

Survivorship and Movements of Southwestern Willow Flycatchers at Roosevelt Lake, Arizona - 2004



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EXECUTIVE SUMMARY

This 2004 annual report details the ninth successful season of documenting demographic information on the Southwestern Willow Flycatcher at Roosevelt Lake. Overall, we captured and banded 128 new adult flycatchers, banded 86 nestlings from 40 nests, banded an additional fledgling, and monitored 276 banded adults. By the end of the field season, 73% of all known Willow Flycatchers at Roosevelt Lake were banded.

This year, we recorded a 56% adult return rate with a corresponding adult survivorship estimate of 63%. We continued to detect high levels of movement from patch to patch, with 46% of returning birds moving to different patches. In 2004, 25 of the 124 hatch year birds banded in 2003 returned, resulting in a juvenile return rate of 20%, and a juvenile survivorship estimate of 40%. Two of the nestlings from 2003 were resighted at Alamo Lake and the Verde River, representing dispersal of up to 270 kilometers from Roosevelt Lake. Two nestlings banded in 2001 were also detected for the first time this year, raising 2001 juvenile return rate estimates from 27% to 29%. In addition, we detected one adult that moved from Roosevelt Lake to the San Pedro/Gila River between 2003 and 2004. Finally, we continued our passive netting efforts to detect floaters, with 70 adults captured, and three to nine floaters identified.

The Roosevelt Lake population grew by a record 66% from 2003 to 2004. Many of these new flycatchers were breeding at two newly discovered patches, Bermuda Flats North and South, which were found halfway through the season. These two new patches, close to the lake and partially submerged, held a large number of breeding flycatchers: one quarter of the Roosevelt Lake flycatcher population was detected there. The age structure of the flycatcher breeding population became more typical of years prior to the 2002 drought, when near complete reproductive failure resulted in a drastic decrease in young birds and an older age structure. The previous year, 2003, was a highly productive year for the flycatchers at Roosevelt Lake, resulting in a large recruitment of young (second year) individuals. The large increase in population size and a more normal age structure both indicate that the Roosevelt Lake population has rebounded from the effects of the 2002 record drought.

Survivorship and Movements of Southwestern Willow Flycatchers at Roosevelt Lake, Arizona – 2004

INTRODUCTION

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) is a small, endangered bird that breeds only in riparian habitats scattered throughout portions of the Southwestern states (Unitt 1987, Marshall 2000, Sogge et al. 2003). The flycatcher has suffered serious declines as riparian habitats have been lost or modified (Marshall and Stoieson 2000, USFWS 1993), and was listed as a federal endangered species in 1995 (USFWS 1995).

Two of the largest Southwestern Willow Flycatcher breeding sites in Arizona are found at the Salt River and Tonto Creek inflows to Roosevelt Lake (Paradzick and Woodward 2003, Fig. 1). Flycatchers were first observed here in 1993 (Muiznieks et al. 1994), where they breed in patches of dense riparian habitat. These sites include a mosaic of patches, some of which are dominated by tamarisk (*Tamarix ramosissima*), others by native willow (primarily *Salix gooddingii*), and some with a mixture of both tamarisk and willow. The Salt River Inflow and Tonto Creek Inflow sites face the prospect of inundation and potential destruction of habitat when increased lake levels, made possible by modifications to Roosevelt Dam, occur. The lake level has been below the elevation of the historic breeding patches since 1996, but may be raised to a level above the breeding patches in the future, depending upon precipitation and runoff (USFWS 1996).

The U.S. Bureau of Reclamation (Reclamation) consulted with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act (ESA) regarding potential impacts to the Southwestern Willow Flycatcher resulting from modifications to Roosevelt Dam. The resulting Biological Opinion requires that Reclamation fund a comprehensive Southwestern Willow Flycatcher research program that includes collection of demographic data (such as birth/death rates, lifetime reproductive success, immigration/emigration, site fidelity, movement between sites, age-specific reproductive success, and longevity). Such a study requires color banding flycatchers so that individuals can be identified and their movements, survivorship, and reproductive efforts can be tracked (Appendix 1).

A major reason to study movements at Roosevelt Lake (and beyond) was to determine where resident flycatchers moved once their breeding habitat was inundated. At the beginning of this project, little was known about site fidelity, dispersal, or movement behavior of Willow Flycatchers. Therefore, there was no way to predict how individual flycatchers would respond when habitat inundation occurred. The lower San Pedro/Gila River Willow Flycatcher population was selected for study because it was believed to be an area where Willow Flycatchers might disperse to once Roosevelt Lake filled. Due to the drought, Roosevelt Lake has not yet inundated flycatcher breeding habitat. In 2001, USGS reduced effort at the San Pedro/Gila River in order to focus on the rapidly growing population at Roosevelt Lake. AGFD continued banding and resighting efforts there.

The Roosevelt Lake Biological Opinion was the driving force behind the research presented in this report. Reclamation has funded this USGS-based research program at Roosevelt Lake and the San Pedro/Gila River since 1996.

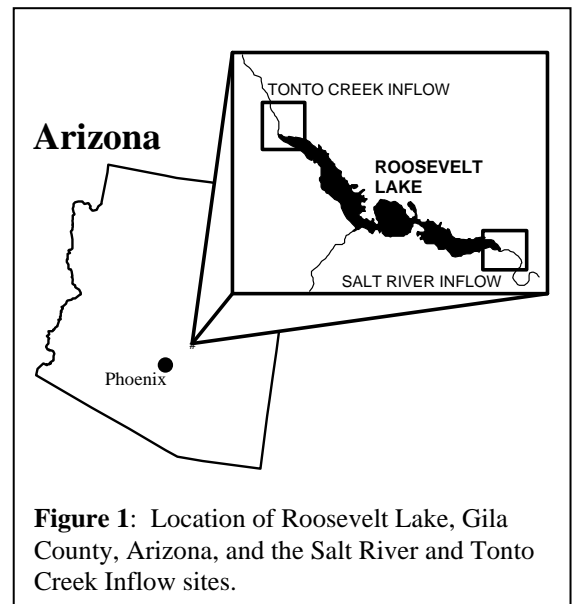


Figure 1: Location of Roosevelt Lake, Gila County, Arizona, and the Salt River and Tonto Creek Inflow sites.

STUDY AREA AND BANDING HISTORY

STUDY AREA

Roosevelt Lake is formed by Roosevelt Dam at the confluences of the Salt River and Tonto Creek in central Arizona, approximately 90 km northeast of Phoenix. Willow Flycatchers are found at roughly 2100 ft (640 m) elevation at the inflows of the Salt River and Tonto Creek, breeding in riparian vegetation found along the river channel or within the lakebed (conservation space) of the reservoir. Roosevelt Lake's primary purpose is to hold and retain water for downstream use as well as for flood control; therefore the water levels fluctuate significantly with winter runoff spikes and rapid summertime drawdowns. In 1995, high water levels inundated portions of the breeding habitat discovered in 1993. Since 1995, the average surface elevation of Roosevelt Lake has fluctuated but in general has dropped due to lower than average precipitation in Arizona. This has allowed new habitat to form on the once inundated floodplain within the reservoir's conservation space (below elevation 2152 ft or 656 m). In 1999, Willow Flycatchers were first detected occupying some of this new habitat, and in years since, additional patches of new habitat have become occupied by breeding flycatchers.

The Tonto Creek and Salt River inflows consist of a matrix of riparian habitat, with areas of occupied patches interspersed with unoccupied habitat (Fig. 2). In past years, most of these patches were considered separate sites (Luff et al. 2000, Paradzick et al. 2001). However, based on the high degree of observed movement among these patches, both between and within years, we now consider all of the patches at each inflow area as one site. The following sections give brief histories of the patches at the Salt River Inflow and the Tonto Creek Inflow sites. Note that the USGS site/patch nomenclature convention is different than that of AGFD. USGS refers to 20 patches within 2 sites (Salt River Inflow and Tonto Creek Inflow) whereas AGFD refers to 7 sites in the Salt River and Tonto Creek inflows (Appendix 2).

Salt River Inflow: From 1996 through 1998, all activity at the Salt River Inflow focused on a single patch (now called Old Salt). Beginning in 1999, flycatchers were detected at additional patches at lower elevations in the lakebed. These new, young patches form a mosaic of different patch sizes, ages, and habitat composition. Shangri-la and Mudflats had significant numbers of flycatchers present when discovered, and presumably were occupied by flycatchers prior to discovery. Eleven of 13 historic patches were occupied by breeding Willow Flycatchers in 2004 (listed below in order from farthest upstream to farthest downstream):

Old Salt - The original patch where Willow Flycatchers were known to breed, discovered in 1993 (Muiznieks et al. 1994). Old Salt consists of a mature monotypic stand of tamarisk. The elevation is between 2120 and 2134 ft.

Mudflats - Flycatchers were first detected here in 1999. This patch (and all the other patches below) was under water in 1995 and has developed since that time. It is now composed mostly of tamarisk, with a small native component. The elevation is between 2114 and 2122 ft.

Shangri-la - Flycatchers were first detected here in 1999. This site is composed of dense willow, cottonwood (*Populus fremontii*), and tamarisk. The elevation is between 2112 and 2120 ft.

School House South 1 - When flycatchers were first detected here in 1999 the patch was primarily composed of dense, mature tamarisk trees. No flycatchers have been detected here since 2001 and now the patch is composed of primarily dead tamarisk. The elevation is between 2110 and 2122 ft. (Not shown in Fig. 2).

School House South 3 - A patch of mixed riparian habitat, with flycatchers first detected in 2000. The elevation is between 2100 and 2110 ft.

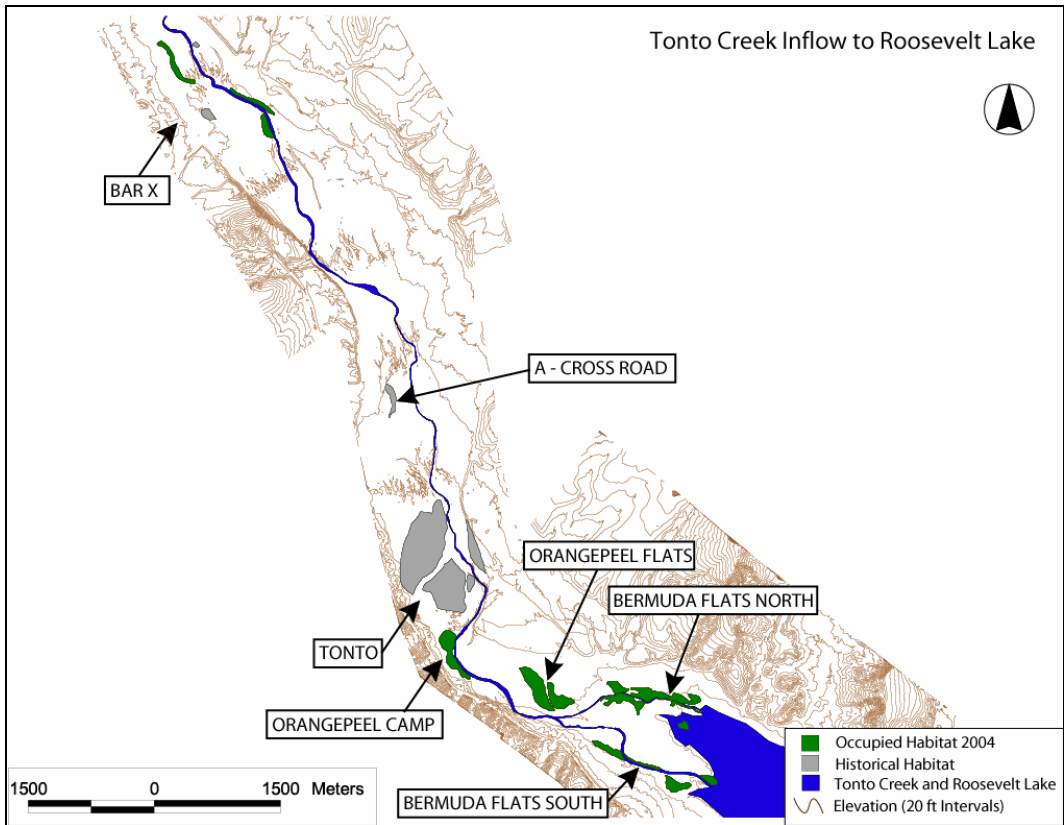
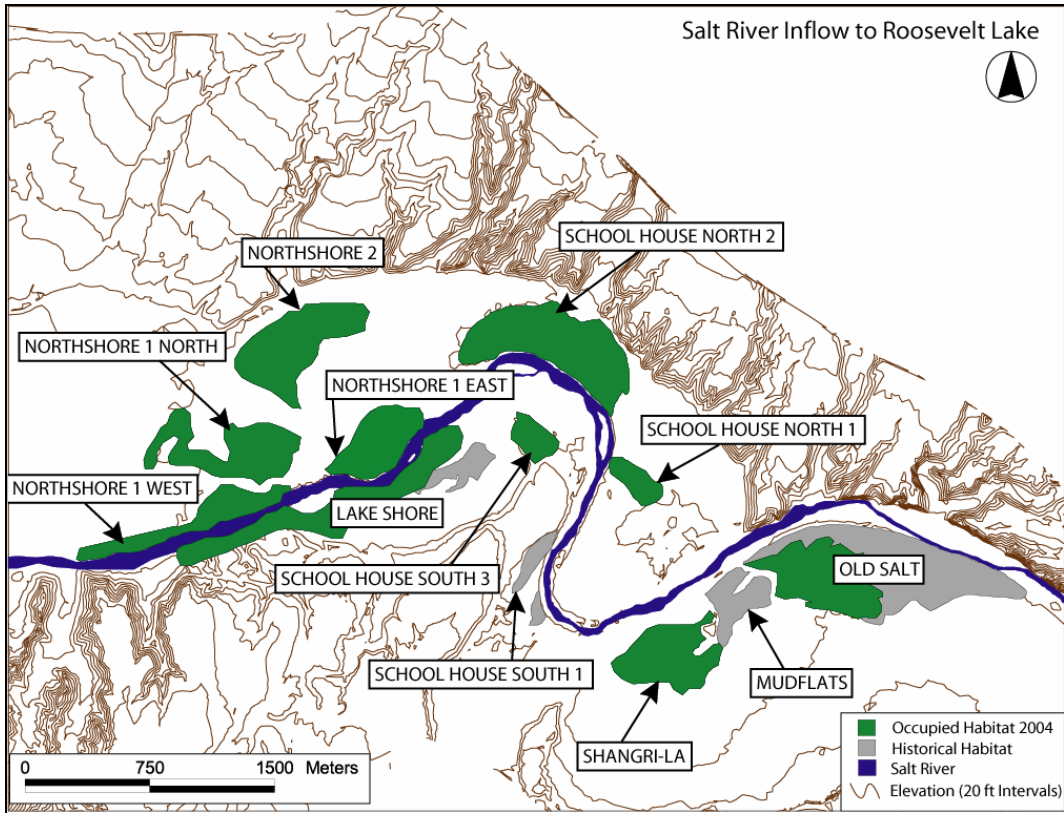


Figure 2. Location and names of Willow Flycatcher occupied and historic habitat patches at Roosevelt Lake.

