aid in determining the stage and cause of nest failure.

Mayfield nest success (Mayfield 1961, 1975) was calculated for the study area. Exposure days were determined using the midpoint method for failed and successful nests and the last active date for nests of unknown fate, because this method has been demonstrated to provide the least biased Mayfield estimate (Manolis et al. 2000).

We calculated female productivity and fecundity for the study area. We excluded females that 1) were not monitored consistently prior to 11 June, and/or 2) had a first nesting attempt with an estimated first-egg day after 11 June. Excluding these females provided a sub-sample for which we could be confident that no first successful nesting attempts were missed. We used an 11 June cutoff date because Ellis et al. (2008) reported 10 June ± 1.2 days as a 10-year mean first-egg day for first nesting attempts (Ellis et al.’s [2008] study included Gila and San Pedro rivers and Roosevelt Lake populations). Ellis et al. (2008) reported 12 June as the earliest fledge date in their long-term study.

Nest Monitoring Data

All nest monitoring data were recorded on standardized data sheets (territory/nest record forms; Appendix A). Site names remained consistent with those used during previous years of the study, and all nest locations were recorded using UTM coordinates. Copies of the territory/nest record forms were submitted to USFWS and AGFD.

DOCUMENTATION OF REGENERATION AND LOSS OF FLYCATCHER HABITAT

For several years, documentation of the regeneration and loss of flycatcher habitat within the project area has been a part of annual reporting (see Graber et al. 2007, Weddle et al. 2007, Graber and Koronkiewicz

2009, 2010). We followed up on these topics, highlighting the response of flycatchers to any habitat change within the project area. In 2008, we implemented photo points at a subset of known flycatcher breeding sites to further examine future losses and regeneration of habitat and corresponding fluctuations in flycatcher numbers. In 2009 and 2010, we continued this effort (see Appendix I enclosed on CD).

HYDROLOGICAL CHARACTERISTICS

Per the methods of Weddle et al. (2007), we evaluated the influence of variation in streamflow on the abundance of flycatchers in the Gila River study area. This enabled comparisons of hydrological and flycatcher occupancy data from previous years of study (1998–2009) within the study area with 2010 data. We performed a series of linear regressions on the number of flycatcher territories per breeding season as related to Gila River streamflow from 1998 to 2010.

Condition of habitat at the time of flycatcher settlement (late April to early June) is likely an important determining factor of flycatcher occupancy at sites. The Arizona Sonoran Desert experiences a bimodal rainfall pattern defined as a light winter and spring rainfall, a dry early summer, and heavy rainfall from July to September (Brown and Li 1996, Adams 1997, Xu et al. 2004, Diem and Brown 2006); at least 50% of this region's annual precipitation occurs between July and September (Adams 1997). Surface and ground-water availability (influenced by rainfall and dam discharge) have been found to positively affect woody and herbaceous species richness and cover on the San Pedro River near its confluence with the Gila River (Lite et al. 2005). We concur with Weddle et al. (2007) that there could be cumulative improvement of riparian habitat along the Gila River with increased streamflow prior to flycatcher settlement that could make the habitat more appealing to flycatchers and increase occupancy. However, the exact time period of increased streamflow that is important for the development and persistence of suitable flycatcher habitat is unknown. Therefore, we performed regressions on streamflow over a variety of time periods:

a. Annual streamflow (i.e., May 1997–April 1998, May 1998–April 1999, etc.);
b. Beginning of previous monsoon season to the beginning of the flycatcher breeding season (i.e., July 1997–April 1998, July 1998–April 1999, etc.);
c. Streamflow during flycatcher settlement/migration (April–June) for the current and previous year;
d. Breeding season streamflow (April–August) for the current and previous year;
e. Winter and spring streamflow (December–March);
f. Fall through winter streamflow (October–March); and
g. Fall streamflow (October–November).

We used mean monthly Gila River streamflow data collected at U.S. Geological Survey gauging stations located upstream (Gauging Station #09469500, Gila River Below Coolidge Dam; USGS 2010) and downstream (Gauging Station #09474000, Gila River at Kelvin; USGS 2010) of breeding flycatchers. When mean monthly data was not available, we calculated monthly means using daily data provided on the USGS site. Mean monthly streamflow data collected at each of the two gauging stations were averaged per month yielding combined mean monthly streamflow (Appendix B). To perform linear regressions, combined mean monthly streamflow was summed for each of the above delineations of time.

RESULTS

SURVEYS, DETECTIONS, AND DISTRIBUTION

From 15 May to 12 July 2010, we spent 193 hours[4] surveying 51 sites covering approximately 92 linear km of riparian habitat. We detected 255 resident flycatchers occupying 138 territories (133 pairs) at 26 sites (Table 1; Appendix C). Resident flycatchers were detected for the first time at GRN014 and GRS004. Among sites that were surveyed in both 2009 and 2010, there was one site that had at least one resident flycatcher in 2009, but no residents in 2010 (GRS014), and six sites that had at least one resident flycatcher in 2010, but no residents in 2009 (GRN033, GRS015, GRN014, GRN011, GRN007, and GRS004). We documented cowbirds at each of the 51 survey sites. We detected migrant flycatchers at seven sites: GRN018, GRS016, GRS014, GRS010, GRN009, GRS008, and Dripping Springs Campground (Appendix C). Five of the seven sites where migrant flycatchers were detected also supported breeding flycatchers (GRN018, GRS010, GRN009, GRS008, and Dripping Springs Campground). There were four flycatchers of unknown status documented at three sites: GRN018, GRN008, and Dripping Springs Campground.

Table 1. Southwestern Willow Flycatcher Survey Effort, Detections, and Nesting Attempts at the Gila River Study Area, 2010

Survey hours	193
Sites surveyed	51
Linear km of habitat covered	92
Sites with resident flycatchers	26
Sites with documented pairs	25
Sites with documented breeding	24
Resident flycatchers	255
Territories	138
Pairs	133
Nesting attempts	206
Sites with cowbirds detected	51
Breeding sites with cowbirds detected	24

NEST MONITORING

From 15 May to 24 August 2010 we spent approximately 2,950 hours monitoring territories and nests. We documented 206 nesting attempts at 24 sites (Table 2; Appendix C); 72 nests were found in building stage, 20 in laying stage, 78 in incubation stage, 13 in nestling stage, 15 after fledging, and eight with stage unknown. Of the 206 nesting attempts, 177 nests were documented containing flycatcher eggs or nestlings and were used in calculating nest success and productivity (one nest found in incubation stage was not monitored; and therefore, not used in calculating nest success and productivity). For nests where complete clutches could be confirmed (164), mean flycatcher clutch size was 2.81 eggs. The earliest observed occurrence of egg-laying was on 20 May at Dripping Springs Campground, followed by the first

[4] Flycatchers are also detected during nest/territory monitoring visits. In 2010, we detected 96 territories during 193 hours of standardized surveys and 42 additional territories during approximately 2,982 additional hours of territory/nest monitoring.

hatching event on 3 June at the same nest. The first fledging events (two nests) were on 20 June at Dripping Springs Wash. The last documented fledging event occurred on 24 August at Dripping Springs Campground. There were five nests still active on the last day of monitoring (24 August)—each containing nestlings.