School House North 1 - A dense patch of mature tamarisk habitat, with flycatchers first detected in 1999.

The elevation is between 2114 and 2122 ft.

School House North 2 - A large, dense patch of tamarisk, with flycatchers first detected in 2000. The elevation is between 2100 and 2114 ft.

Lake Shore - Lake Shore has expanded to include younger patches downstream of the original Lake Shore patch, which is comprised of mature, monotypic willow trees. Flycatchers were first detected here in 2000. The elevation is between 2084 and 2094 ft.

North Shore 1 East, North and West and North Shore 2 - A large area composed of a matrix of willow and tamarisk habitat. Although flycatchers were heard singing here in 2000, the first year of confirmed breeding was in 2001. In 2004, we divided North Shore 1 into 3 distinct patches since the population has continued to expand: East, North, and West. The elevation of these patches is between 2082 and 2096 ft.

Cottonwood Acres - A historic patch that had one breeding pair in 1999 and 2000 (Not shown in Fig. 2).

Tonto Creek Inflow: Until 2000, all documented flycatcher breeding activity within the Tonto drainage was at the Tonto habitat patch. Habitat was created at the Tonto drainage by the receding lakebed in 2000. There were five distinct habitat patches occupied by breeding Willow Flycatchers in 2004 and two unoccupied historic patches (Fig. 2) (in order from upstream to downstream):

Bar X - Flycatchers were first detected breeding here in 2003. It is a series of small, narrow stands of young willows and cottonwoods 7.3 km upstream of the Tonto patch. The elevation is between 2200 and 2224 ft.

A-cross Road - This small, isolated patch is 2.5 km upstream of the Tonto patch. Flycatchers were first detected here in 2000. This patch consists of very young, thin, tamarisk, mixed with mature cottonwoods and an under story of short mesquite (*Prosopis* spp.). Flycatchers were not detected here in 2003 or 2004. The elevation is between 2144 and 2154 ft.

Tonto - Tonto is the oldest patch of the Tonto Creek Inflow site, having been discovered in 1993 (Muiznieks et al. 1994). The vegetation in this patch was established after the 1978-1980 floods. The Tonto patch is comprised of tall tamarisk stands with mature willow and cottonwood trees in most locations. Flycatchers did not use this patch in 2004. The elevation is between 2124 and 2134 ft.

Orange Peel Campground - Flycatchers were first confirmed breeding here in 2000, although two flycatchers were territorial early in the season in 1998, and singing from migrants or unpaired males was documented in 1999. This site consists of willow interspersed with tamarisk and mesquite and little understory structure. The elevation is between 2110 and 2120 ft.

Orange Peel Flats - This patch is composed primarily of dense tamarisk, with flycatchers first detected in 2000. The elevation is between 2100 and 2110 ft.

Bermuda Flats North and South - These patches were first found in 2004 and consist of young willow and tamarisk in a series of linear patches in an open setting. The downstream part of the habitat was partially inundated by Roosevelt Lake in 2004. The elevation of these two sites is between 2074 and 2096.

HISTORY OF THE BANDING PROJECT AT ROOSEVELT LAKE

In 1996, the USGS Colorado Plateau Field Station (CPFS) and the Arizona Game and Fish Department (AGFD) began a long term and large-scale demographic study of Willow Flycatchers in Arizona. AGFD continued its ongoing surveying and nest monitoring of new and known flycatcher breeding sites, while USGS joined the efforts by color banding the flycatchers at most of the AGFD monitored sites, as well as several other areas. From 1996 to 2004, 950 adults and 636 nestling/fledgling Willow Flycatchers were captured and banded by USGS across Arizona. In total, there were 1102 flycatchers that were banded at or moved to Roosevelt lake since 1996 (Appendix 1). An additional population genetics component of this study took place during 1996 and 1997 (Sogge et al. 1998, Busch et al. 2000, Paxton 2000).

To date, nine years of data collection (1996-2004) have been funded and conducted. The work conducted from 1996-2003 provides the foundation for this year's site and patch fidelity, movement, and survivorship data (Paxton and Sogge 1996, Paxton et al. 1997, Netter et al. 1998, English et al. 1999, Luff et al. 2000, Kenwood and Paxton 2001, Koronkiewicz et al. 2002, Newell et al. 2003). This report summarizes results of the ninth year of fieldwork.

PROJECT OBJECTIVES

The major goal of this project is to color band and resight Southwestern Willow Flycatchers at all locations within the Roosevelt Lake area in order to gather detailed demographic information about the population. Monitoring these color banded birds is the only effective way to determine between-year survivorship and mortality of adults and young, immigration and emigration, site and patch fidelity, and movement between sites. Furthermore, the presence of banded birds at a site contributes to on-going flycatcher studies by AGFD, providing a more accurate assessment of the number of breeding birds and the ability to document breeding activities (e.g., pairing, nesting attempts, reproductive success) of individuals within and between years.

Specific objectives of the USGS-based demography study are to:

- (1) Collect data on between-year survivorship and mortality of adults and young, immigration, emigration, site and patch fidelity, and movement between patches and sites;
- (2) Assist AGFD by banding female flycatchers for their seasonal fecundity study;
- (3) Determine, along with AGFD, the number of flycatchers present at Roosevelt Lake; and
- (4) Genetically determine the sex of all banded Southwestern Willow Flycatchers.

METHODS

BANDING ADULTS

All adult Willow Flycatchers were captured using mist nets (see Ralph et al. 1993). Mist nets were typically set up in a known breeding territory and recordings of Willow Flycatcher vocalizations (both songs and calls) were broadcast from a compact disk player to attract territorial flycatchers (per Sogge et al. 2001). This method is known as target netting.

Prior to 1998, all flycatchers were banded with a uniquely numbered federal aluminum bird band and a unique combination of two plastic color bands. However, as birds were resighted in subsequent years, it became apparent that plastic bands could cause injuries to the legs of some flycatchers. Therefore, in

1998, we created color bands by anodizing aluminum bands and then adhering automobile detailing tape to the aluminum band and sealing the entire band with epoxy (making sure that no epoxy could come in contact with flycatcher's legs). Thus, from 1998 to 2004 each captured adult was banded with a unique combination of a numbered federal anodized colored band on one leg, and an aluminum color band (either striped or solid) on the other leg. We attempted to recapture most adults that had been previously banded with plastic bands; all plastic bands on recaptured adults were removed and replaced with a unique metal band combination. These techniques allowed each individual to be identified if seen again in the field without need for recapture (see Resighting section below).

In addition to banding, each adult was measured for wing chord, tail length, weight, and fat level in a standardized method (Pyle 1997). When possible, the gender of adult flycatchers was determined by the presence of a cloacal protuberance (male) or brood patch (female). A blood sample was taken from all flycatchers to determine gender via genetic methods (see Genetics section below).

RESIGHTING

Resighting consists of using binoculars to determine the identity of a color banded flycatcher by observing, from a distance, the unique color band combination on its legs. Resighting allows researchers to detect and monitor individual flycatchers without the need to recapture them. Typically, territories and nests are the focal areas for resighting in order to determine which individuals belong to a specific territory. This information can then be used to document movement, individual productivity, and gender-based behavioral patterns. Furthermore, resighting is the most reliable method for establishing which particular territory a flycatcher belongs to, as techniques used to capture adults (such as playbacks of flycatcher vocalizations) can lure in adults from neighboring territories.

All banders and AGFD field crews recorded their observations of color banded flycatchers. For every resighted flycatcher, we recorded the color band combination, site, patch, specific location at the patch (using a designated territory number or GPS coordinate), the level of confidence in the resight, and any behavioral observations. Because resighting is difficult, and misidentification of color combinations is a possibility, all resight data in this report are based on at least three or more resights of each color banded individual in the same area.

RETURN RATES AND SURVIVORSHIP ESTIMATES

Using the encounter history (whether a flycatcher was present in a given year) of banded adults through resights and recaptures, we can calculate a return rate from year to year. The return rate can be considered the minimum survivorship, as not every banded flycatcher is detected in each year. A given year's return rate can increase in subsequent years as flycatchers not detected in one year may be detected in following years. Survivorship estimates are based on return rates and take into account some percentage of undetected flycatchers. We used the program MARK (White and Burnham 1999) to derive the maximum-likelihood estimate of survivorship in the Roosevelt Lake population. Prior to 2003, all survivorship estimates for this project were reported in terms of return rates.

NESTLING BANDING

Nestlings were banded at 7-10 days of age (determined using the USGS nestling aging guide; Paxton and Owen 2002) and only when they could be taken from nests that were safely accessible. Unfortunately, most nests are not accessible without risk of damaging the nest or nest plant, and accessible nests sometimes fail (e.g., from predation) before the young can be banded. Thus, only a small proportion of nestlings are typically banded in any year. Nestlings were banded with a gold-anodized federal bird band in 2004, and a drop of blood was taken for genetic gender determination (see Genetics section below).

PASSIVE NETTING

Passive netting is the process of placing one or more mist nets in an area and waiting for birds to fly into them (without the use of playback, decoys, or other lures). In 2001, USGS conducted a passive netting pilot project and found it to be an effective technique for detecting non-breeding flycatchers (floaters) that may be present at the sites but not readily detected with conventional survey techniques (i.e. territorial response to tape-playback). Our interest in exploring the number of floaters present at the breeding patches was the result of occasionally capturing flycatchers that could not be assigned to a nearby territory, and were never seen again in that year.

Additional objectives of passive netting were to catch: 1) individuals that might be using areas outside their noted territory, 2) flycatchers (banded and unbanded) not previously detected in the patch, and 3) flycatchers that were not responsive when using the target netting method described above.

From 2001 to 2003, our passive netting efforts took place in the Lake Shore patch. However, in 2004, flycatchers were absent from much of the historically occupied section of Lake Shore so we shifted our efforts to occupied younger patches of habitat at Lake Shore, North Shore, Bermuda Flats and Shangri-la. These patches were thought to be analogous, in structure and flycatcher use, to the habitat found in Lake Shore prior to 2002. We continued to conduct a minimum of four passive netting sessions per two week period; a typical session consisted of the equivalent of four 12-meter nets (shorter nets were often used, in greater number) run from 0530-1100, for an average of 22 net/hours per session, and a total of 39 sessions. Passive netting was conducted within, adjacent to and outside of willow flycatcher habitat. Nets were checked for birds every 20 minutes or less and any flycatchers caught were processed according to the methods stated in the banding section of this report. Non-Willow Flycatcher species were immediately released upon extraction from a mist net.

GENETIC GENDER DETERMINATION

A genetic sample was taken from all newly captured flycatchers while being handled for banding. DNA was obtained from a small drop of blood taken (non-lethally) from Willow Flycatchers by clipping off the tip of one toenail, just past the vascularized tissue. This technique works well for obtaining small amounts of blood from flycatchers and other small passerines, with no discernable negative effects (Super and van Riper 1995, Busch et al. 2000). The drop of blood was stored in a small vial with 1xSSC-EDTA buffer. Samples were placed on ice in the field, and then frozen in the lab until the DNA was extracted. Gender was determined as described in Paxton et al. (2002). Gender determination makes it possible to look for gender-based differences in factors such as dispersal, site fidelity, and survivorship.

DETERMINING AGE BY MOLT PATTERNS

Pyle (1998) proposed that second year Willow Flycatchers can exhibit patterns of retained flight feathers (primaries and secondaries) that are not observed in older adults. While handling flycatchers during banding, we inspected each wing for retained feathers, indicated by wear and lighter color (especially on the feather spines) compared with adjacent flight feathers. We began to evaluate this as a possible technique for aging flycatchers in 1998, when the idea was first proposed. After several years of evaluating returning adults and banded, second year returning nestlings, we are confident that retained feathers indicate a second year Southwestern Willow Flycatcher. However, not all second year birds exhibited this pattern, so absence of retained feathers does not preclude the individual from being a second year bird. Thus, all flycatchers with retained feathers are now being aged as second year adults (SY), and those without the retained feathers are considered second year or older (AHY).

RESULTS

SUMMARY OF 2004 BANDING AND RESIGHTING EFFORTS

In 2004, USGS banded 128 new adult flycatchers, one fledgling from an unknown nest, 86 nestlings from 40 nests, and recaptured 22 returning nestlings (Table 1). In addition, we resighted five returning nestlings from 2003 that we could not catch. Overall, 73% of adult flycatchers detected at Roosevelt Lake were banded by the end of the breeding season (Table 1).

The USGS crew spent considerable time resighting and recapturing banded birds, and with the help of AGFD detected a total of 148 adult flycatchers banded as nestlings or adults in previous years. In total we detected 276 banded flycatchers at Roosevelt Lake in 2004 (Table 1). The total number of adults detected at Roosevelt Lake, including unbanded birds and birds with undetermined band combinations was 379 (Table 1). This includes four flycatchers that were banded as nestlings in previous years that we failed to catch in 2004.

The number of flycatchers reported herein for each patch may differ slightly from those reported by AGFD. The differences between numbers are due to different approaches in determining the exact number of individual flycatchers. Our estimates are based on the number of banded and unbanded birds detected, taking into account birds that move from patch to patch, are polygamous, and are captured but are never detected again. Our estimates are best interpreted as the minimum number of individual adults present at Roosevelt in 2004.

Table 1: Summary of Willow Flycatchers banded during the 2004 breeding season at Roosevelt Lake, Arizona. Data presented for each habitat patch are number of new adult captures (number of unbanded flycatchers banded in 2004), returning nestlings (flycatchers that were banded as nestlings in previous years, and first detected in 2004), total number of banded adults, total number of adults detected (banded and unbanded), number of nestlings banded (and number of nests), and percent of all adult flycatchers detected that were banded by the end of the season.

Patch	# New Adult Captures	# Returning Nestlings Banded	Total # Banded Adults	Total # Adult Birds Detected	# Nestlings Banded (# Nests)	% of All Adults Banded
Old Salt	1	0	2	2	0	100
Mudflats	2	0	2	6	0	33
Shangri-la	8	1	37	49	22(11)	76
School House South 3	4	0	6	8	6(3)	75
School House North 1	3	0	5	5	4(2)	100
School House North 2	0	0	9	14	5(2)	64
Lake Shore	16	3	23	31	1(1)	74
North Shore 1 East	5	2	22	25	9(4)	88
North Shore 1 West	7	1	18	28	5(2)	54
North Shore 1 North	12	2	43	48	16(6)	90
North Shore 2	11	4	19	30	4(2)	63
Bar X	12	0	14	18	0	78
Orange Peel Campground	5	2	16	23	1(1)	70
Orange Peel Flats	2	0	10	13	1(1)	77
Bermuda Flats North	29	4	44	60	6(4)**	73
Bermuda Flats South	11	3	19	32	7(2)	59
Totals	128	22	276*	379*	87(41)**	73

*total is less than the sum because 13 flycatchers were detected in more than one site

**includes one fledgling banded from an unknown nest

SITE-BY-SITE BANDING RESULTS AT ROOSEVELT LAKE

Salt River Inflow

In 2004, the USGS and AGFD field crews detected 239 Willow Flycatchers at the Salt River Inflow patches (179 banded, 39 unbanded, three nestlings from previous years that we failed to catch in 2004, and 18 unknown banded individuals). We detected 143 territories consisting of 69 monogamous territories, 35 polygamous territories, 27 territories with unpaired males, and 12 territories with status of the male territorial but all else unknown.

At the Salt River Inflow, the USGS banding crew captured 69 new adult flycatchers, recaptured 41, and with help from AGFD resighted the 69 other banded known returning flycatchers (Table 2).

Considering only flycatchers found at the Salt River Inflow site, Shangri-la had the highest percentage of birds (21%) followed by North Shore 1 North (20%) and Lake Shore (13%).

Table 2: Banded Willow Flycatchers detected at the Salt River Inflow, Roosevelt Lake, Arizona, in 2004. Data presented for each habitat patch are date first banded, federal bird band number, color band combination, age in 2004, sex, territory occupied in 2004, whether the bird was a confirmed resident of a territory, and capture status (new capture, recapture or resight).

Patch Name	Date Banded	Federal Bird Band Number	Color Band		Age 2004	Sex	2004 Territory	Confirmed Resident of Territory	Status
			Left Leg	Right Leg					
Old Salt	7/19/1999	1710-20298	YKY	VV	6Y	M	27	Yes	Resight
	6/7/2004	2210-57019	WVW	KK	AHY	M*	78	Yes	New
Mudflats	6/15/2004	2280-96697	GG	ZG	SY	M*	34	No	New
	6/15/2004	2290-24260	ZKZ	GG	AHY	M*	8	Yes	New
Shangri-la	6/29/2003	1490-89764	WDW	VV	SY	F*	82	Yes	Recapture
	6/28/2001	1490-89816	WK	VV	5Y	F	29	Yes	Resight
	6/30/1998	1590-97540	VV	RY	A7Y	F*	20	Yes	Resight
	6/22/1999	1590-97543	VV	WG	A6Y	M*	73	Yes	Resight
	6/22/1999	1590-97544	VV	RD	A6Y	M	25/88 ¹	Yes	Resight
	5/22/2001	1710-20203	ZZ	RO	A4Y	M*	72	Yes	Resight
	6/5/2001	1710-20243	OD	ZZ	A4Y	F*	25	Yes	Resight
	6/23/1999	1710-20280	VV	KD	A6Y	M	69	Yes	Resight
	7/24/1999	1710-20305	VV	DO	A6Y	M	20/22 ¹	Yes	Resight
	6/1/2001	1710-20461	VYV	ZZ	A4Y	M	39	Yes	Resight
	7/16/1998	1710-20473	ZW	ZZ	A7Y	M*	9	Yes	Recapture
	5/17/2001	1710-20498	ZZ	WV	A4Y	F	77	Yes	Resight
	5/20/2000	1710-20597	KK	YV	ASY	M	71	Yes	Recapture
	5/22/2000	1710-20603	KK	WW	A5Y	M*	10/40/50 ¹	Yes	Recapture
	6/16/2000	1710-20611	GV	KK	A5Y	F	9	Yes	Resight
	6/13/2000	1710-46327	KK	DY	6Y	M	5/77 ¹	Yes	Resight
	6/16/2002	1740-51745	DK	XX	ATY	F	22	Yes	Resight
5/18/2002	1740-51818	XX	YK	ATY	M*	1	Yes	Resight	
7/3/2001	1740-51889	VWV	KK	5Y	M	79	Yes	Resight	
Shangri-la	6/25/1998	1740-91866	DD	KK	A7Y	M	76	Yes	Resight

Patch Name	Date Banded	Federal Bird Band Number	Color Band		Age 2004	Sex	2004 Territory	Confirmed Resident of Territory	Status
			Left Leg	Right Leg					
	6/19/2000	1740-91973	WW	KK	A5Y	M	83	Yes	Resight
	6/7/2004	2210-57020	OR	KK	SY	M*	72	Yes	New
	7/2/2004	2210-57311	GG	KO	AHY	F*	84	Yes	New
	6/17/2004	2280-96678	WVW	GG	AHY	F*	89	Yes	New
	6/6/2004	2280-96685	WRW	GG	AHY	F*	83 ²	No	Recapture
	5/8/2004	2280-96694	WK	GG	AHY	M*	29/82 ¹	Yes	New
	6/3/2004	2280-96695	GG	GW	SY	M*	84 ²	No	New
	6/9/2004	2280-96696	GG	WR	SY	M*	38	No	New
	6/16/2004	2280-96698	GG	GWG	SY	M*	31	No	New
	5/30/2003	2290-24223	WW	GG	ASY	F	72	Yes	Resight
	6/27/1999	2290-24246	KV	GG	A6Y	M	30/100 ¹	Yes	Recapture
	5/31/2003	2290-24251	GG	DW	ASY	F	39	Yes	Resight
	6/1/2003	2290-24252	KYK	GG	ASY	F*	1	Yes	Resight
	6/11/2003	2290-24253	KY	GG	ASY	F	69	Yes	Resight
	7/22/2003	2290-24256	GK	GG	TY	M	89	Yes	Resight
	6/5/1997	2290-24257	GG	OW	A8Y	F	79	Yes	Resight
	6/20/2004	2290-24265	GG	ZW	AHY	F*	40	Yes	New
School House South 3	6/30/2002	1740-51748	XX	KG	ATY	F	21	Yes	Resight
	6/2/2004	2210-57004	KK	WRW	SY	F*	28	Yes	New
	6/2/2004	2280-96666	WR	GG	SY	M*	29	Yes	New
	6/2/2004	2280-96667	RK	GG	SY	M*	28	Yes	New
	7/5/2004	2290-24230	GG	OZ	SY	M*	88	No	New
	7/22/2003	2290-24255	KY	GG	ASY	M	21/94 ¹	Yes	Resight
School House North 1	6/19/2000	1740-91974	GK	KK	A5Y	F*	30	Yes	Resight
	6/6/2004	2210-57018	KK	ZWZ	SY	M*	22	Yes	New
	6/7/2004	2290-24210	GG	WW	AHY	F*	7	Yes	New
	6/6/2000	2290-24314	DD	DWD	A5Y	M	30	Yes	Resight
	6/6/2004	2290-24339	YWY	DD	SY	M*	7	Yes	New
School House North 2	6/20/2001	1490-89954	YKY	ZZ	4Y	M	12/31 ¹	Yes	Recapture
	7/21/2002	1710-20225	KYK	ZZ	4Y	M	81	Yes	Resight
	5/5/2001	1710-20239	ZZ	GO	A4Y	M	76	Yes	Resight
	6/24/2000	1710-20325	DYD	VV	5Y	F	81	Yes	Resight
	5/4/2001	1710-20497	ZZ	YW	A4Y	M	78	Yes	Resight
	6/26/2002	1740-51775	XX	VY	ATY	F	31	Yes	Resight
	6/3/2004	2280-96679	VK	GG	AHY	F*	12 ²	Yes	Resight
	6/1/2003	2290-24213	GG	GRG	TY	F	36	Yes	Resight
	5/15/2003	2290-24267	GG	DRD	ASY	M	79	Yes	Resight
Lake Shore	6/28/2003	1490-89766	VV	GRG	SY	F*	21	Yes	Recapture
Lake Shore	6/27/2003	1490-89854	VV	RWR	SY	M*	N/a	No	Recapture

Patch Name	Date Banded	Federal Bird Band Number	Color Band		Age 2004	Sex	2004 Territory	Confirmed Resident of Territory	Status
			Left Leg	Right Leg					
	6/27/2003	1490-89856	VV	KOK	SY	M*	N/a	No	Recapture
	7/27/2001	2210-57059	KV	KK	4Y	F	32	Yes	Recapture
	5/17/2003	2210-57323	GG	WG	ASY	M	50/95 ¹	Yes	Recapture
	6/26/2003	2280-96652	GG	YKY	ASY	F*	50	Yes	Resight
	6/15/2004	2280-96676	RZ	GG	SY	M*	N/a	No	New
	6/15/2004	2280-96677	GG	ZO	SY	M*	34	No	New
	6/6/2004	2280-96681	WY	GG	SY	F*	96	Yes	New
	6/6/2004	2280-96682	YY	GG	SY	M*	77	Yes	New
	6/6/2004	2280-96683	GG	VV	AHY	M*	96	Yes	New
	6/6/2004	2280-96684	YV	GG	AHY	F*	93	Yes	New
	6/6/2004	2280-96685	WRW	GG	AHY	F*	78 ²	Yes	New
	6/6/2004	2280-96686	GG	KOK	SY	M*	N/a	No	New
	6/6/2004	2280-96687	GG	KZ	SY	M*	13	Yes	New
	6/6/2004	2280-96688	GG	RKR	SY	F*	95	Yes	New
	6/7/2004	2290-24258	GG	GR	AHY	M*	79	Yes	New
	6/7/2004	2290-24276	GG	OK	SY	M*	21	Yes	New
	6/4/2004	2290-24316	DD	WOW	AHY	M*	93/94 ^{1,2}	Yes	New
	6/25/2003	2290-24325	YGY	DD	ASY	M*	32/78 ¹	No	Recapture
	6/17/2004	2350-24152	OK	GG	SY	F*	94	Yes	New
	6/21/2004	2350-24181	YVY	GG	SY	M*	N/a	No	New
	6/21/2004	2350-24182	GG	YV	AHY	M*	N/a	No	New
North Shore 1 East	5/22/2001	1710-20240	KG	ZZ	A4Y	F	35	Yes	Resight
	6/2/2001	1710-20462	DY	ZZ	A4Y	M	51 ²	No	Recapture
	7/25/2003	1740-51626	RZ	VV	SY	M	42	Yes	Recapture
	6/21/2003	1740-51635	VV	GKG ²	SY	M*	N/a	No	Recapture
	7/16/2002	1740-51754	XX	YKY	ATY	F*	42	Yes	Resight
	7/15/2002	1740-51781	XX	YR	ATY	F	21	Yes	Resight
	7/27/2002	1740-51804	ZKZ	XX	4Y	F	41	Yes	Recapture
	7/27/2002	1740-51805	GKG	XX	ATY	F*	51	Yes	Resight
	7/21/2000	2210-57002	KK	OK	5Y	M	97/21 ¹	Yes	Resight
	6/9/2004	2210-57022	ZG	KK	AHY	M*	131	Yes	New
	7/15/2000	2210-57075	OG	KK	5Y	F	131	Yes	Resight
	6/3/2004	2280-96695	GG	GW	SY	M*	38 ²	Yes	Resight
	6/9/2004	2290-24277	GG	GK	AHY	F*	68	Yes	New
	6/15/2004	2290-24278	ZR	GG	AHY	F*	97	Yes	New
	5/18/2002	2290-24307	DD	WGW	ATY	M*	66	Yes	Resight
	6/25/2003	2290-24311	DD	YDY	ASY	M*	68	Yes	Resight
	6/23/1999	2290-24319	DD	WKW	A6Y	M	35	Yes	Recapture
	7/17/2001	2290-24320	DYD	DD	4Y	M	68 ²	No	Recapture
North Shore 1	7/24/2001	2290-24324	GYG	DD	5Y	M*	67	Yes	Recapture