Table 2. Results of Nesting Attempts at the Gila River Study Area, 2010[5]

Site	Pairs	Nests	Successful Nests	Failed Nests	Unknown Outcome[6]
GRN033	1	0	0	0	0
GRS025	1	1	0	0	1
GRN018	1	1	1	0	0
GRS018	5	8	6	2	0
GRS015	1	1	1	0	0
Kearny	3	4	0	4	0
GRN014	1	2	1	1	0
GRS012	1	1	1	0	0
GRN011[7]	1	3	2	0	1
GRS011	7	9	4	4	1
GRN010	2	4	1	3	0
GRS010	5	7	6	1	0
GRS009	1	1	1	0	0
GRN009	3	5	3	1	1
GRS008	1	3	2	1	0
GRN008[8]	9	18	10	8	0
GRS007	3	3	2	0	1
GRN007[9]	5	8	3	3	2
GRS005	1	2	1	1	0
GRN005	4	5	4	1	0
GRS004	1	2	1	1	0
GRN004	3	5	2	2	1
GRS003	13	18	12	6	0
Dripping Springs Campground	32	50	31	18	1
Dripping Springs Wash	28	45	30	14	1
Total	**133**	**206**	**125**	**71**	**10**

[5] Includes non-monitored nests.
[6] Nests monitored for only a portion of the nesting cycle or insufficient evidence for determining outcome.
[7] A nesting pair assigned to GRS012 (territory 27) placed nests at both GRS012 and GRN011; this pair is not counted under the column for 'Pairs' for GRN011 to avoid double counting.
[8] A nesting pair assigned to GRS007 (territory 16) placed nests at both GRS007 and GRN008; this pair is not counted under the column for 'Pairs' for GRN008 to avoid double counting.
[9] A nesting pair assigned to GRS007 (territory 54) placed nests at both GRS007 and GRN007; this pair is not counted under the column for 'Pairs' for GRN007 to avoid double counting.

Nest Success

Of the 177 monitored nests, 110 (62%) fledged, 58 (33%) failed, and 9 (5%) had unknown outcomes. We were able to determine exposure days to calculate Mayfield nest survival probability (Mayfield 1961, 1975, Manolis et al. 2000) for each of the 177 monitored nests. We calculated[10] a 62% chance that a flycatcher nest fledged at least one young (Appendix D).

Depredation was the major cause of nest failure, accounting for 72% of all failed nests (Table 3). More predation events occurred in incubation (59%) than nestling stage (41%); however, several nests were depredated close to the predicted hatching date and some of the nests estimated to be in egg stage may have been in nestling stage at the time of the predation event. Specific nest predators were not identified.

Table 3. Causes of Nest Failure at the Gila River Study Area, 2010[11]

Site	Depredated	Deserted[12]	Abandoned[13]	Infertile	Weather	Other[14]
GRS018	0	0	1	0	0	1
Kearny	4	0	0	0	0	0
GRN014	0	0	0	0	0	1
GRS011	4	0	0	0	0	0
GRN010	3	0	0	0	0	0
GRS010	1	0	0	0	0	0
GRN009	1	0	0	0	0	0
GRS008	0	0	1	0	0	0
GRN008	4	0	2	0	1	1
GRN007	2	0	0	0	1	0
GRS005	1	0	0	0	0	0
GRN005	0	0	1	0	0	0
GRS004	1	0	0	0	0	0
GRN004	2	0	0	0	0	0
GRS003	4	1	0	0	0	1
Dripping Springs Campground	14	1	1	1	0	1
Dripping Springs Wash	10	1	1	0	0	2
Total	**51**	**3**	**7**	**1**	**2**	**7**

[10] Daily survival probability = 1 – (failed nests/exposure days). Survival probability for nesting period = daily survival probability$^{\text{nesting period}}$; nesting period = 28 days (Ellis et al. 2008).

[11] Includes non-monitored nests; monitored nests that failed include the "Depredated", "Deserted", "Infertile", and "Weather" categories and one nest (Dripping Springs Campground) in the "Other" category; categories defined above (Methods: Nest Monitoring, pg. 11).

[12] Nest deserted after egg-laying.

[13] Nest abandoned prior to egg-laying.

[14] Nest failed due to unknown causes or failure cannot be categorized (i.e., unclear if abandoned or depredated).

Nest and Female Productivity

We estimated 266 young fledged from 110 of 177 nests used for calculating Mayfield nest survival probability (Appendix D)—one fledgling was found dead after fledging. This fledgling total excludes those associated with nests (15) found after a fledging event (26 additional confirmed fledglings). Of the young presumed to have fledged, we were able to confirm 72% left the nest (i.e., confirmed fledglings were either seen leaving the nest, seen in the area directly around the nest, or seen associating with adults from the nest). The remaining fledglings (28%) were presumed fledged if they were siblings of confirmed fledglings (and were alive prior to the outcome determination) or the nest they were associated with met the conditions for success (e.g., defensive or feeding behavior by adults, nestlings observed two days prior to the estimated fledge date).

Average seasonal fecundity (mean fledges per monitored female) was 2.82 and average seasonal productivity (mean fledges per nesting attempt per monitored female) was 1.89. Among 73 monitored females, we documented 31 (42%) with one nesting attempt, 34 (47%) with two nesting attempts, seven (10%) with three nesting attempts, and one (1%) with four nesting attempts. Nine females (five monitored and four non-monitored) renested in the same nest cup as an earlier attempt and one monitored female placed a nest on top of a previously undetected 2010 or 2009 nest. Of the 42 females with re-nesting attempts, 22 attempted a double-brood (nesting attempt following a successful nest); 16 of the 22 double-brooded successfully (two non-monitored females also double-brooded successfully). Four of the 73 monitored females failed to fledge any young.

Parasitism

Brown-headed cowbird parasitism was documented for the second consecutive year at the Gila River study area after not being documented since 2004 (Ellis et al. 2008). Parasitism was low—detected at 2 (1%) of the 177 monitored nests. Both parasitized nests successfully fledged one flycatcher young; one of the nests also successfully fledged one cowbird young while the other nest contained an un-hatched and later broken cowbird egg. Cowbirds may have contributed to nest failures (e.g., abandonment, desertion, and depredation) at other nests but direct evidence was not found.

HABITAT AND HYDROLOGICAL CHARACTERISTICS

General vegetation characteristics at breeding sites were characterized as mixed native and exotic associations; however, the amount of tamarisk varied within and among sites. Most breeding sites were composed of dense monotypic stands of tamarisk (>90% exotic); however, territories were often situated in areas consisting of mixed native and tamarisk trees (50-90% exotic). Older breeding sites (e.g., GRS007, Kearny, and GRN018) contained mature tamarisk, Goodding's willow, and Fremont cottonwood (50-90% exotic) forming a nearly continuous closed canopy (overstory) while newer breeding sites (e.g., Dripping Springs Wash, GRS003, and GRN008) were primarily composed of dense young tamarisk lacking a mature overstory. Although vegetation composition and structure varied, all sites were adjacent to flowing or standing water during the breeding season.

Nesting Substrate Characterization

Nesting substrate was documented for 202 of the 206 nesting attempts at the Gila River study area. Tamarisk was the primary nesting substrate documented (195 nests), followed by Goodding's willow (6 nests) and baccharis (*Baccharis* spp.; 1 nest). Mean nest height was 3.6 m.

Streamflow and Number of Flycatcher Territories

All linear regressions showed a positive relationship between Gila River streamflow and the number of flycatcher territories. April–June streamflow from the previous year had the strongest relationship to the number of territories (R^2 = 0.42, t = 2.80, P = 0.02), explaining 42% of the variation in flycatcher territories from 1998 to 2010. On average, for every additional 100 cubic feet per second (cfs) there was an increase of 5.5 territories. The 10-month period from the beginning of the previous monsoon season to the beginning of the breeding season (July–April) had a fairly strong relationship to the number of territories (R^2 = 0.34, t = 2.37, P = 0.03), as did annual streamflow (May–April; R^2 = 0.32, t = 2.28, P = 0.04) and fall through winter streamflow (October–March; R^2 = 0.31, t = 2.22, P = 0.05).

Winter–spring streamflow (December–March) had a comparatively weak relationship with the number of territories (R^2 = 0.29, t = 2.11, P = 0.06). Streamflow during flycatcher settlement in spring (April–June), breeding season streamflow (April–August), and fall streamflow (October–November) had no relationship on the number of territories (R^2 = 0.16, t = 1.46, P = 0.17; R^2 = 0.15, t = 1.38, P = 0.20; R^2 = 0.21, t = 1.69, P = 0.12). Likewise, June–August streamflow from the previous breeding season had no relationship to the number of territories.

DISCUSSION

SURVEYS, DETECTIONS, AND DISTRIBUTION

Water exchanges involving the San Carlos Apache Tribe and downstream water users and planned construction activities near the Ashurst-Hayden Diversion Dam have the potential to decrease releases from Coolidge Dam that would otherwise flow downstream in the Gila River study area. Decreased Gila River streamflow can modify existing and potential flycatcher breeding habitat and therefore has the potential to modify flycatcher abundance, distribution, and nesting success (Graf et al. 2002). From 2002 to 2004, decreased releases from Coolidge Dam resulted in the Gila River drying by June each year and the number of flycatcher territories declined by nearly half each year (43% decline from 2002 to 2003, 46% decline from 2003 to 2004; Munzer et al. 2005)[15]. From 2005 to 2010, flows within the study area have been relatively consistent annually and throughout the flycatcher breeding season[16]. In 2009, June–July flows were markedly lower than that of 2005 to 2008, while in 2010 June–July flows were markedly higher than that of 2005 to 2008 (Appendix B). The number of flycatcher territories doubled from 2004 to 2005 (14 to 28 territories) and have continued to increase with 39, 62, 63, 96, and 138 territories recorded from 2006 to 2010, respectively. An overall increase of 124 flycatcher territories (886% increase) has been recorded since 2004 (Appendix E; Weddle et al. 2007, Graber and Koronkiewicz 2009, 2010) and this increase may be attributed to higher and more consistent annual flows over the past six years.

We detected more flycatcher territories in 2010 (138) than in any previous year of this study (Appendix E); previous highs were 96, 69, 63, and 62 territories detected in 2009, 1999, 2008, and 2007, respectively. In 2010, we detected resident flycatchers at 26 sites, exceeding the previous high of 21 sites occupied in 2009. Comparing sites surveyed in both 2009 and 2010, in 2010 14 sites increased in the number of territories and four sites decreased. The largest increases were at Dripping Springs Campground (increased by 12 territories), Dripping Springs Wash (increased by 10 territories), GRS003 (increased by six territories), GRN007 (increased by five territories; see this section last paragraph), and GRN005 (increased by three territories; see this section last paragraph), while the only decrease greater than one territory was at GRS008 (decreased by four territories; see 'Habitat and Hydrological Characteristics' below). One site supported at least one territory in 2009 but none in 2010 (GRS014), while six sites supported at least one territory in 2010 but none in 2009 (GRN033, GRS015, GRN014, GRN011, GRN007, and GRS004).

In 2009, we suggested three factors related to annual flycatcher distribution and abundance driving the recent pattern of population growth within the study area (there are likely other environmental and demographic factors contributing to the recent trend). Assuming annual survivorship remains constant, factors that standout include 1) increased flycatcher recruitment, 2) decreased suitable flycatcher habitat in nearby locations, and 3) continued habitat regeneration within the study area related to consistent and increased flows since 2005. An exceptionally high number of fledglings were produced last year (in 2009)—the highest number recorded in this study for the third consecutive year (Appendix D; 82 in 2007, 90 in 2008, and 176 in 2009; in 2010 we detected 266 fledglings). While dispersal of first-year flycatchers is more extensive than adult birds (Sogge et al. 2010), we assume some of these birds are contributing to the observed trend along this 71 km stretch of river. Decreased suitable flycatcher habitat has been observed in some nearby locations (personal communication, Dan Wolgast, The Nature Conservancy 2009; personal communication Celeste Andresen, The Nature Conservancy 2010). For

[15] Breeding season (April–August) mean streamflow at the Gila River study area from 2002–2004 was 81 cfs, compared to 437 cfs from 1997–2001 (see Appendix B for monthly mean data).

[16] Breeding season (April–August) mean streamflow at the Gila River study area from 2005–2010 was 591 cfs (see Appendix B for mean monthly data; USGS 2010).

example, during the 2009 and 2010 breeding seasons the San Pedro River at The Nature Conservancy's San Pedro River Preserve—directly adjacent to the Gila River study area—has been drying (atypically) by June. This drying of the river appears to be related to increased ground water pumping adjacent to the preserve. Flycatcher territories at this site have decreased by approximately 12 territories in five years (15 territories in 2005; 3 territories in 2010; English et al. 2006; personal communication, Celeste Andresen, The Nature Conservancy 2010). Similar worsening conditions at nearby locations combined with improving conditions along the Gila River study area may facilitate flycatcher immigration into the study area.

In 2010, we discovered a side channel extending from GRN005 to GRN007 that we believe has never been surveyed effectively since project initiation in 1996. This channel is hidden to the unfamiliar observer and was not navigable by boat in recent years due to debris blockage. While two territories at either end of this channel have been detected in recent years, in 2010 we detected seven new territories (nine total territories) along this channel. This is one example of being able to increase detections over time with an experienced field crew surveying the same sites year after year. We may be able to detect a handful of territories with an experienced crew; however, it is important to note that the population trend is real. If we subtract seven territories from the 2010 total, that leaves us with 131 territories—a 35 territory increase from 2009.

NEST MONITORING

In 2008, similar to AGFD's nest monitoring effort in 2007, we searched for and monitored nests only as time allowed until 31 July and therefore were unable to determine accurate flycatcher productivity metrics for the breeding season. In 2009 and 2010, we conducted intensive flycatcher nest searching and monitoring until the end of the flycatcher breeding season, allowing us to determine total number of nesting and re-nesting attempts, nest fate (success or failure), causes of nest failure, brood parasitism rate, Mayfield nest survival probabilities, seasonal fecundity, and average seasonal productivity. Intensive territory and nest monitoring in 2010 resulted in the recording of 206 flycatcher nesting attempts, more than in any previous year of this study; previous highs were 133, 95, and 94 nesting attempts detected in 2009, 2008, and 1999, respectively.