Patch Name	Date Banded	Federal Bird Band Number	Color Band		Age 2004	Sex	2004 Territory	Confirmed Resident of Territory	Status	
			Left Leg	Right Leg						
East	6/2/1997	2350-24051	KZ	ZZ	A8Y	F	67	Yes	Recapture	
	6/16/2004	2350-24178	WKW	GG	AHY	M*	00	Yes	New	
	6/16/2004	2350-24179	WGW	GG	AHY	M*	48	Yes	New	
North Shore 1 North	7/14/2001	1490-89802	VV	WRW	A4Y	F	63	Yes	Resight	
	6/27/2001	1490-89913	ZZ	KGK	5Y	M*	63	Yes	Resight	
	6/20/2001	1490-89950	ZZ	OK	4Y	F	64	Yes	Resight	
	6/18/2001	1490-89962	RZ	ZZ	4Y	M	71	Yes	Resight	
	6/25/2001	1710-20226	ZZ	RK	4Y	M	90	Yes	Resight	
	6/30/1999	1710-20288	VV	RYS	6Y	M	74	Yes	Resight	
	6/30/2003	1710-20315	VV	YRY	SY	F*	11	Yes	Recapture	
	6/18/1999	1710-20339	VV	OG	7Y	M	40	Yes	Resight	
	7/9/1999	1710-20385	YRY	DD	6Y	M	55	Yes	Recapture	
	6/13/2000	1710-46325	WG	KK	A5Y	F	54	Yes	Resight	
	6/27/2002	1740-51716	XX	RKR	ATY	F	73	Yes	Resight	
	8/7/2002	1740-51723	OKO	XX	ATY	M*	75	Yes	Resight	
	7/14/2002	1740-51756	XX	WG	ATY	M	58	Yes	Resight	
	6/5/2002	1740-51778	YD	XX	ATY	F*	20	Yes	Recapture	
	6/11/2002	1740-51798	XX	WD	ATY	M*	57	Yes	Resight	
	7/1/2000	1740-91975	KK	OY	A5Y	M	20	Yes	Resight	
	7/31/2000	2210-57014	KK	DD	5Y	F	71	Yes	Resight	
	7/11/2000	2210-57070	RD	KK	5Y	F	55	Yes	Resight	
	7/22/2002	2210-57305	XX	ZKZ	ATY	M	65	Yes	Resight	
	6/14/2001	2210-57307	DD	OKO	A4Y	M	72	Yes	Resight	
	5/18/2004	2290-24204	ZK	GG	AHY	M*	91	Yes	New	
	7/15/2003	2290-24216	GG	VK	ASY	F	90	No	Recapture	
	6/11/2003	2290-24232	YW	GG	ASY	F	37	Yes	Recapture	
	6/11/2003	2290-24233	RD	GG	TY	F	24	No	Resight	
	6/16/2003	2290-24237	KW	GG	ASY	F	90	Yes	Resight	
	6/3/2004	2290-24248	GG	GG	AHY	F*	74 ²	No	New	
	6/3/2004	2290-24249	GG	YW	AHY	M*	24	Yes	New	
	6/8/2004	2290-24259	WD	GG	AHY	M*	27	Yes	New	
	6/19/2004	2290-24264	GG	YWY	AHY	F*	88	Yes	New	
	5/21/2004	2290-24274	DD	GG	AHY	F*	83	Yes	New	
	6/13/2003	2290-24281	GG	DWD	ASY	F	56	Yes	Recapture	
	6/13/2003	2290-24285	GG	WDW	ASY	F	57	No	Recapture	
	6/2/2002	2290-24301	DD	WZW	ATY	M	89	Yes	Recapture	
	7/7/1999	2290-24306	RGR	DD	6Y	M	56	Yes	Resight	
	6/16/2001	2290-24315	DRD	DD	4Y	M	64	Yes	Recapture	
	5/29/2002	2290-24322	KOK	DD	ATY	M	37	Yes	Recapture	
	6/13/2003	2290-24323	DD	KWK	TY	M	88	Yes	Recapture	
	North Shore 1	6/30/2004	2350-24154	WO	GG	AHY	M*	19	Yes	New

Patch Name	Date Banded	Federal Bird Band Number	Color Band		Age 2004	Sex	2004 Territory	Confirmed Resident of Territory	Status
			Left Leg	Right Leg					
North	5/10/2004	2350-24165	KO	GG	AHY	M*	73	Yes	New
	6/19/2004	2350-24180	YRY	GG	SY	F*	91	Yes	New
	7/20/2004	2350-24206	KK	WO	SY	F*	85	Yes	New
	7/20/2004	2350-24207	KK	ZR	SY	M*	11/85 ¹	Yes	New
	7/1/2004	2350-24234	KK	RY	SY	F*	65	Yes	New
North Shore 1 West	6/24/2003	1490-89812	WOW	VV	SY	M*	86	No	Recapture
	6/6/1999	1710-20263	GW	VV	A6Y	F	98	Yes	Resight
	6/3/2001	1710-20264	OO	VV	A4Y	F	50	Yes	Resight
	6/2/2001	1710-20462	DY	ZZ	A4Y	M	69 ²	Yes	Resight
	6/19/2000	1710-20698	YY	KK	A5Y	F	99	Yes	Resight
	6/16/2002	1740-51779	XX	DYD	ATY	F	49	Yes	Resight
	6/7/2004	2210-57025	GWG	KK	AHY	F*	100	No	New
	6/20/2004	2210-57029	KK	RKR	AHY	M*	93	Yes	New
	6/20/2004	2210-57036	GZ	KK	SY	M*	86	Yes	New
	7/15/2002	2210-57301	XX	KWK	ATY	F	86	Yes	Resight
	6/7/2004	2280-96689	GG	WRW	AHY	M*	100	No	New
	6/20/2004	2290-24217	GG	KYK	AHY	F*	84	No	New
	6/20/2004	2290-24218	GG	WOW	AHY	M*	98	No	New
	5/28/2003	2290-24303	YKY	DD	ASY	M	84/98 ¹	Yes	Recapture
	6/11/2002	2290-24309	DD	ZKZ	4Y	M*	49	Yes	Recapture
	7/1/2000	2290-24312	RKR	DD	5Y	M	15/99 ¹	Yes	Resight
	7/1/2001	2290-24321	RWR	DD	4Y	M	50	Yes	Recapture
	7/19/2004	2350-24226	KK	DR	AHY	F*	8	Yes	New
North Shore 2	6/28/2003	1490-89781	VV	WKW	SY	F*	139	Yes	Recapture
	7/7/2003	1490-89809	VV	KYK	SY	M	123	Yes	Recapture
	6/24/2003	1490-89815	UNB	VV	SY	M*	122	Yes	Recapture
	6/19/2001	1490-89933	RGR	ZZ	4Y	M	46	Yes	Resight
	6/21/2003	1740-51637	VV	YWY	SY	M*	34	Yes	Recapture
	6/11/2002	1740-51791	GRG	XX	ATY	M*	45	Yes	Resight
	6/4/2004	2210-57005	KK	KW	AHY	M*	111	Yes	New
	6/17/2004	2210-57027	KK	OKO	SY	M*	5	No	New
	6/17/2004	2210-57028	KK	KZ	SY	F*	52	Yes	New
	7/4/2004	2210-57316	VG	GG	SY	F*	34	Yes	New
	6/4/2004	2280-96668	GG	DD	AHY	M*	92	Yes	New
	6/4/2004	2280-96669	YKY	GG	AHY	F*	111	Yes	New
	6/3/2004	2290-24250	GG	KWK	SY	M*	33	Yes	New
	6/17/2004	2290-24263	ZWZ	GG	AHY	M*	47	Yes	New
	7/27/2003	2290-24283	GG	YK	ASY	M	95	Yes	Recapture
	6/16/2004	2290-24284	GG	YR	AHY	M*	25	No	New
North Shore 2	6/17/2004	2290-24289	KR	GG	AHY	U	96	No	New

Patch Name	Date Banded	Federal Bird Band Number	Color Band		Age 2004	Sex	2004 Territory	Confirmed Resident of Territory	Status
			Left Leg	Right Leg					
	7/17/2001	2290-24320	DYD	DD	4Y	M	6/52 ^{1,2}	Yes	Resight
	7/6/2004	2350-24227	KK	VK	SY	F*	45	Yes	New

Color band color codes: X=silver, V=violet, Z=gold, K=black, D=blue, G=green, O=orange, R=red, W=white, and Y=yellow
Age: SY=2 years, AHY=2 years or older, TY=3 years, ASY=3 years or older, 4Y=4 years, ATY=4 years or older, 5Y=5 years old, A4Y=5 years or older, 6Y=6 years, A5Y=6 years or older, 7Y= 7 years, A6Y=7 years or older, 8Y=8 years, A7Y=8 years or older, A8Y=9 years or older
Sex Codes: F=female, M=male, U=unknown
* Birds sexed in the field
¹ Polygamous male
² Exhibited within season movement between patches

Tonto Creek Inflow

In 2004, USGS and AGFD detected 140 Willow Flycatchers at the Tonto Creek Inflow patches (97 banded, 27 unbanded, one nestling from a previous year that we failed to catch, and 15 unknown banded individuals). These birds were associated with 69 territories consisting of 31 monogamous pairs, 23 polygamous territories, eight single males, and seven territorial males with all else unknown.

The USGS banding crew captured 59 new flycatchers, recaptured 25, and along with AGFD resighted the remaining 13 adults banded in previous years in Tonto Creek (Table 3). We could not determine the band combinations of 15 flycatchers at Tonto Creek, primarily from the newly discovered Bermuda Flats patches; many of these unknown individuals may have been detected earlier in the season at another territory or patch before moving to Bermuda Flats.

USGS and AGFD found two new sites at Tonto Creek during the height of the breeding season this year. These two sites, Bermuda Flats North and Bermuda Flats South, had the highest number of flycatchers in Tonto Creek with 41% and 22%, respectively (Table 1). Bermuda Flats North had the highest number of birds of any patch at Roosevelt Lake (60).

Table 3: Banded Willow Flycatchers detected at Tonto Creek Inflow, Roosevelt Lake, Arizona, in 2004. Data presented for each habitat patch are date first banded, federal bird band number, color band combination, age in 2004, sex, territory occupied in 2004, whether the bird was a confirmed resident of a territory, and capture status (new capture, recapture or resight).

Patch Name	Date Banded	Federal Bird Band Number	Color Band		Age 2004	Sex	2004 Territory	Confirmed Resident of Territory	Status
			Left Leg	Right Leg					
Bar X	6/5/2004	2210-57016	RKR	KK	AHY	M*	23	No	New
	6/5/2004	2210-57017	KK	GWG	SY	M*	88	Yes	New
	6/15/2004	2210-57026	KK	RK	AHY	M*	20	No	New
	6/5/2004	2280-96670	GG	WGW	SY	F*	3	Yes	New
	6/5/2004	2280-96671	GZ	GG	SY	M*	21	Yes	New
	6/5/2004	2280-96672	OWO	GG	SY	F*	20	Yes	New
	6/5/2004	2280-96673	DYD	GG	AHY	F*	88	Yes	New
	6/5/2004	2280-96674	GG	YRY	AHY	M*	N/a	No	New
	6/3/2003	2290-24201	GG	RG	ASY	F	23	Yes	Recapture
	6/22/2004	2290-24227	RYR	GG	AHY	F*	24	Yes	New
	6/22/2004	2290-24228	YDY	GG	AHY	M*	24	Yes	New
	6/22/2004	2290-24229	ZRZ	GG	AHY	F*	5	Yes	New
	6/3/2004	2290-24248	GG	GG	AHY	F*	21 ²	Yes	Recapture
	7/3/2004	2350-24191	RGR	GG	AHY	M*	5/26 ¹	No	New
Orange Peel Campground	6/30/2003	1490-89770	WGW	VV	SY	M*	38	Yes	Recapture
	6/24/2003	1490-89814	KGK	VV	SY	F*	90 ²	No	Recapture
	6/26/2001	1490-89936	RYR	ZZ	A4Y	M	36	Yes	Resight
	6/26/2001	1710-20271	VV	VWV	A4Y	F	21	Yes	Resight
	5/18/2000	1710-20671	KK	WY	A5Y	M	21	Yes	Resight
	6/18/2000	1710-20696	KK	RG	A5Y	F*	20	Yes	Resight
	6/19/2002	1740-51820	WZ	XX	ATY	F	88	Yes	Resight
	6/8/2004	2210-57021	DO	KK	SY	M*	38	Yes	New
	5/18/2002	2280-96665	GG	KK	ATY	M	22/90 ¹	Yes	Recapture
	6/3/2004	2280-96679	VK	GG	AHY	F*	77 ²	Yes	New
	6/3/2004	2280-96680	KK	GG	AHY	M*	39	Yes	New
	5/7/2004	2290-24203	RW	GG	AHY	M*	35	Yes	New
	6/5/2004	2290-24209	GG	YY	AHY	M*	88 ²	No	New
	6/5/2003	2290-24239	GG	RGR	TY	M*	76	Yes	Resight
	6/24/2003	2290-24291	RKR	GG	ASY	F*	18	Yes	Resight
5/9/2001	2290-24308	DD	KOK	A4Y	M	20	Yes	Resight	
Orange Peel Flats	5/20/2001	1490-89908	ZZ	YO	A4Y	M	15/89/66 ¹	Yes	Resight
	7/2/1999	1710-20217	ZZ	WD	A6Y	F*	66	Yes	Resight
	7/28/1999	1710-20561	DO	VV	6Y	F	40 ²	Yes	Recapture
	7/26/2002	1740-51720	XX	OD	ATY	M	37/40 ¹	Yes	Recapture
	6/28/2002	1740-51800	XX	GRG	ATY	M	16/19 ¹	Yes	Resight
	5/20/2003	2290-24211	GG	RWR	TY	F	89	Yes	Resight

Patch Name	Date Banded	Federal Bird Band Number	Color Band		Age 2004	Sex	2004 Territory	Confirmed Resident of Territory	Status
			Left Leg	Right Leg					
Orange Peel Flats	6/12/2003	2290-24234	GG	RY	ASY	M	5/17 ¹	Yes	Resight
	6/15/2003	2290-24236	GG	DYD	ASY	F	16	Yes	Resight
	5/24/2004	2290-24247	GG	WK	AHY	F*	19	Yes	New
	6/5/2004	2290-24275	GG	WD	AHY	F*	17	Yes	New
Bermuda Flats North	7/27/2003	1490-89732	UNB	VV	SY	F	N/a	No	Recapture
	6/24/2003	1490-89814	KGK	VV	SY	F*	79 ²	No	Recapture
	6/24/2003	1490-89818	RGR	VV	SY	M*	N/a	No	Recapture
	6/27/2003	1490-89852	VV	ZK	SY	F*	77	No	Recapture
	6/19/2003	1490-89883	KRK	VV	SY	M*	8	Yes	Recapture
	6/3/2001	1710-20220	UNB	ZZ	A4Y	F	8	No	Recapture
	7/28/1999	1710-20561	DO	VV	6Y	F	8 ²	No	Recapture
	6/21/2003	1740-51635	VV	GKG	SY	U	79 ²	No	Recapture
	6/27/2002	1740-51739	YKY	XX	ATY	M	77	Yes	Recapture
	6/12/2002	1740-51746	RYR	XX	ATY	F*	10	Yes	Recapture
	6/30/2004	2210-57023	ZRZ	KK	SY	F*	40	Yes	New
	6/30/2004	2210-57024	YDY	KK	AHY	M*	40	Yes	New
	7/29/2002	2210-57319	XX	ZRZ	4Y	M	79	Yes	Recapture
	7/16/2004	2210-57328	KG	GG	AHY	F*	N/a	No	New
	7/16/2004	2280-96651	OW	GG	AHY	U	N/a	No	New
	7/28/2004	2280-96699	ZW	GG	SY	F*	79	No	New
	6/5/2004	2290-24209	GG	YY	SY	M*	61 ²	No	Recapture
	5/28/2003	2290-24270	GG	OKO	ASY	M	10	Yes	Recapture
	6/30/2004	2290-24298	GG	WYW	AHY	F*	00	No	New
	6/4/2004	2290-24316	DD	WOW	AHY	M*	91 ²	Yes	Resight
	7/20/2004	2290-24317	RDR	DD	SY	M*	7	No	New
	7/3/2003	2290-24340	YWY	DD	SY	M*	7 ²	No	Recapture
	7/5/2004	2290-24341	DD	WDW	AHY	F*	7	Yes	New
	7/5/2004	2350-24155	GG	GZ	SY	F*	78	Yes	New
	7/4/2004	2350-24156	KRK	GG	AHY	M*	7	Yes	New
	7/19/2004	2350-24158	OZ	GG	AHY	M*	9	Yes	New
	7/30/2004	2350-24166	RG	GG	SY	F*	N/a	No	New
	7/30/2004	2350-24167	RWR	GG	SY	F*	N/a	No	New
	7/31/2004	2350-24168	VW	GG	AHY	U	3	No	New
	7/4/2004	2350-24185	GV	GG	SY	F*	8	Yes	New
	7/5/2004	2350-24186	GG	VY	AHY	F*	76	Yes	New
	7/5/2004	2350-24192	GG	DO	AHY	M*	72	No	New
7/5/2004	2350-24193	RY	GG	AHY	F*	72	Yes	New	
7/7/2004	2350-24194	OR	GG	AHY	F*	6	Yes	New	
7/7/2004	2350-24204	WV	KK	SY	M*	6	Yes	New	
7/7/2004	2350-24205	KOK	KK	SY	M*	5	No	New	

Patch Name	Date Banded	Federal Bird Band Number	Color Band		Age 2004	Sex	2004 Territory	Confirmed Resident of Territory	Status
			Left Leg	Right Leg					
Bermuda Flats North	7/28/2004	2350-24208	KZ	KK	AHY	M*	1/73 ¹	No	New
	7/31/2004	2350-24228	KK	DWD	AHY	F*	3	Yes	New
	6/30/2004	2350-24233	YR	KK	AHY	M*	89	Yes	New
	7/30/2004	2350-24237	KK	RZ	AHY	F*	N/a	No	New
	7/30/2004	2350-24242	KK	YDY	SY	U	N/a	No	New
	7/30/2004	2350-24243	YRY	KK	AHY	F*	N/a	No	New
	7/31/2004	2350-24248	KK	YVY ²	SY	U	N/a	No	New
	8/1/2004	2350-24249	GKG	KK	AHY	F*	2	No	New
Bermuda Flats South	7/23/2003	1490-89727	VW	VV	SY	M	N/a	No	Recapture
	6/18/2001	1710-20250	ZG	ZZ	4Y	F	56	No	Recapture
	7/15/2002	1740-51787	OD	XX	4Y	M	57	Yes	Resight
	5/22/2002	1740-51796	XX	KW	ATY	M	82	Yes	Recapture
	7/6/2004	2210-57084	KK	VY	SY	F*	49	Yes	New
	6/21/2004	2290-24219	GG	WO	SY	M*	87/84 ¹	Yes	New
	6/21/2004	2290-24220	GRG	GG	SY	M*	86	No	New
	6/22/2004	2290-24290	VY	GG	AHY	M*	49	Yes	New
	6/22/2004	2290-24296	WOW	GG	AHY	F*	53	No	New
	6/22/2004	2290-24297	GG	WKW	AHY	M*	51/52 ¹	Yes	New
	7/17/2004	2290-24299	RZR	GG	AHY	M*	N/a	No	New
	6/1/2001	2290-24310	VYV	DD	A4Y	M	51	No	Recapture
	7/3/2003	2290-24340	YWY	DD	SY	M*	83 ²	Yes	Recapture
	6/22/2004	2350-24184	GG	OD	AHY	M*	56	Yes	New
	6/22/2004	2350-24190	GG	GV	SY	F*	71	No	New
	8/1/2004	2350-24225	KWK	KK	SY	F*	86	No	New
	7/29/2004	2350-24235	RZ	KK	AHY	F*	57	Yes	New
7/31/2004	2350-24248	KK	YVY	SY	U	86 ²	No	Recapture	

Color band color codes: X=silver, V=violet, Z=gold, K=black, D=blue, G=green, O=orange, R=red, W=white, and Y=yellow

Age: SY=2 years, AHY=2 years or older, TY=3 years, ASY=3 years or older, 4Y=4 years, ATY=4 years or older, 5Y=5 years old, A4Y=5 years or older, 6Y=6 years, A5Y=6 years or older, 7Y= 7 years, A6Y=7 years or older, 8Y=8 years, A7Y=8 years or older, A8Y=9 years or older

Sex Codes: F=female, M=male, U=unknown

* Birds sexed in the field

¹ Polygamous male

² Exhibited within season movement between patches

2003/2004 ADULT SURVIVORSHIP

Survivorship is defined as the number of individuals that survive from the end of one breeding season to the beginning of the next breeding season. Survivorship is estimated from the number of banded flycatchers present in one year that are detected in the following years (return rate), and is based on resights and recaptures of banded individuals. However, it is assumed that some individuals are alive in a particular year but not detected. Therefore, our return rates are minimum numbers, with actual survivorship being some higher, but unknown percent. Although true survivorship is unknown, it can be modeled based on the known return rates and an estimate of how many birds may have been present but were not detected. In past reports, we presented only return rates; these numbers are still useful for comparisons with past years, especially at the patch level. In 2004, 111 of 200 banded adult flycatchers at Roosevelt Lake patches in 2003 returned to the same or a different breeding location. Thus, the overall 2003-2004 adult return rate was 56% (Table 4). The maximum-likelihood survivorship estimate for 2003/2004 was 63% (95% Confidence Interval: 54%-71%).

Table 4: Willow Flycatcher return rates at Roosevelt Lake, Arizona, from 2003 to 2004, organized by site and patch. Return rate is the percent of the total number of banded adult flycatchers present in a patch in 2003 that returned (to any patch) in 2004.

2003 Site	2003 Patch	# Banded Adults 2003	# from 2003 Detected in Any Patch in 2004	% Return Rate
Salt River Inflow	Old Salt	11	5	45
	Mudflats	6	3	50
	Shangri-la	41	25	62
	School House South 3	12	5	42
	School House North 1	9	4	44
	School House North 2	17	10	59
	Lake Shore	14	9	64
	North Shore 1 East	21	13	62
	North Shore 1 North	26	15	58
	North Shore 1 West	13	5	38
	North Shore 2	4	2	50
Salt River Inflow Totals:		174*	96	55
Tonto Creek Inflow	Bar X	2	2	100
	Tonto Creek	5	1	20
	Orange Peel Campground	11	8	73
	Orange Peel Flats	8	4	50
	Tonto Creek Inflow Totals:	26	15	58
Overall Totals		200*	111	56

*total is less than the 2003 sum because 10 individuals were detected in two patches in 2003 and only considered either in the patch they were territorial in or the last territorial patch they occupied

2003/2004 ADULT PATCH FIDELITY

Patch fidelity is defined as the percent of adult banded flycatchers that return to the same breeding patch used the previous year. There are two ways to calculate patch fidelity. Commonly, it is calculated by dividing the number of banded birds that returned to their breeding patch in the present year by the total number of banded birds at the patch in the previous year. Another method is to calculate patch fidelity by using only those adults known to have survived from the previous year to the present year (Percent of Returning With Patch Fidelity). This can be a better estimate of patch fidelity since it considers only those birds that had a choice between returning to the same patch and moving to a different patch. We found that 30% of adults returned to the same breeding patch in 2004 that they occupied in 2003 (Table 5). Considering only those birds that returned and were detected in 2004, 54% showed patch fidelity by returning to the same breeding patch they occupied in 2003 (Table 5).

Table 5: Willow Flycatcher patch fidelity at Roosevelt Lake, Arizona, from 2003 to 2004, organized by site and patch. Percent patch fidelity is the number of *all banded adults present in 2003* that returned in 2004 to the same patch they occupied in 2003, whereas percent of returning with patch fidelity only considers those banded *adults that returned and were detected in 2004*.

Site	Patch	# Banded Adults 2003	# Returned to Same Patch 2004	Patch Fidelity (%)	% of Returning With Patch Fidelity
Salt River Inflow	Old Salt	11	1	9	20
	Mudflats	6	0	0	0
	Shangri-la	41	21	51	84
	School House South 3	12	0	0	0
	School House North 1	9	2	22	50
	School House North 2	17	3	18	30
	Lake Shore	14	1	7	11
	North Shore 1 E	21	7	33	54
	North Shore 1 N	26	13	50	87
	North Shore 1 W	13	2	15	40
North Shore 2	4	0	0	0	
Salt River Inflow Patch Fidelity:		174	50	29%	52%
Tonto Creek Inflow	Bar X Road	2	1	50	50
	A+ Cross Road	0	0	0	0
	Tonto Creek	5	0	0	0
	Orange Peel Camp	11	6	55	75
	Orange Peel Flats	8	3	38	75
Tonto Creek Inflow Patch Fidelity:		26	10	38%	67%
Overall Totals:		200*	60	30%	54%

*total is less than the 2003 sum because 10 individuals were detected in two patches in 2003 and only considered either in the patch they were territorial in or the last territorial patch they occupied

2003/2004 ADULT SITE FIDELITY

We now consider the patches within each of the Salt River Inflow and Tonto Creek Inflow drainages as components that collectively constitute a single site; thus average patch fidelity is not true site fidelity. Site fidelity is the return rate of flycatchers to a site, in this case, either Salt River Inflow or Tonto Creek Inflow. In 2004, the site fidelity at Salt River Inflow and Tonto Creek Inflow was 51% and 54%, respectively, for an average site fidelity of 51% at Roosevelt Lake (Table 6). If only the banded birds that returned to Roosevelt Lake from 2003 are considered, eliminating birds from 2003 that were not detected in 2004 (presumed mortality), the site fidelity average is 92% for Roosevelt Lake (Table 6).

Table 6: Willow Flycatcher site fidelity at Roosevelt Lake, Arizona, from 2003 to 2004. Table includes the number of banded, territorial adults in 2003, the number of those that returned to the same site in 2004, percent site fidelity of all banded birds in 2003, and percent of returning territorial banded birds that showed site fidelity.

Site	# Banded Adults 2003	# Returned to Same Site 2004	Site Fidelity (%)	% of Returning With Site Fidelity
Salt River Inflow	174	88	51	92
Tonto Creek Inflow	26	14	54	93
Average Site Fidelity	200	102	51	92

2003/2004 ADULT MOVEMENT

Between-year, Within-patch Movement

Within-patch movement is defined as the relocation of a territorial flycatcher from one territorial area to a new territorial area within a breeding patch. Because flycatcher territories vary in size and precise territorial boundaries were not mapped, flycatchers were considered to have moved only if they were resighted or recaptured >50 m from a previous resight/capture area or nest location.

Between-year movement within patches is defined as the relocation of a flycatcher within the previous year's breeding patch. Of the 60 returning territorial flycatchers that returned to their previous year's breeding patch, 37 (62%) settled in approximately the same area and 23 (38%) moved >50 m (Table 7). The average distance moved by a flycatcher within a patch, between 2003 and 2004, was 221 m (range = 55 to 880 m). Flycatchers that were detected in 2004 but not detected in 2003 were not included in this analysis of movement.

Table 7: Between-year, within-patch movement of adult Willow Flycatchers returning to the same breeding site at Roosevelt Lake, Arizona, between 2003 and 2004. Average and range of distance moved (in meters) is included for those flycatchers that moved greater than 50 m. This table only includes birds that were territorial in 2003.