Results of several productivity measures calculated for 2010 are similar to those reported in a 10-year flycatcher study by Ellis et al. (2008): simple nest success, Mayfield nest probability, average seasonal fecundity, renesting and double-brood attempts, and hatching success. Ellis et al. (2008) reported an average 56% simple nest success over 10 years (range 24%–68%). In 2010, simple nest success was 64%. Mayfield nest survival probability over 10 years ranged from 35% to 100% (mean 62%). Mayfield nest probability in 2010 was 62%, consistent with the 10-year mean reported by Ellis et al. (2008).

Average seasonal fecundity in 2010 was 2.82; higher than the 10-year mean (1.96 ± 0.14 fledges), but similar to recent years (2.40 in 2009, 2.80 in 2007, 2.20 in 2006[17]). In 2010, females successfully reared 266 fledglings, the highest number of fledglings documented in this study. In 2010, 58% of monitored females attempted a second nest and 43% of females with a successful first attempt made a double-brood attempt. Ellis et al. (2008) reported 51% of females (Gila River study area females) renested and 44% of females with a successful first attempt made a double-brood attempt. Hatching success for eggs that survived incubation period—an indicator of resource availability—was 88% in 2010; Ellis et al. (2008) reported 86.3% ± 0.08 (for all AGFD study sites).

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[17] 2008 fecundity data is omitted when comparing between-year data because several nests (25) were still active when field studies ended.

For the seventh consecutive year, there was no brown-headed cowbird trapping at the Gila River study area. Two nests (1%) in 2010 were documented with cowbird eggs or nestlings; the second consecutive year parasitism has been documented after not being documented since 2004 (Ellis et al. 2008). Parasitism rates at the Gila River study area have always been low (2.8% overall parasitism rate among AGFD study populations; Ellis et al. 2008) relative to other flycatcher populations (e.g., 15%–32% on the Lower Colorado River from 2003–2008; Koronkiewicz et al. 2004, 2006*a*; McLeod et al. 2005, 2007, 2008a, 2008b; McLeod and Koronkiewicz 2009).

HABITAT AND HYDROLOGICAL CHARACTERISTICS

The flycatcher occupies a variety of riparian habitats across its range (Sogge and Marshall 2000, USFWS 2002, 2005). Like the Gila River study area, many occupied sites in Arizona are mixed exotic and native vegetation, with tamarisk stands being the dominant vegetation type. The importance of high quality riparian vegetation for this species has continuously been at the forefront of recovery discussions (USFWS 2002). Diversity in species composition within occupied habitats suggests that flycatchers rely on structure of vegetation as much as, or more than, specific species of vegetation. Recent studies of flycatcher physiology, immunology, site fidelity, productivity, and survivorship suggest native and exotic habitats do not differ in quality for flycatchers (Owen et al. 2005, Sogge et al. 2006, Paxton et al. 2007, McLeod et al. 2008).

The presence of water and/or saturated soil immediately adjacent to and/or under river bank vegetation is likely the primary habitat feature that drives flycatcher colonization and breeding. When flycatchers arrived to the study area in May and June 2010, river water levels were up—with the highest average May–June streamflow recorded during this study—and this may have contributed to the observed population increase (44% increase). As the breeding season progressed, flows remained steady—in fact, since this study began in 1996, only one season (1998) exceeded the average breeding season streamflow observed in 2010. Unlike 2009 when we noted dessication to tamarisk within known territories due to lack of precipitation, in 2010 tamarisk remained vibrant with normal monsoon rains and consistently high streamflow (June–August flows averaged 769 cfs). While a specific mechanism was not tested, high streamflows in 2010 appears to have directly or indirectly prolonged the flycatcher nesting season: renesting attempts—a seasonal indicator of productivity—were up; 41% of nesting attempts were second, third, or fourth attempts. In 2009, when June–August flows averaged 464 cfs and precipitation was low, 23% of nesting attempts were renests. In 2002—a known drought year when June–August flows averaged 18 cfs and precipitation was low—10% of nesting attempts were renests (Ellis et al. 2008).

Sustained flycatcher occupancy within the Gila River study area is largely dependent on continued streamflow. The affinity of breeding flycatchers with standing water and saturated soil is noted consistently in the literature, and presence of water may be a factor in sustaining particular vegetation features at breeding sites (Paradzick 2005) and providing a more suitable microclimate for raising offspring (Sogge and Marshall 2000, McLeod et al. 2008). Moreover, the availability of surface water at flycatcher breeding sites is likely the primary factor influencing residency and breeding at a site in any given year, with flycatchers breeding in years when sites contain standing water (Weddle et al. 2007, McLeod et al. 2008*b*).

Similar to previous years, we found that the streamflow from the beginning of the previous monsoon season through the beginning of the flycatcher breeding season (July–April) had a strong relationship to the number of flycatcher territories from the following breeding season. We concur with Weddle et al. (2007) that there is a cumulative effect of increased streamflow during the approximately 10 months prior to flycatcher settlement. Although breeding season streamflow (April–August) had no relationship to the number of territories, this result is likely a function as to how annual streamflow was categorized. It is likely that adequate streamflow during the flycatcher breeding season is also important to breeding flycatchers, but flycatcher responses may only be apparent once certain low streamflow thresholds are reached. It is important to note that the variability in the number of flycatcher territories as related to streamflow in this analysis explains only the variability in the number of flycatcher territories per time period and streamflow ranges analyzed. Although it can be theorized that a significant increase in July–April streamflow would likely result in more flycatcher territories, quantifiable predictions are difficult and highly contingent on multiple environmental and demographic factors.

In 2010, we found April–May streamflow from the previous year had the strongest relationship to the number of territories, explaining the most variability (42%) in the number of flycatcher territories from the following breeding season (an increase of 5.5 territories per 100 cfs). This would suggest that migrating flycatchers or floaters are evaluating habitat the year before and then settling at the site the following year. It is important to note, however, that finding significance does not indicate a biologically valid pattern or explanation. Further modeling using additional explanatory variables (e.g., precipitation) is necessary to determine the relationship between seasonal fluctuations of streamflow and flycatcher numbers.

Presence of ground and surface water (using streamflow as a relative indicator at the Gila River study area) may also influence factors such as food abundance and riparian microclimate conditions (Reitan and Thingstad 1999). Flycatchers typically complete their first nesting attempt in early July (Ellis et al. 2008); therefore, monsoon rains and the subsequent increase in streamflow and prey abundance are more likely to have an immediate positive effect on fledgling survival and second nesting attempt success. Increased streamflow annually will have a long-term positive effect by encouraging suitable habitat to develop and support pre-existing habitat adjacent to the river, which may encourage immigration and support more flycatchers. Other variables such as rainfall, food abundance, and breeding success, may interact and contribute to the number of flycatcher territories each year. Paxton et al. (2007) found habitat type (native, exotic, or mixed) in which flycatchers breed along the San Pedro and Gila rivers does not appear to influence adult survivorship. However, Paxton et al. (2007) did find the breeding status of an individual did, with successful breeders having higher survivorship than non-successful breeders, unpaired individuals, and those of unknown status. Sedgwick (2004) found that willow flycatchers maintain a higher rate of site and territory fidelity when they have greater breeding success, which may be directly (e.g., food abundance) or indirectly (e.g., vegetation and habitat quality) affected by increased streamflow and/or moisture availability.