Site	Patch	#Birds Returning to Breeding Patch	# (%) Birds moved > 50 m	Average Distance Moved (m)	Range of Distances Moved (m)
Salt River Inflow	Old Salt	1	0	0	0
	Mudflats	0	N/A	N/A	N/A
	Shangri-la	21	12(57)	178	58-400
	School House South 3	0	N/A	N/A	N/A
	School House North 1	2	0	0	0
	School House North 2	3	1 (33)	335	335
	Lake Shore	1	1 (100)	310	310
	North Shore 1 East	7	2 (29)	230	230
	North Shore 1 North	13	3 (23)	120	55-190
	North Shore 1 West	2	1 (50)	120	120
	North Shore 2	0	N/A	N/A	N/A
Salt River Inflow Movement		50	20 (40)	193	55-400
Tonto Creek Inflow	Tonto	0	0	N/A	N/A
	Bar X	1	1 (100)	880	880
	Orange Peel Camp	6	0	0	0
	Orange Peel Flats	3	2 (67)	165	80-250
Tonto Creek Inflow Movement		10	3 (30)	403	80-880
Overall Totals		60	23 (38)	221	55-880

Between-year, Between-patch Movement

Between-patch movement is defined as flycatcher movement from one breeding patch to another breeding patch, and may occur between and within years. Year to year movement between patches may occur within and between sites, the latter being less common. In order to detect movements away from Roosevelt Lake, we resighted Willow Flycatchers at the Verde River, White Mountains, and Alamo Lake and reviewed the Arizona Game and Fish Department resight data from San Pedro/Gila River sites.

In total, we detected 51 2003/2004 between year movements; 42 within-site between-patch movements and nine between-site movements by adult flycatchers (Table 8). Of the nine between-site movements, eight were between Salt River Inflow and Tonto Creek Inflow, and one was a bird that moved from Roosevelt Lake to the San Pedro/Gila River. We also observed eight other between-year movements by birds detected in previous years but not in 2003; five between year between-patch movements and three between year between site movements (Table 8).

Table 8: Adult Willow Flycatchers at Roosevelt Lake, Arizona, 2004, that exhibited between-year, between-patch movement from previous years to 2004. Birds that were detected in previous years but not in 2003 are also included. Birds that were detected in two patches in 2004 have only the first patch detected documented in the table. Table includes distance moved in km, color band combination, federal bird band number, 2004 age, and sex.

Patch Detected 2003 (unless previous year noted)	Patch Detected in 2004	Distance Moved (km)	Federal Bird Band Number	Color Band		2004 Age	Sex
				Left Leg	Right Leg		
Old Salt	Shangri-la	1.4	1710-20498	ZZ	WV	A4Y	F
	Lake Shore	3.5	2290-24325	YGY	DD	ASY	M*
	North Shore 1 North	3.8	2290-24237	KW	GG	ASY	F
	Orange Peel Flats	27.3	1740-51720	XX	OD	ATY	M
Mudflats	School House North 2	2.2	2290-24213	GG	GRG	TY	F
	North Shore 1 East	2.6	1710-20240	KG	ZZ	A4Y	F
	Bermuda Flats North	25.5	1710-20220	UNB	ZZ	A4Y	F
Shangri-la	School House North 2	2	1710-20497	ZZ	YW	A4Y	M
	North Shore 1 East	2.2	2350-24051	KZ	ZZ	A8Y	F
	North Shore 1 West	2.6	1710-20264	OO	VV	A4Y	F
	Orange Peel Flats	25.8	2290-24234	GG	RY	ASY	M
School House South 3	Shangri-la	1.5	2290-24223	WW	GG	ASY	F
	School House North 2	0.8	1710-20239	ZZ	GO	A4Y	M
	North Shore 1 North	1.5	2290-24281	GG	DWD	ASY	F
			2290-24301	DD	WZW	ATY	M
Orange Peel Flats	24.8	2290-24211	GG	RWR	TY	F	
School House North 1	School House North 2	1	1710-20325	DYD	VV	5Y	F
	North Shore 1 East	1.5	1710-20462	DY	ZZ	A4Y	M
School House North 2	School House South 3	0.8	1740-51748	XX	KG	ATY	F
	Lake Shore	1.2	2280-96652	GG	YKY	ASY	F*
	North Shore 1 North	1.7	1710-20385	YRY	DD	6Y	M
			2290-24285	GG	WDW	ASY	F
	North Shore 1 West	2	2290-24321	RWR	DD	4Y	M
	Bermuda Flats North	23.2	2290-24270	GG	OKO	ASY	M
Bermuda Flats South	23.1	1740-51796	XX	KW	ATY	M	
School House North 2 (2002)	North Shore 1 East	1.2	2290-24320	DYD	DD	4Y	M
School House North 2 (2001)	North Shore 1 North	1.7	2210-57070	RD	KK	5Y	F

Patch Detected 2003 (unless previous year noted)	Patch Detected in 2004	Distance Moved (km)	Federal Bird Band Number	Color Band		2004 Age	Sex
				Left Leg	Right Leg		
Lake Shore	North Shore 1 East	0.3	2290-24307	DD	WGW	ATY	M*
			2290-24324	GYG	DD	5Y	M*
	North Shore 1 North	0.6	1710-20339	VV	OG	7Y	M
			1740-91975	KK	OY	A5Y	M
			2290-24306	RGR	DD	6Y	M
	North Shore 1 West	0.3	1710-20263	GW	VV	A6Y	F
			1710-20698	YY	KK	A5Y	F
2290-24309			DD	ZKZ	4Y	M*	
Lake Shore (2002)	North Shore 1 North	0.6	1740-51723	OKO	XX	ATY	M*
	Bermuda Flats North	22.3	1740-51739	YKY	XX	ATY	M
North Shore 1 East	Lake Shore	0.3	2210-57323	GG	WG	ASY	M
	North Shore 1 North	0.8	2210-57307	DD	OKO	A4Y	M
			2290-24322	KOK	DD	ATY	M
			1710-20288	VV	RYR	6Y	M
	North Shore 1 West	0.8	2290-24303	YKY	DD	ASY	M
North Shore 2	1.1	2290-24283	GG	YK	ASY	M	
North Shore 1 North	North Shore 2	1.1	1740-51791	GRG	XX	ATY	M*
	Orange Peel Camp	25.4	2290-24239	GG	RGR	TY	M*
North Shore 1 West	North Shore 1 East	0.8	2290-24311	DD	YDY	ASY	M*
	North Shore 1 North	0.8	2290-24216	GG	VK	ASY	F
	Wheatfields South ¹	98	2290-24313	DD	YKY	ASY	M*
North Shore 1 (2002)	North Shore 2	0.7	1490-89933	RGR	ZZ	4Y	M
North Shore 2	Shangri-la	2.9	2290-24253	KY	GG	ASY	F
	North Shore 1 North	0.7	2210-57305	XX	ZKZ	ATY	M
North Shore 2 (2002)	Orange Peel Flats	23.5	1740-51800	XX	GRG	ATY	M
	Bermuda Flats South	21.9	1740-51787	OD	XX	4Y	M
Bar X	Bermuda Flats South	9.7	2290-24310	YVY	DD	A4Y	M
Tonto Creek	Orange Peel Camp	0.7	1710-20671	KK	WY	A5Y	M
Orange Peel Campground	North Shore 1 West	25	1740-51779	XX	DYD	ATY	F
	Orange Peel Flats	0.9	1710-20217	ZZ	WD	A6Y	F*
Orange Peel Flats	Bermuda Flats North	1.3	2210-57319	XX	ZRZ	4Y	M
Orange Peel Flats (2002)	Bermuda Flats North	1.3	1740-51746	RYR	XX	ATY	F*

Color band color codes: X=silver, V=violet, Z=gold, K=black, D=blue, G=green, O=orange, R=red, W=white, and Y=yellow
Age: SY=2 years, AHY=2 years or older, TY=3 years, ASY=3 years or older, 4Y=4 years, ATY=4 years or older, 5Y=5 years old, A4Y=5 years or older, 6Y=6 years, A5Y=6 years or older, 7Y= 7 years, A6Y=7 years or older, 8Y=8 years, A7Y=8 years or older, A8Y=9 years or older
Sex Codes: F=female, M=male, U=unknown
* Birds sexed in the field
¹ Lower San Pedro River

Same-year, Within-patch Movement

Same-year movement within-patches occurs when a territorial flycatcher moves within the same breeding season to a different territory within the breeding patch. Two flycatchers were detected moving within-patch during the 2004 breeding season. These were both males that remained unpaired while defending their initial territory, and then crossed the territories of other flycatchers to breed at a new location within the patch. These two movements were of 150 meters and 530 meters.

Same-year, Between-patch Movement

We detected 12 same-year between-patch movements in 2004 (Table 9). Most of these movements were between patches in the same site, though there were four movements between sites as well. In addition to the movements observed via resighting and banding, a radio telemetry study conducted at Roosevelt Lake with Willow Flycatchers documented between-patch movements by six males (Cardinal and Paxton 2004). The movements of these six telemetered males were not detected via resighting, which suggests that between-patch movement may be more common than previously thought. Most of the birds that were radio-tagged made multiple movements, and some returned to their original patch at least once. This illustrates that some of these between-patch movements did not involve permanent relocation.

Table 9: Adult Willow Flycatchers at Roosevelt Lake, Arizona, that exhibited same-year, between-patch movement in 2004. Included are patches detected in 2004, the distance moved, federal bird band number, color combination, age in 2004, and sex. Movements by birds that were only detected via radio-telemetry are not recorded in this table.

Patch First Detected	Patch Later Detected	Distance Moved (km)	Federal Bird Band Number	Color Band		Age 2004	Sex
				Left Leg	Right Leg		
Shangri-la	North Shore 1 East	2.2	2280-96695	GG	GW	SY	M*
Lake Shore	Shangri-la	1.9	2280-96685	WRW	GG	AHY	F*
	Bermuda Flats North	22.3	2290-24316	DD	WOW	AHY	M*
North Shore 1 East	North Shore 2	1.1	2290-24320	DYD	DD	4Y	M
	North Shore 1 West	0.8	1710-20462	DY	ZZ	A4Y	M
	Bermuda Flats North	22.5	1740-51635	VV	GKG	SY	U
North Shore 1 North	Bar X	30.5	2290-24248	GG	GG	AHY	F*
Orange Peel Camp	School House North 2	26.3	2280-96679	VK	GG	AHY	F*
	Bermuda Flats North	2.4	1490-89814	KGK	VV	SY	F*
			2290-24209	GG	YY	SY	M*
Orange Peel Flats	Bermuda Flats North	1.3	1710-20561	DO	VV	6Y	F
Bermuda Flats North	Bermuda Flats South	0.9	2350-24248	KK	YVY	SY	U
Bermuda Flats South	Bermuda Flats North	0.9	2290-24340	YWY	DD	SY	M

Color band color codes: X=silver, V=violet, Z=gold, K=black, D=blue, G=green, O=orange, R=red, W=white, and Y=yellow
Age: SY=2 years, AHY=2 years or older, TY=3 years, ASY=3 years or older, 4Y=4 years, ATY=4 years or older, 5Y=5 years old, A4Y=5 years or older, 6Y=6 years, A5Y=6 years or older, 7Y= 7 years, A6Y=7 years or older, 8Y=8 years, A7Y=8 years or older, A8Y=9 years or older
Sex Codes: F=female, M=male, U=unknown
 * Birds sexed in the field

NESTLING BANDING, SURVIVORSHIP AND MOVEMENT

2004 Nestling Banding

We banded a total of 86 nestlings (from 40 nests) at Roosevelt Lake in 2004 (Table 10). In addition we banded one fledgling from an unknown nest in Bermuda Flats North (Table 10). Nestlings banded in 2004 received a gold-anodized federal bird band on one leg.

Table 10: Willow Flycatcher nestlings and fledglings banded in 2004 at Roosevelt Lake, Arizona. Table includes patch banded in, territory and nest number, date banded, federal bird band number, and color band combination.

Patch	2004 Territory and Nest	Date Banded	Federal Bird Band Number	Color Band	
				Left Leg	Right Leg
Shangri-la	1B	8/1/2004	1490-89918	ZZ	UNB
			1490-89919	ZZ	UNB
	10C	7/10/2004	1490-89997	ZZ	UNB
	20B	8/2/2004	1490-89924	ZZ	UNB
	25A	6/17/2004	1490-89982	ZZ	UNB
			1490-89983	UNB	ZZ
	29A	6/17/2004	1490-89988	UNB	ZZ
			1490-89989	ZZ	UNB
			1490-89990	UNB	ZZ
			1490-89991	ZZ	UNB
	29B	7/27/2004	1490-89922	UNB	ZZ
			1490-89923	UNB	ZZ
	30A	6/17/2004	1490-89984	UNB	ZZ
			1490-89985	ZZ	UNB
			1490-89986	UNB	ZZ
	71A	7/2/2004	1490-89904	ZZ	UNB
			1490-89905	ZZ	UNB
1490-89915			ZZ	UNB	
72A	6/21/2004	2350-24024	UNB	ZZ	
		2350-24028	UNB	ZZ	
82A	7/6/2004	1490-89995	UNB	ZZ	
88A	6/17/2004	1490-89981	UNB	ZZ	
School House South 3	21A	6/18/2004	2350-24023	UNB	ZZ
			2350-24025	UNB	ZZ
			2350-24026	UNB	ZZ
	29A	7/15/2004	1490-89963	ZZ	UNB
			1490-89965	ZZ	UNB
94C	7/27/2004	2350-24056	ZZ	UNB	
School House North 1	7A	7/10/2004	1490-89996	ZZ	UNB
	30A	6/28/2004	2350-24015	ZZ	UNB
			2350-24016	ZZ	UNB
			2350-24017	ZZ	UNB
School House North 2	12A	7/4/2004	2350-24027	ZZ	UNB
			2350-24030	ZZ	UNB
			2350-24031	UNB	ZZ
	79A	6/28/2004	2350-24012	UNB	ZZ

Patch	2004 Territory and Nest	Date Banded	Federal Bird Band Number	Color Band	
				Left Leg	Right Leg
School House North 2	79A	6/28/2004	2350-24013	UNB	ZZ
Lake Shore	77A	7/20/2004	2350-24055	ZZ	UNB
North Shore East	21B	7/27/2004	2350-24057	ZZ	UNB
			2350-24058	ZZ	UNB
	42A	6/28/2004	2350-24014	UNB	ZZ
			2350-24059	ZZ	UNB
	48A	7/14/2004	2350-24060	ZZ	UNB
			2350-24061	ZZ	UNB
	97A	6/19/2004	1490-89992	UNB	ZZ
			1490-89993	ZZ	UNB
			1490-89994	UNB	ZZ
North Shore North	11A	7/18/2004	2350-24052	UNB	ZZ
			2350-24053	UNB	ZZ
			2350-24054	UNB	ZZ
	55B	7/15/2004	2350-24021	ZZ	UNB
			2350-24022	ZZ	UNB
	63A	6/19/2004	2350-24009	UNB	ZZ
			2350-24010	ZZ	UNB
			2350-24011	UNB	ZZ
	64A	6/23/2004	1490-89960	UNB	ZZ
			1490-89961	UNB	ZZ
	73A	7/16/2004	1490-89974	ZZ	UNB
			1490-89975	ZZ	UNB
			1490-89976	ZZ	UNB
	88B	7/1/2004	1490-89937	UNB	ZZ
1490-89938			UNB	ZZ	
1490-89946			UNB	ZZ	
North Shore West	15C	8/7/2004	2350-24062	ZZ	UNB
			2350-24063	ZZ	UNB
	84B	7/16/2004	1490-89967	ZZ	UNB
			1490-89972	ZZ	UNB
North Shore 2	34A	7/14/2004	2350-24018	ZZ	UNB
			2350-24019	ZZ	UNB
			2350-24020	ZZ	UNB
	45A	7/6/2004	1490-89947	UNB	ZZ
	Orange Peel Campground	76C	7/16/2004	2350-24033	ZZ
Orange Peel Flats	17D	8/2/2004	1490-89925	ZZ	UNB
Bermuda Flats North	7A	7/10/2004	1490-89998	ZZ	UNB
			1490-89999	ZZ	UNB
	10A	8/7/2004	2350-24064	ZZ	UNB
	40A	7/16/2004	1490-89916	UNB	ZZ
1490-89917			UNB	ZZ	

Patch	2004 Territory and Nest	Date Banded	Federal Bird Band Number	Color Band	
				Left Leg	Right Leg
Bermuda Flats North (Fledgling)	N/A	7/15/2004	2290-24318	DD	UNB
Bermuda Flats South	51A	7/17/2004	2350-24032	ZZ	UNB
			2350-24034	ZZ	UNB
			2350-24035	ZZ	UNB
			2350-24036	ZZ	UNB
	57A	7/29/2004	1490-89948	ZZ	UNB
			1490-89952	ZZ	UNB
			1490-89958	ZZ	UNB

First Year Survivorship and Movement

In 2003, we banded 120 nestlings from 53 nests and four fledglings from unknown nests at Roosevelt Lake. We recaptured 20 of these banded nestlings in 2004 (Table 11), and resighted, but were unable to catch, five additional banded nestlings most likely from 2003. Two of the five returning nestlings were resighted away from Roosevelt Lake at Brown's Crossing at Alamo Lake and Horseshoe Reservoir on the Verde River (270 and 64 kilometers from Roosevelt Lake, respectively). Thus, the 2003-2004 first-year return rate (based on the 25 known returning nestlings) was 20%. In addition, two returning flycatchers banded as nestlings in 2001 were recaptured in 2004 (Table 11). The detection of these fourth year birds increases the return rate estimate for 2001 nestlings from 27% (Newell et al. 2003) to 29%. Based on these 2004 return rates, we calculated maximum-likelihood survivorship estimates of 40% (95% Confidence Interval 27%-54%) for 2003-2004.

Table 11: Willow Flycatcher nestlings banded in previous years that were first captured in 2004. Table includes natal banding patch, patch detected in 2004, the distance moved from natal banding patch, federal bird band number, color band combination, natal banding date, and sex.

Natal Banding Patch	Patch Detected in 2004	Distance Moved (km)	Federal Bird Band Number	Color Band		Natal Date Banded	Sex
				Left Leg	Right Leg		
Shangri-la	North Shore 1 East	2.2	1740-51626	RZ	VV	7/25/2003	M
	North Shore 2	2.9	1490-89809	VV	KYK	7/7/2003	M
	Bermuda Flats North	25	1490-89732	UNB	VV	7/27/2003	F
	Bermuda Flats South	24.7	1490-89727	VW	VV	7/23/2003	M
Shangri-la (2001)	Bermuda Flats South	24.7	1710-20250	ZG	ZZ	6/18/2001	F
School House North 2	North Shore 1 North	1.7	1710-20315	VV	YRY	6/30/2003	F*
Lake Shore	Bermuda Flats South	22.3	2290-24340	YWY	DD	7/3/2003	M*
Lake Shore (2001)	North Shore 1 North	0.6	2290-24315	DRD	DD	6/16/2001	M
North Shore 1 East	Lake Shore	0.3	1490-89856	VV	KOK	6/27/2003	M*
	Orange Peel Camp	25.4	1490-89770	WGW	VV	6/30/2003	M*
North Shore 1 North	Shangri-la	2.5	1490-89764	WDW	VV	6/29/2003	F*
	Lake Shore	0.6	1490-89854	VV	RWR	6/27/2003	M*
	North Shore 1 West	0.4	1490-89812	WOW	VV	6/24/2003	M*
	North Shore 2	0.7	1490-89815	UNB	VV	6/24/2003	U
	Orange Peel Camp	24.8	1490-89814	KGK	VV	6/24/2003	F*
	Bermuda Flats North	25.5	1490-89818	RGR	VV	6/24/2003	M*
	1490-89852		VV	ZK	6/27/2003	F*	
	1490-89883		KRK	VV	6/19/2003	M*	
North Shore 1 West	North Shore 1 East	0.8	1740-51635	VV	GKG	6/21/2003	U
	North Shore 2	1.1	1740-51637	VV	YWY	6/21/2003	U
Tonto	Lake Shore	25.9	1490-89766	VV	GRG	6/28/2003	F*
Orange Peel Flats	North Shore 2	23.5	1490-89781	VV	WKW	6/28/2003	F*

Color band color codes: X=silver, V=violet, Z=gold, K=black, D=blue, G=green, O=orange, R=red, W=white, and Y=yellow
Sex Codes: F=female, M=male, U=unknown
 * Birds sexed in the field

PASSIVE NETTING AND DETECTION OF FLOATERS

The total number of adult captures from passive netting in 2004 was 70 (28 new captures and 42 recaptures), plus one fledgling. This was accomplished through a total of 859 net hours (each net hour equals the time a 12 m net is open for one hour). In 2004, we focused our passive netting efforts in North Shore 1 East, North, West, and Bermuda Flats North, with some effort in Shangri-la, North Shore 2, Bermuda Flats South, and the new, younger habitat of Lake Shore. Overall we caught 8.14 birds/100 net hours.

All the birds caught passively in North Shore 1 East, North Shore 2, Shangri-la, and Bermuda Flats South were territory holders. We caught one bird each in Lake Shore, North Shore 1 North, and West that were suspected floaters (Table 12). Of the 27 individuals passively caught in Bermuda Flats North at the end of the season, only 11 could be assigned to a territory. Ten were post-breeding females that were not associated with a territory we observed, two were males caught in a different patch than where they bred, and four were of unknown status that were caught post breeding season (Table 12). However, we cannot say with confidence whether any of these 4 adults of unknown status were floaters, since the Bermuda Flats North site was found late in the 2004 season, and we suspect that not all territories were identified and extensively resighted before the end of the season. In addition, we target netted 2 adults that we could not assign to a territory and therefore have unknown status (Table 12).

Table 12: Southwestern Willow Flycatchers that were caught in 2004 and believed to be floaters, or post-breeders that could not be assigned a territory. Table includes federal bird band number, color band combination, patch detected in 2004, 2004 territory, 2004 age, sex, type of capture, date banded, and status.

Federal Bird Band Number	Color Band		Patch Detected in 2004	2004 Territory	2004 Age	Sex	Type of Capture	Date Banded	Status
	Left Leg	Right Leg							
1490-89856	VV	KOK	LAKE	65	SY	M	RNP	6/27/2003	FL
2290-24218	GG	WOW	NSHW	98	AHY	M	NCP	6/20/2004	FL
2290-24285	GG	WDW	NSHN	37	ASY	F	RCP	6/13/2003	FL
2290-24317	RDR	DD	BEFN	7	SY	M	NCP	7/20/2004	UU
2280-96651	OW	GG	BEFN	42	AHY	U	NCP	7/16/2004	UU
2350-24242	KK	YDY	BEFN	9	SY	U	NCP	7/30/2004	UU
2350-24248	KK	YVY	BEFN	9	SY	U	NCP	7/31/2004	UU
2350-24158	OZ	GG	BEFN	9	AHY	M	NCT	7/19/2004	UU
1740-51635	VV	GKG	BEFN	79	SY	U	RCT	6/21/2004	UU

Color band color codes: X=silver, V=violet, Z=gold, K=black, D=blue, G=green, O=orange, R=red, W=white, and Y=yellow
Patch codes: LAKE=Lake Shore, NSHW=North Shore 1 West, NSHN=North Shore 1 North, BEFN=Bermuda Flats North
Age: SY=2 years, AHY=2 years or older, TY=3 years, ASY=3 years or older, 4Y=4 years, ATY=4 years or older, 5Y=5 years old, A4Y=5 years or older, 6Y=6 years, A5Y=6 years or older, 7Y= 7 years, A6Y=7 years or older, 8Y=8 years, A7Y=8 years or older, A8Y=9 years or older

Sex Codes: F=female, M=male, U=unknown

* Birds sexed in the field

Capture codes: RNP=returning nestling passive capture, RCP=recapture passive, NCP=new capture passive,

Status Codes: **FL=floater, UU=post-breeding adult, status unknown**

DISCUSSION

In 2004 at Roosevelt Lake we saw a 66% increase in the number of flycatchers compared to 2003 (379 and 229 respectively), and the occupation of two new patches by breeders. The population seems to have rebounded from the almost complete reproductive failure of the 2002 breeding season and the subsequent decline of the Roosevelt population in 2003. However, the discovery of the two new breeding patches during the middle of the breeding season presented considerable challenges to our field crew. As a consequence, we could not determine the band combinations of 8.7% of the resighted flycatchers at Roosevelt Lake, which is comparatively high to previous years (only 0.8% were unconfirmed in 2003). Despite some of these difficulties, we caught and banded a record number of new adults (128 new captures) and continued to recapture high numbers of returning nestlings and band high numbers of nestlings.

2004 BANDING AND RESIGHTING EFFORTS

Captures

Overall, 128 new adults, 86 young, and 22 returning nestlings were banded in 2004. In addition, 126 adults banded in previous years were detected through resights and recaptures. Even though we banded over twice the number of adults this year than last, the percentage of banded adults in the population by the end of the 2004 season was only 73%, compared to 88% in 2003. Productivity was high in 2003 (Smith et al. 2004), presumably resulting in a large influx of unbanded adults in 2004 (assuming mostly recruitment from Roosevelt Lake).

From 1996 to 2004, we banded 613 adult and 461 nestling or fledgling Southwestern Willow Flycatchers at Roosevelt Lake; as a result, 68% or more of all flycatchers detected at USGS study sites within a given year were banded (Paxton and Sogge 1996, Paxton et al. 1997, Netter et al. 1998, English et al. 1999, Luff et al. 2000, Kenwood and Paxton 2001, Koronkiewicz et al. 2002, Newell et al. 2003). Since 2001 this figure has remained above 73% at Roosevelt Lake. Maintaining high overall percentages of banded birds is important because it increases the proportion of banded birds returning in subsequent years, which in turn increases our ability to detect site fidelity and movement, provides a more accurate calculation of survivorship, and provides AGFD with banded females for their seasonal fecundity study.

Age Structure

With the adoption of the retained feather aging method, and tracking returning, banded nestlings that are of known age, we were able to definitively age 120 of the 275 (44%) banded Willow Flycatcher adults at Roosevelt Lake in 2004.

The age structure at Roosevelt Lake has changed over the years. Prior to 2003, the age structure was relatively young, characteristic of a growing population (Fig. 3). In 2003, the age structure was noticeably older, with third and fourth year birds occurring in the highest frequency. This was due to the low nest productivity in 2002, which resulted in low recruitment in 2003. As expected, given the high productivity of 2003, the structure became bi-modal in 2004, with a large second year (SY) component (61% of the new captures this year were known to be SY birds) and a smaller fourth year (4Y) peak (the residual pattern from the 2003 age structure). Since 2004 productivity was comparable to 2002 and before, we expect to see a similar trend in 2005 with a large cohort of second year birds.