Riparian habitat improvement has been apparent at several sites primarily composed of younger tamarisk (characterized with a canopy height of approximately 3–6 m): GRS011, GRS010, GRN008, GRS003, Dripping Springs Wash, and Dripping Springs Campground. Flycatcher territories at these sites have increased from a combined 0 flycatcher territories in 2004 to 95 flycatcher territories in 2010; flycatcher territories increased at each of these sites from 2009–2010. Dripping Springs Wash and Dripping Springs Campground have shown the greatest increase in flycatcher territories since increased and constant streamflow has been restored. These sites are the only sites upstream of Gila River's confluence with the San Pedro River and are, therefore, the areas likely experiencing the greatest benefits from increased discharges from Coolidge Dam. This could explain the noticeable improvement in habitat at these sites and the larger increase in flycatcher occupancy compared to smaller, more widely distributed increases at other sites in the study area.

Occupied sites within the Gila River study area consisted primarily of tamarisk (50–90% or >90% exotic) with tamarisk being the most common nesting substrate. Young tamarisk used by flycatchers was either inundated with 0.35–1.0 m of flowing water or was associated with saturated soil during at least part of the 2010 season. Many flycatcher territories in young tamarisk were on small islands within the river and several nests were placed in trees directly adjacent to the river. Young tamarisk was primarily found within the floodplain with the only associated overstory occurring on steep eroded banks abutting the floodplain. Occupied mature tamarisk stands were associated with steep eroded banks adjacent to the river with an understory of sparse or dying tamarisk. These sites (e.g., Kearny, GRN018, GRS018, GRS008) all supported the same or fewer territories in 2010 compared to 2009. Average canopy height varied among sites, with the densest canopy layer varying between 4 m and 9 m.

For the second consecutive year, we documented the largest number of resident territories and young produced at the Gila River study area. Since studies related to the 1996 Biological Opinion on Roosevelt Dam (USFWS 1996) ended in 2006, we have observed a 249% increase in territories, highlighting the importance of continuing to monitor this population. Continued monitoring effort will assist in assessing further flycatcher response to variable annual and seasonal streamflow on the Gila River. Flycatcher habitat historically scours out and regenerates frequently (USFWS 2002). As we have observed at several sites at the Gila River study area, unsuitable habitat may become suitable within a few years with an increase of streamflow. Habitat at sites now occupied by flycatchers was considered unsuitable as recently as 2004. If streamflow continues to be favorable on the Gila River, future surveys may document flycatchers returning to previously occupied or new sites as habitat develops.

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APPENDIX A

2010 Field Data Forms

Willow Flycatcher (WIFL) Survey and Detection Form (revised April 2010)

Site Name____________________________ State_____ County__________________
USGS Quad Name____________________________ Elevation________________ (meters)
Creek, River, Wetland, or Lake Name________________________________

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

Survey Coordinates: Start: E________________ N__________________ UTM Datum______(See instructions)
Stop: E________________ N__________________ UTM Zone_______

If survey coordinates changed between visits, enter coordinates for each survey in comments section on back of this page.

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

Survey # Observer(s) (Full Name)	Date (m/d/y) Survey time	Number of Adult WIFLs	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N If Yes, number of nests	Comments (e.g., bird behavior; evidence of pairs or breeding; potential threats [livestock, cowbirds, *Diorhabda* spp.]). If *Diorhabda* found, contact USFWS and State WIFL coordinator	GPS Coordinates for WIFL Detections (this is an optional column for documenting individuals, pairs, or groups of birds found on each survey). Include additional sheets if necessary.			
							# Birds	Sex	UTM E	UTM N
Survey # 1 Observer(s)	Date Start Stop Total hrs ___									
Survey # 2 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 3 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 4 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 5 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Overall Site Summary Totals do not equal the sum of each column. Include only resident adults. Do not include migrants, nestlings, and fledglings. Be careful not to double count individuals. Total Survey Hrs___		Total Adult Residents	Total Pairs	Total Territories	Total Nests	Were any Willow Flycatchers color-banded? Yes___ No___ If yes, report color combination(s) in the comments section on back of form and report to USFWS.				

Reporting Individual__________________________ Date Report Completed________________
US Fish and Wildlife Service Permit #__________________ State Wildlife Agency Permit #________________

***Submit** form to USFWS and State Wildlife Agency by September 1st. Retain a copy for your records.*

Fill in the following information completely. Submit form by September 1st. Retain a copy for your records.

Reporting Individual ______________________ Phone # ______________
Affiliation ______________________ E-mail ______________
Site Name ______________________ Date Report Completed ______________
Was this site surveyed in a previous year? Yes___ No___ Unknown ___
Did you verify that this site name is consistent with that used in previous years? Yes ___ No ___ Not Applicable ___
If site name is different, what name(s) was used in the past? ______________________
If site was surveyed last year, did you survey the same general area this year? Yes ___ No ___ If no, summarize below.
Did you survey the same general area during each visit to this site this year? Yes ___ No ___ If no, summarize below.

Management Authority for Survey Area: Federal ___ Municipal/County ___ State ___ Tribal ___ Private ___
Name of Management Entity or Owner (e.g., Tonto National Forest) ______________________

Length of area surveyed: __________ (km)

Vegetation Characteristics: Check (only one) category that best describes the predominant tree/shrub foliar layer at this site:

_____ Native broadleaf plants (entirely or almost entirely, > 90% native)

_____ Mixed native and exotic plants (mostly native, 50 - 90% native)

_____ Mixed native and exotic plants (mostly exotic, 50 - 90% exotic)

_____ Exotic/introduced plants (entirely or almost entirely, > 90% exotic)

Identify the 2-3 predominant tree/shrub species in order of dominance. Use scientific names.

____

Average height of canopy (Do not include a range): ______________________ (meters)

Attach the following: 1) copy of USGS quad/topographical map (REQUIRED) of survey area, outlining survey site and location of WIFL detections; 2) sketch or aerial photo showing site location, patch shape, survey route, location of any detected WIFLs or their nests; 3) photos of the interior of the patch, exterior of the patch, and overall site. Describe any unique habitat features in Comments.

Comments (such as start and end coordinates of survey area if changed among surveys, supplemental visits to sites, unique habitat features. Attach additional sheets if necessary.

____
____
____
____
____

Territory Summary Table. Provide the following information for each verified territory at your site.

Territory Number	All Dates Detected	UTM E	UTM N	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)

Attach additional sheets if necessary

Willow Flycatcher Survey Continuation Sheet

(For reporting additional detections and territories; append to Survey and Detection form)

Reporting Individual ______________________ Phone # ______________

Affiliation ______________________ E-mail ______________

Site Name ______________________ Date Report Completed ______________

Territory Number	All Dates Detected	UTM E	UTM N	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)

Comments ______________________

WILLOW FLYCATCHER TERRITORY & NEST MONITORING CARD

Monitored / Non-monitored

Site Name:____________________ **Territory/Nest no:**______________

MP / VP UTM's:________________E/___________________N

Est. HD:______ **Est. FD:**______

Official Confirmed Band Combo

(*To be filled out by Supervisor*)

♂combo:_____________ to ⊗:______

♀combo:_____________ to ⊗:______

Date	Time In	Time Out	Observer	Mon Type (O/M)	Stage	# Adult pres	# WF Egg	# CB Egg	# WF Nstl	# CB Nstl	# WF Fldg	Age of Young (WN Description in Comments)	Field Tasks
Behaviors & Comments:													
Behaviors & Comments:													
Behaviors & Comments:													
Behaviors & Comments:													
Behaviors & Comments:													
Behaviors & Comments:													

Exact written description on OP flag

Estimated tree height from water or land (m).

Draw the nest tree (include tree species)

Distance from nest to H_2O___________(m)

Distance to dry land___________(m) Note: is nest tree connected to dry land via connecting branches?__________(Y or N)

Depth of water under nest__________(m)

Island?________(Y or N)

Base of nest tree in water?__________(Y or N)

Willow Flycatcher Nest Record Form (2010)

Nest ID:____________

Substrate:____________________

Nest Found: ____________________

First Egg:____________________

Clutch Completion:__________________

Hatching:____________________

Fledged or Failed:__________________

Outcome:____________________

	Presumed	Confirmed
Eggs		
Nestlings		
Fledglings		

Date	Contents	Exposure Days
Total Exposure Days		

Outcome codes:
UN= unknown; **FY**= fledged young, with at least one young seen leaving or in the vicinity of nest; **FP**= fledged young, as determined by parents behaving as if dependent fledgling(s) nearby; **FU**= suspected fledging of at least one young; **FC**= fledged at least one host young with cowbird parasitism; **FD**= Nest partially depredated with confirmed fledging of at least one young; **PO**= predation observed; **PE**= probable predation, nest empty and intact; **PD**= probable predation, damage to nest structure; **PC**= probable predation by cowbird; **AB**= nest abandoned prior to egg(s) being laid; **DC**= deserted with egg(s) or young due directly to cowbird **DE**= deserted with egg(s) or young; **AC**= nest abandoned due to cowbird; **CO**= failure due to cowbird, host attempted to raise cowbird young. No host young were fledged from the nest; **WE**= failure due to weather; **HA**= failure due to human activities; **IN**= failure, entire clutch infertile; **OT**= failure due to other, or unknown, causes.

Appendix B

Table of the Mean Monthly Streamflow at the Gila River Study Area

Table B.1. Combined Mean Monthly Streamflow (cfs) for Two Gauges at the Gila River Study Area, Arizona, 1997–2010

Year	Territories	Combined Mean Monthly Streamflow (cfs)[a]											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	33	166	248	677	521	538	672	816	542	83	147	7	165
1998	48	110	208	493	441	610	699	852	923	443	153	44	320
1999	69	90	172	367	166	253	5	100	373	130	72	6	154
2000	52	81	144	278	340	118	8	5	70	22	190	80	216
2001	40	54	154	411	494	540	635	725	481	246	205	5	245
2002	46	107	138	243	25	14	1	1	52	56	103	8	108
2003	26	68	166	338	217	87	6	51	37	4	0	1	55
2004	14	85	141	297	382	230	3	6	110	84	37	11	122
2005	28	208	374	382	609	535	695	818	618	500	226	7	289
2006	39	177	234	224	403	479	480	650	722	351	236	11	294
2007	64	194	194	418	487	542	662	706	467	195	134	8	138
2008	62	334	240	548	666	511	569	629	411	241	242	6	231
2009	96	161	245	498	569	606	374	457	562	199	199	3	57
2010	138	273	195	529	588	610	800	860	646	--	--	--	--

[a]Combined mean monthly streamflow calculated by averaging mean monthly streamflow recorded at two U.S. Geological Survey gauging stations: #09469500 (Gila River Below Coolidge Dam; USGS 2010) and #09474000 (Gila River at Kelvin; USGS 2010). Per USGS, mean monthly streamflow for October 2009 to August 2010 are preliminary (i.e., are provisional data and are subject to revision) at the time of the publication of this report.

APPENDIX C

Willow Flycatcher Survey Results by Site in the Gila River Study Area

Table C.1. Willow Flycatcher Survey Results by Site in the Gila River Study Area, Arizona, 2010

Site name County, Elevation (m), Survey Hours	Individual Surveys		Site Summary						
	Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
South Butte [e, f, i] Pinal, 485, 0.49	6/28/2010	0	0	0	0	0	0	0	Y
North Butte [e, f, i] Pinal, 491, 0.43	6/28/2010	0	0	0	0	0	0	0	Y
GRN033 [e, f, i] Pinal, 494, 2.14	6/28/2010	2	2	1	1	0	0	0	Y
Donnelly Wash [e, f, i] Pinal, 495, 0.29	6/28/2010	0	0	0	0	0	0	0	Y
GRS032 [e, f, i] Pinal, 494, 0.33	6/28/2010	0	0	0	0	0	0	0	Y
GRSN031[e, f, i] Pinal, 506, 1.05	6/27/2010	0	0	0	0	0	0	0	Y
GRSN030 [e, f, i] Pinal, 506, 0.69	6/27/2010	0	0	0	0	0	0	0	Y
GRN029 [e, f, i] Pinal, 515, 0.43	6/27/2010	0	0	0	0	0	0	0	Y
GRN028 [e, f, i] Pinal, 518, 0.26	6/27/2010	0	0	0	0	0	0	0	Y
GRN027 [e, f, i] Pinal, 521, 0.43	6/27/2010	0	0	0	0	0	0	0	Y
GRSN026 [e, f, i] Pinal, 536, 0.43	6/27/2010	0	0	0	0	0	0	0	Y
GRS025 [e, f, i] Pinal, 536, 1.38	6/27/2010	2	2	1	1	1	0	0	Y
GRSN023 [e, f, i] Pinal, 536, 0.20	6/27/2010	0	0	0	0	0	0	0	Y
GRSN022 [e, f, i] Pinal, 540, 0.02	6/27/2010	0	0	0	0	0	0	0	Y
GRS020 [e, f] Pinal, 543, 1.77	5/15/2010 6/12/2010 7/9/2010	0 0 0	0	0	0	0	0	0	Y
GRN020 [e, f] Pinal, 549, 0.55	5/15/2010 6/12/2010 7/9/2010	0 0 0	0	0	0	0	0	0	Y
GRS019 [e, f] Pinal, 555, 1.13	5/15/2010 6/12/2010 7/9/2010	0 0 0	0	0	0	0	0	0	Y
GRN019 [e, f] Pinal, 549, 0.25	5/15/2010 6/12/2010 7/9/2010	0 0 0	0	0	0	0	0	0	Y
GRN018 [e, f] Pinal, 561, 4.57	Monitored 5/31 to 8/07	N/A	2	1	1	1	1	2	Y
GRS018 [e, f] Pinal, 543, 2.94	Monitored 5/15 to 8/18	N/A	10	5	5	8	0	0	Y
GRS016 [e, f] Pinal, 549, 1.65	Monitored 5/15 to 8/07	N/A	1	1	0	0	0	2	Y

Table C.1. Willow Flycatcher Survey Results by Site in the Gila River Study Area, Arizona, 2010 (Continued)