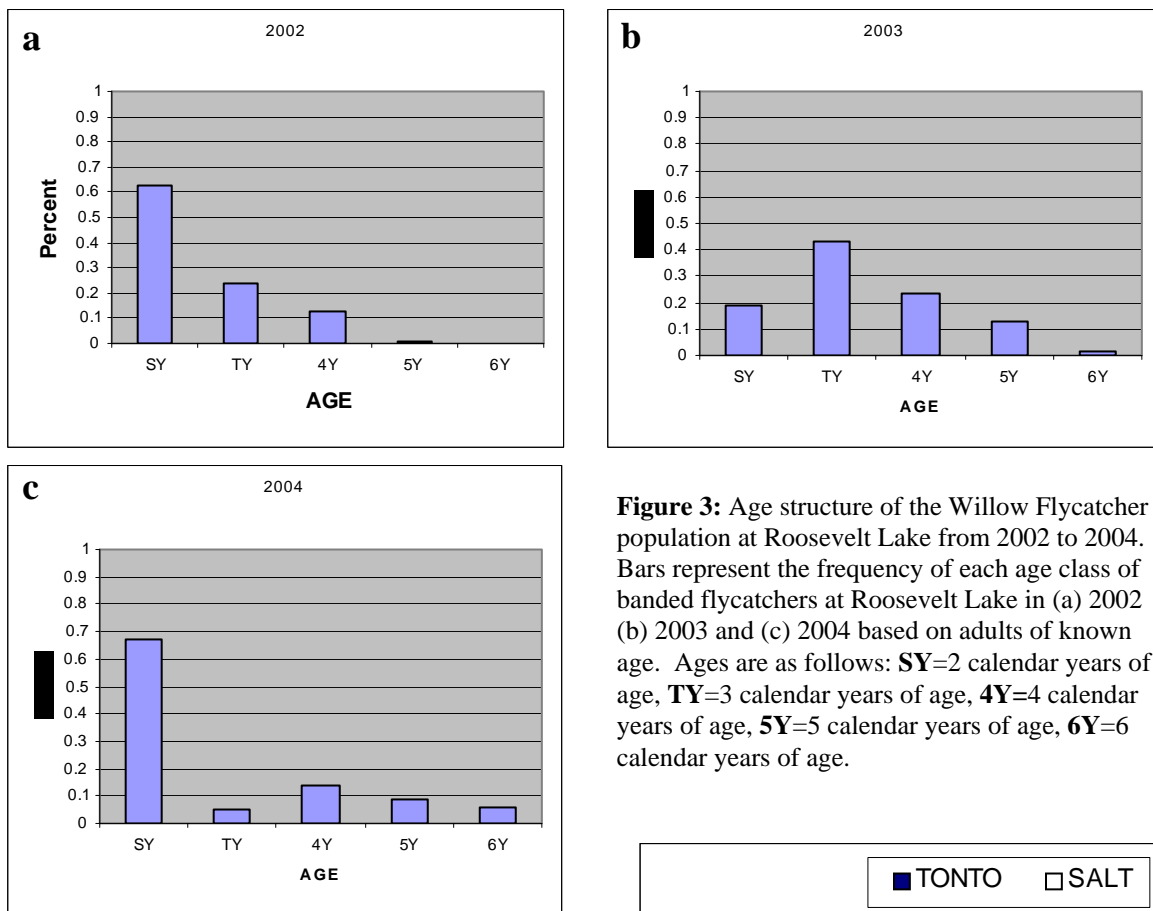


Figure 3: Age structure of the Willow Flycatcher population at Roosevelt Lake from 2002 to 2004. Bars represent the frequency of each age class of banded flycatchers at Roosevelt Lake in (a) 2002 (b) 2003 and (c) 2004 based on adults of known age. Ages are as follows: **SY**=2 calendar years of age, **TY**=3 calendar years of age, **4Y**=4 calendar years of age, **5Y**=5 calendar years of age, **6Y**=6 calendar years of age.

Population Trends

After last year's 16% population decline, the population increased by 66% in 2004 (Fig. 4). The Willow Flycatcher population at Roosevelt Lake in 2004 was larger than in any previous year since surveys began in 1993.

In addition to changes in overall population size, we continued to observe shifts in the number of breeders occupying the various patches at Roosevelt Lake. One of the newly discovered patches in 2004, Bermuda Flats North, had the highest percentage of

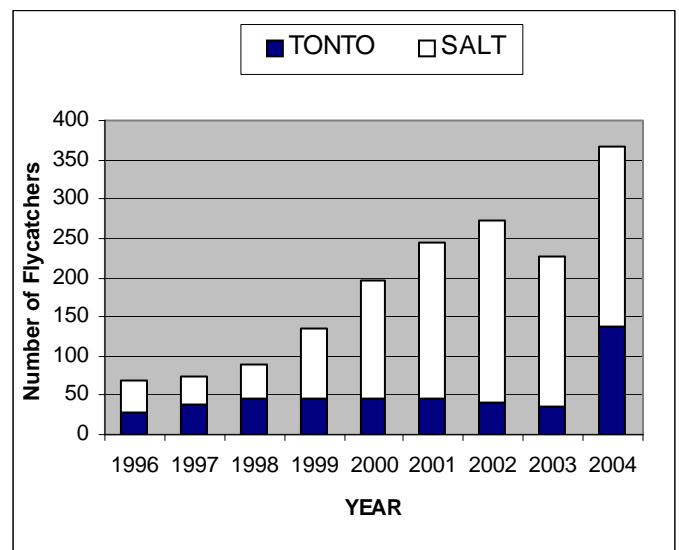


Figure 4: Population size of Willow Flycatchers at Roosevelt Lake, Arizona, from 1996-2004, at the Tonto Creek Inflow (blue bar) and Salt River Inflow (white bar).

birds (16%), followed by Shangri-la and North Shore 1 North, each with 13%. Much of the population increase occurred on the Tonto Creek Inflow, primarily due to the discovery of the Bermuda Flats patches; the population on the Salt River Inflow stayed relatively constant from the previous year.

The general population trend observed over the years at Roosevelt Lake continued in 2004: the breeding population continues to quickly colonize new habitat, while older patches tend to have fewer breeders as they age. The Bermuda Flats patches had the largest number of breeders in 2004, and was the youngest occupied habitat at Roosevelt Lake. However, this is only a general pattern, and one of the older patches, Shangri-la, has consistently had a high number of birds over the years. Again, as in past years, it appears that younger birds colonize younger habitats. Forty-three percent of the banded flycatchers at the Bermuda Flats patches were second year birds, compared to only 12% at the adjacent, but older Orange Peel patches, and 14% at Shangri-la.

ADULT SURVIVORSHIP

The estimated 2003-2004 return rate for Roosevelt Lake, based on 111 returning banded adults, was 56%. One problem with calculating survivorship is that it assumes that all living, banded flycatchers are detected. This year we detected 12 flycatchers at Roosevelt Lake that were last seen in 2002 and five birds that were last detected in 2001. Recalculating the return rates for those years by including these individuals increases the 2001-2002 corrected return rate from 63% (Koronkiewicz et al. 2002) to 66%, and the 2002-2003 return rate from 53% (Newell et al. 2003) to 61%.

Because not all flycatchers are detected in a given year, the return rates underestimate the true survival rate. By estimating the probability of not detecting a banded flycatcher in a given year, we are able to provide better estimates of the true survivorship of adults. These are higher than the return rates, because the model used (MARK) tries to estimate the number of flycatchers undetected, but alive. Estimating survivorship for past years indicates that the average survivorship for the Roosevelt Lake flycatcher population is 65%, with an upper 95% confidence interval of 74% (Table 12).

Table 13: Adult Willow Flycatcher survivorship estimates for Roosevelt Lake, Arizona, 1998-2004. For each between-year period is the return rate, survivorship estimate, and the upper 95% confidence interval. In all cases the return rate was greater than the lower 95% C.I.

Year	Return Rate (%)	Survivorship Estimate (%)	Upper 95% C.I. (%)
1998/1999	58	65	78
1999/2000	53	57	67
2000/2001	69	73	81
2001/2002	66	68	77
2002/2003	61	62	70
2003/2004	56	63	71
Average	60	65	74

ADULT SITE FIDELITY, PATCH FIDELITY AND MOVEMENT

Site and Patch Fidelity

Flycatchers that survive the winter and return to the breeding grounds have a choice between returning to the approximate area where they bred the year before, or to move to a new breeding location. Based on banding results from 1997 to 2004, we know that a high number of flycatchers move to different breeding patches and sites from one year to the next. Prior to 2001, we presented site fidelity (returning to the same site) and movement among sites based on definitions of most habitat patches being separate sites. However, a site may best be defined by the movement patterns of flycatchers, which is considerable

among patches. Therefore, since 2001 we have considered all patches within the Salt River Inflow as one site, and all patches within the Tonto Creek Inflow as one site. For the highest resolution, we have presented the return patterns by patch, which can be compared with pre-2001 "site"-level (now patch-level) site fidelity data.

Over the last seven years, 1997-2003, average patch fidelity rates ranged from 30% to 44%. Our 2003-2004 average patch fidelity rate of 30% is at the low end of this range. However, with the more encompassing definition of site adopted in 2001, site fidelity for Roosevelt Lake was 51% in 2004 (102 of 200 territorial banded birds from 2003). This is roughly the same as in 2003 (52%), and compares to 42% in 2002 and 61% in 2001.

Calculating site fidelity as the number of flycatchers returning to a site divided by the total number of banded birds present at that site the year before is convenient for comparisons among sites and to other studies, but it does not differentiate between fidelity based on mortality versus choice. Because this study encompasses all known occupied Willow Flycatcher areas at Roosevelt Lake, most local movements are readily detected. It is instructive to look at an alternate calculation of site fidelity – based on the number of birds known to have *survived*, thus having the choice between site fidelity or movement. In this calculation, 54% (60 of 111) of known surviving territorial adults returned to the same breeding patch and 92% (102 of 111) to the same site in 2004.

Adult Movement

Between-year, between-patch movement gives us an indication of the dynamic nature of habitat use by the Willow Flycatcher. The 42 between-year, between-patch (but within-drainage) movements seen in 2004 are higher than all previous years except 2003. In addition, we detected eight adult flycatchers that moved between the Tonto Creek and Salt River sites, which is on the high end of the range observed since 1997. Among those adults that returned to the same breeding patch, 38% moved to an area that was >50 m from their previous year's breeding area.

In 2004, we resighted mainly at Roosevelt Lake, but also made short visits to other sites including Horseshoe Reservoir at the Verde River, the White Mountains, and Brown's Crossing at Alamo Lake. We also examined resight data gathered by AGFD at the San Pedro/Gila River sites. One cross drainage movement from Roosevelt Lake to the San Pedro/Gila River was observed this year, which is fewer than in previous years.

Same-year movement was also observed within-and between-sites in 2004. Two adults moved to different locations within the same patch and another 13 moved between-patches. We also detected six movements between patches, via radio telemetry, that otherwise would not have been noted through resighting. Of the 13 between-patch movements, two were between the two Bermuda Flats patches, and five of the remaining 11 movements (45%) were to the Bermuda Flats patches. A large percentage of birds that were moving between-patches were moving to and within the new habitat.

The levels of observed movement have significant implications to the genetic structure of these sites, site tenacity, and response to habitat modification and/or destruction. This level of population movement and resultant genetic mixing helps explain the patterns of high genetic diversity within, and low population structuring (e.g., low reproductive isolation) among, Willow Flycatcher populations in the Southwest (Busch et al. 2000). These types of movements also provide a reminder that flycatchers may view sites, corridors, and habitat patchiness and isolation differently than we typically do.

Detection of continuous movement of flycatchers throughout the breeding season, both within and between sites, underscores that surveys throughout the breeding season are essential for accurate population estimates of breeding Willow Flycatchers. In fact, accurate population estimates in large, densely populated breeding sites probably require intense color-banding and tracking of individual birds. Additionally, our data indicate that areas within suitable habitat that are unoccupied early in the breeding

season may become occupied later as flycatchers resettle territories. Furthermore, the presence of a flycatcher at a territory throughout the breeding season does not mean that it is the same individual, as reshuffling and replacement of individuals does occur. Although a flycatcher territory may be occupied in consecutive years and have nearly identical territory boundaries in both years, it may not be occupied by the same Willow Flycatcher.

NESTLING BANDING, SURVIVORSHIP AND MOVEMENT

In 2004, we banded 86 nestlings and one fledgling. The high number of nestlings banded, and intensive efforts to recapture them in subsequent years, allows us to more accurately estimate survivorship of juveniles at Roosevelt Lake.

This year, we recaptured 16% of the 124 hatch year birds we banded in 2003. In addition, we resighted five other 2003 returning nestlings at Roosevelt Lake, Brown's Crossing at Alamo Lake, and Horseshoe Reservoir at the Verde River. This increases our return rate to 20% (Table 13). This figure is low compared to previous years because previous years have been corrected to consider returning nestlings first detected in subsequent years. For instance, our initial survivorship estimate was only 18% for nestlings banded in 2001 and returning in 2002; however, captures in subsequent years have raised our estimate to 29% (Table 13). Over the past years, we observed that many banded nestlings are not detected for two or more years after being banded, and our 2004 return rate will likely increase in 2005.

Table 14: Juvenile willow flycatcher survivorship estimates for Roosevelt Lake, Arizona, 1998-2004. Data presented for each between-year period is the return rate, survivorship estimate, and the upper 95% confidence interval. In all cases (except 2003-2004), the return rate was greater than the lower 95% C.I. Detection probability was fixed at 0.5% for all years.

Year	Return Rate (%)	Survivorship Estimate (%)	Upper 95% C.I. (%)
1998/1999	22	40	80
1999/2000	32	25	44
2000/2001	30	31	44
2001/2002	29	41	56
2002/2003	33	33	85
2003/2004	20	40	54
Average	28	35	61

PASSIVE NETTING AND DETECTION OF NON-BREEDING FLYCATCHERS

We continued our passive netting efforts in 2004 to detect floaters and captured 70 adult flycatchers. Through passive netting we detected three to seven floaters. In addition, we captured two additional adults (via target netting) which may have been floaters. The designation of a flycatcher as a floater is always difficult, and can only be done in such studies where intensive tracking and resighting of all territories occurs such as in Roosevelt Lake. In 2004, we had high confidence in identifying almost all territories and territory holders, with the exception of the Bermuda Flats patches. At these patches, six individuals were captured that we could not assign to a territory, and may have been floaters; however, we cannot confirm them as floaters because of our uncertainty that we identified all breeders at those patches. Therefore, we only have high confidence in confirming the three individuals captured on the Salt River Inflow site as floaters. The three floaters that we caught in 2004 compares to five in 2003, 56 in 2002, and eight in 2001. It is this difficulty in identifying floaters that has led them to be largely ignored in many demographic studies. However, documenting the presence of floaters is important, as they exist as a surplus, non-counted population that may contribute to the breeding population in future years. Thus, despite the difficulties, research on floaters will continue in the 2005 breeding season.

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