Site name County, Elevation (m), Survey Hours	Individual Surveys		Site Summary						
	Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
GRS015 [e, f] Pinal, 555, 1.07	Monitored 6/23 to 8/09	N/A	2	1	1	1	0	0	Y
GRN015 [e, f] Pinal, 550, 0.34	5/15/2010 6/12/2010 6/23/2010	0 0 0	0	0	0	0	0	0	Y
Kearny [f, h] Pinal, 555, 6.63	Monitored 5/15 to 7/28	N/A	5	3	3	4	0	0	Y
GRS014 [e, f] Pinal, 555, 1.90	Monitored 5/30 to 8/09	N/A	0	0	0	0	0	1	Y
GRN014 [e, f] Pinal, 558, 2.47	Monitored 5/30 to 8/09	N/A	3	2	1	2	0	0	Y
GRN013 [e, f] Pinal, 558, 0.47	5/15/2010 6/12/2010 6/23/2010	0 0 0	0	0	0	0	0	0	Y
GRS013 [e, f] Pinal, 558, 0.57	5/15/2010 6/12/2010 6/23/2010	0 0 0	0	0	0	0	0	0	Y
GRN012 [e, f] Pinal, 579, 0.39	5/15/2010 6/12/2010 6/23/2010	0 0 0	0	0	0	0	0	0	Y
GRS012 [e, f] Pinal, 555, 2.07	Monitored 5/13 to 7/08	N/A	2	1	1	1	0	0	Y
GRN011 [e, f] Pinal, 579, 1.71	Monitored 6/23 to 8/05	N/A	2	1	1	3[J]	0	0	Y
GRS011 [e, f, g, h] Pinal, 561, 8.52	Monitored 5/13 to 8/18	N/A	13	7	7	9[g]	0	0	Y
GRN010 [e, f] Pinal, 573, 2.49	Monitored 5/13 to 8/12	N/A	4	2	2	4	0	0	Y
GRS010 [e, f, g] Pinal, 561, 7.58	Monitored 5/13 to 8/24	N/A	9	5	5	7[g]	0	1	Y
GRS009 [e, f] Pinal, 567, 1.60	Monitored 5/18 to 8/06	N/A	2	1	1	1	0	0	Y
GRN009 [e, f] Pinal, 579, 6.60	Monitored 5/13 to 8/19	N/A	6	3	3	5	0	2	Y
GRS008 [e, f] Pinal, 567, 4.70	Monitored 5/13 to 8/12	N/A	2	1	1	3	0	1	Y
GRN008 [f, h] Pinal, 579, 16.86	Monitored 5/13 to 8/12	N/A	17	9	9	18[j]	1	0	Y
GRS007 [f] Pinal, 573, 14.78	Monitored 5/19 to 8/17	N/A	6	3	3	3	0	0	Y
GRN007 [e, f, g] Pinal, 579, 2.43	Monitored 5/13 to 8/17	N/A	10	5	5	8[g, j]	0	0	Y
GRS006 [e, f] Pinal, 567, 0.38	5/17/2010 6/10/2010 6/25/2010	0 0 0	0	0	0	0	0	0	Y
GRS005 [e, f] Pinal, 567, 1.44	Monitored 5/13 to 8/03	N/A	2	1	1	2	0	0	Y

Table C.1. Willow Flycatcher Survey Results by Site in the Gila River Study Area, Arizona, 2010 (Continued)

Site name County, Elevation (m), Survey Hours	Individual Surveys		Site Summary						
	Survey Date	WIFL[a]	Resident Adult WIFL	Territories	Pairs	Nests	Unknown Status WIFL[b]	Migrant WIFL[c]	BHCO Present[d]
GRN005 [e, f, g] Pinal, 579, 2.27	Monitored 5/17 to 8/03	N/A	8	4	4	5	0	0	Y
GRS004 [e, f] Pinal, 600, 1.82	Monitored 5/13 to 8/12	N/A	3	2	1	2	0	0	Y
GRN004 [e, f] Pinal, 585, 5.62	Monitored 5/13 to 8/18	N/A	7	4	3	5	0	0	Y
GRS003 [e, f, g] Pinal, 585, 12.07	Monitored 5/13 to 8/12	N/A	26	13	13	18	0	0	Y
GRN003 [e, f] Pinal, 585, 0.50	5/17/2010 6/10/2010 6/25/2010	0 0 0	0	0	0	0	0	0	Y
GRN002 [e, f] Pinal, 585, 0.28	5/17/2010 6/10/2010 6/25/2010	0 0 0	0	0	0	0	0	0	Y
GRS002 [e, f] Pinal, 585, 0.52	5/17/2010 6/10/2010 6/25/2010	0 0 0	0	0	0	0	0	0	Y
Dripping Springs Campground [e, g, h] Pinal, 610, 32.20	Monitored 5/16 to 8/24	N/A	60	33	32	50	2	4	Y
Dripping Springs Wash [g, h] Gila, 621, 31.22	Monitored 5/14 to 8/12	N/A	49	28	28	45	0	0	Y
Total	**–**	**–**	**255**	**138**	**133**	**206**	**4**	**13**	**–**

[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, lack of survey data, or confusion with distinguishing neighboring territories.

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

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

[e] Surveys were conducted by kayak only.

[f] Survey hours estimated because site was part of a multiple-site kayak survey.

[g] Total nest number includes at least one instance where fledglings were found and confirmed to a territory but no actual nest was found before fledglings were discovered.

[h] Number of territories + number of pairs does not equal number of residents due to polygyny (one male associated with two females).

[i] Survey did not meet 3-survey period USFWS protocol guidelines due to ‘unsuitable habitat’ determination or accessibility constraints.

[J] A pair assigned to a different site attempted a nest at this site.

APPENDIX D

Willow Flycatcher Nest Success and Productivity of Monitored Nests at the Gila River Study Area

Table D.1. Willow Flycatcher Nest Success and Productivity of Monitored Nests at the Gila River Study Area, Arizona, 1996–2010

Year	Mayfield nest success, % (exposure days)	Number of young fledged	Mean number of young fledged per nest (*n*)[a]	Mean number of young fledged per successful nest (*n*)
1996	100 (20)	2	2.00 (1)	2.00 (1)
1997	71 (163)	16	1.60 (10)	2.00 (8)
1998	61 (1096)	75	1.39 (54)	2.27(33)
1999	48 (777)	41	1.08 (38)	2.41 (17)
2000	70 (620)	42	1.62 (26)	2.33 (18)
2001	52 (1134)	74	1.32 (56)	2.47 (30)
2002	35 (404)	19	0.83 (23)	2.38 (8)
2003	70 (394)	40	2.00 (20)	2.86 (14)
2004	35 (214)	13	1.00 (13)	2.60 (5)
2005	77 (654)	57	1.90 (30)	2.71 (21)
2006	53 (709)	52	1.27 (41)	2.36 (22)
2007	72 (838)	82	1.86 (44)	2.73 (30)
2008[b]	67 (1576)	90	1.08 (83)	2.31 (38)
2009	66 (2337)	176	1.53 (115)	2.38 (74)
2010	62 (3447)	266	1.50 (177)	2.42 (110)

[a] n = number of nests used for calculating Mayfield nest survival estimates (Mayfield 1961, 1975) including nests with unknown outcomes.
[b] Productivity estimates should not be directly compared because nests (25) were still active when field studies ended.

APPENDIX E

Willow Flycatcher Survey Results for the Gila River Study Area

Table E.1. Willow Flycatcher Survey Results for the Gila River Study Area, Arizona, 1996–2010

Year	No. Sites Surveyed	Survey Hours	Residents[a]	Territories	Pairs	Nests
1996	15	126	13	10	3	4
1997	48	715	63	33	30	26
1998	42	575	94	48	46	71
1999	34	544	119	69	58	94
2000	37	578	97	52	48	69
2001	21	83	77	40	40	63
2002	24	120	88	46	43	45
2003	18	134	49	26	23	24
2004	15	106	26	14	12	14
2005	15	142	54	28	26	34
2006	22	148	73	39	34	54
2007	22	149	119	62	57	54
2008	52	176	120	63	60	95
2009	52	250	183	96	93	133
2010	51	193	255	138	133	206

[a] Number of territories + number of pairs may not equal total number of residents due to polygynous males and non-territorial floaters.

APPENDIX F

Willow Flycatcher Territories by Site within the Gila River Study Area

Table F.1. Willow Flycatcher Territories by Site[a] within the Gila River Study Area

Site	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
North Butte[b, c]	--	0	0	0	0	--	--	--	--	--	0	--	1	0	0
GRN033[b, c]	1	0	0	0	0	--	--	--	--	--	0	--	0	0	1
GRSN031[b, c]	1	0	0	--	--	--	--	--	--	--	0	--	0	0	0
GRS025[b]	0	0	0	--	--	--	--	--	--	--	0	--	0	1	1
GRN020[b, c]	2	2	2	5	0	0	0	0	0	0	1	0	0	0	0
GRS018[b]	--	1	1	4	4	2	7	4	2	9	7	6	4	4	5
GRN018[b]	--	2	2	5	4	9	7	5	3	6	5	6	3	2	1
GRS016[b]	--	0	--	--	--	--	--	1	0	1	1	2	0	1	1
GRN015[b, c]	--	--	--	--	1	0	0	0	--	--	--	--	0	0	0
GRS015[b, c]	--	1	1	1	1	0	0	0	--	--	--	--	0	0	1
Kearny	6	8	25	23	19	14	14	9	5	3	5	4	4	3	3
GRN014[b, c]	--	0	0	0	0	--	--	--	--	--	--	--	0	0	2
GRS014[b, c]	--	0	0	0	0	0	0	--	--	--	0	0	1	1	0
GRS013[b, c]	--	1	0	0	0	0	0	0	--	--	--	--	1	0	0
GRS012[b]	--	4	6	8	7	5	3	1	0	0	0	0	0	1	1
GRN011[b, c]	--	2	0	0	0	--	--	--	--	--	--	--	1	0	1
GRS011[b]	--	0	0	1	2	1	1	0	0	0	0	1	3	5	7
GRN010[b]	--	5	4	4	2	1	1	0	0	0	0	0	0	2	2
GRS010[b]	--	3	0	4	0	0	0	0	0	1	1	2	3	3	5
GRS009[b]	--	0	0	--	--	--	--	--	--	--	1	0	0	2	1
GRN009[b]	--	0	0	0	0	1	2	0	0	0	1	2	2	3	3
GRS008[b, c, d]	--	0	0	0	0	0	0	--	--	--	1	3	4	5	1
GRN008	--	0	0	0	0	0	2	0	0	0	1	4	5	8	9
GRS007	--	3	6	11	10	5	7	5	4	6	4	6	2	3	3
GRN007[b, c, d]	--	0	0	0	0	0	0	--	--	--	1	2	0	0	5
GRS005[b, c, d]	--	0	0	--	--	--	--	--	--	--	1	0	0	1	1
GRN005[b, c]	--	0	0	--	0	--	--	--	--	--	--	--	1	1	4
GRS004[b, c]	--	0	0	0	0	0	0	--	--	--	--	--	0	0	2
GRN004[b, c, d]	--	1	1	2	2	2	2	1	0	0	1	1	0[e]	4	4
GRS003[b, c, d]	--	0	--	--	--	--	--	--	--	--	0	0	3	7	13
Dripping Sprgs Campground[b, c, d]	--	--	0	0	0	0	0	0	0	1	5	14	11	21	33
Dripping Sprgs Wash[b, c, d]	--	--	0	1	0	0	0	0	0	1	3	9	14	18	28
Yearly sum of territories	10	33	48	69	52	40	46	26	14	28	39	62	63	96	138
# of sites with territories	4	12	9	12	10	9	10	7	4	8	16	14	17[e]	21	26

[a] Sites ordered downstream to upstream; only sites with documented flycatcher residents between 1996 and 2010 are included.

[b] Kayak-only surveys conducted in 2009 and 2010.

[c] Kayak-only surveys conducted in 2008.

[d] Kayak-only surveys conducted in 2006 and 2007.

[e] A nesting pair associated with GRS003 placed nests at both GRS003 and GRN004 in 2008; this territory was designated to GRS003. Both sites were included in the final "sites with territories" number.

APPENDIX G

AGFD and Rangewide Site Names with Total Site Number, Management Unit and County for the Gila River Study Area

Table G.1. AGFD and Rangewide Site Names with Total Site Number, Management Unit and County for the Gila River Study Area

AGFD Site Name	Total Site Number	Rangewide Site Name[a]	Management Unit	County
GRN033	AZGI098	Gila River GRN033	Middle Gila/San Pedro	Pinal
GRSN031	AZGI096	Gila River GRSN031	Middle Gila/San Pedro	Pinal
GRN020	AZGI087	Gila River GRN020 (Kelvin Bridge)	Middle Gila/San Pedro	Pinal
GRN018	AZGI083	Gila River GRN018	Middle Gila/San Pedro	Pinal
GRS018	AZGI082	Gila River GRS018	Middle Gila/San Pedro	Pinal
GRS016	AZGI081	Gila River GRS016	Middle Gila/San Pedro	Pinal
GRS015	AZGI080	Gila River GRS015	Middle Gila/San Pedro	Pinal
GRN015	AZGI113	Gila River GRN015	Middle Gila/San Pedro	Pinal
Kearny	AZGI042	Gila River Kearny Sewage Ponds	Middle Gila/San Pedro	Pinal
GRS013	AZGI076	Gila River GRS013	Middle Gila/San Pedro	Pinal
GRS012	AZGI074	Gila River GRS012	Middle Gila/San Pedro	Pinal
GRN011	AZGI073	Gila River GRN011	Middle Gila/San Pedro	Pinal
GRS011	AZGI072	Gila River GRS011	Middle Gila/San Pedro	Pinal
GRN010	AZGI071	Gila River GRN010	Middle Gila/San Pedro	Pinal
GRS010	AZGI070	Gila River GRS010	Middle Gila/San Pedro	Pinal
GRS009	AZGI068	Gila River GRS009	Middle Gila/San Pedro	Pinal
GRN009	AZGI069	Gila River GRN009	Middle Gila/San Pedro	Pinal
GRS008	AZGI066	Gila River GRS008	Middle Gila/San Pedro	Pinal
GRN008	AZGI067	Gila River GRN008	Middle Gila/San Pedro	Pinal
GRS007	AZGI064	Gila River GRS007	Middle Gila/San Pedro	Pinal
GRN007	AZGI065	Gila River GRN007	Middle Gila/San Pedro	Pinal
GRS005	AZGI061	Gila River GRS005	Middle Gila/San Pedro	Pinal
GRN004	AZGI060	Gila River GRN004	Middle Gila/San Pedro	Pinal
Dripping Springs Campground	AZGI036	Gila River - Dripping Springs Wash	Middle Gila/San Pedro	Pinal, Gila
Dripping Springs Wash	AZGI004	Gila River - Dripping Springs Wash	Middle Gila/San Pedro	Gila

[a] Rangewide site names were only created for sites where flycatchers were detected prior to 2008.