**WCFO Field Report**

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Subject: Southwestern Willow Flycatcher Monitoring, May-September 2015

## INTRODUCTION

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*; hereafter flycatcher) is an obligate riparian bird that occurs patchily along rivers and streams throughout much of the southwestern U.S. from April through September. Females build small open-cup nests, which are typically placed in the fork of small-diameter vertical branches, 2-7 m above the ground. Successful flycatchers typically produce a single clutch per year, but will occasionally produce a second clutch following a successful nest. Unsuccessful flycatchers will re-nest multiple times following nest failure. The flycatcher was federally listed as endangered in 1995 due to declining populations caused primarily by the loss and modification of breeding habitat (USFWS 1995). The current flycatcher population consists of approximately 1000 known pairs, and an estimated population size of 1200 pairs (USFWS 2002). Three to 11 pairs breed along the Virgin River in St George, Utah (Day 2003).

Breeding habitat is characterized by a mosaic of relatively dense tree and shrub growth, typically in association with surface water or saturated soil, interspersed with more open areas, open water, or shorter, sparser vegetation along rivers, streams, or other wetlands. Plant species composition, vegetation height and density, and patch size vary greatly, but most occupied sites typically consist of dense vegetation in the interior of the patch and within 3-4 m of the ground (Sogge and Marshall 2000, USFWS 2002). Flycatchers historically nested primarily in willows (e.g., *Salix exigua*, *S. gooddingii*), buttonbush (*Cephalanthus occidentalis*), and seepwillow (*Baccharis salicifolia*), but now also nest in thickets dominated by tamarisk (e.g., *Tamarix ramosissima*) and Russian olive (*Elaeagnus angustifolia*). Because habitat loss and degradation are the main factors contributing to the decline of the species, the Southwestern Willow Flycatcher recovery plan emphasizes the increase and improvement of breeding habitat through restoration of native breeding habitat and the management of exotic vegetation (USFWS 2002).

Utah Division of Wildlife Resources (UDWR) continued long-term population monitoring in 2015 by conducting presence-absence surveys at known and potential breeding sites, and at planned future restoration project sites. In 2015, in coordination with the Virgin River Program, UDWR also continued monitoring breeding productivity for an eighth year. As a flycatcher surrogate species (ecologically similar and more common), Yellow Warbler (*Setophaga petechia*; hereafter warbler) breeding behavior and productivity were also monitored in 2015. Associated with nest monitoring, UDWR sampled habitat at successful and unsuccessful nest sites and at randomly selected sites within occupied habitat patches. Toward the goal of recovering the St George flycatcher population, UDWR will use these data to refine ongoing riparian habitat restoration activities to benefit Southwestern Willow Flycatchers specifically. Data were collected by UDWR personnel Christian N. Edwards and Erik T. Woodhouse.

## METHODS

*Population Size and Distribution*
We conducted presence-absence surveys at six previously occupied breeding sites (Riverside Marsh, Riverside East, River Road Bridge, Seegmiller Marsh, Y-Drain Marsh, and Snipe Pond), at two potential breeding sites (Schmutz Drain and Mad Dog Pond), and at one restoration project

site (Riverside Marsh) along the Virgin River in St George, Washington Co., Utah. We also conducted surveys at a potential breeding site on Sand Wash and at a potential breeding site near the Santa Clara River and Virgin River confluence (Dixie Center Willows). We followed the standardized Southwestern Willow Flycatcher survey protocol (Sogge et al. 2010), conducting one survey during each of three survey periods (15-31 May, 1-24 June, and 24 June-17 July) at currently occupied breeding sites. At potential breeding sites, we conducted one survey during the first survey period and two surveys during each of the latter two survey periods. Prior to attempting surveys we used aerial photographs to delineate survey areas and to identify survey routes providing adequate coverage of the area. During surveys we walked survey routes, stopping every 20-30 m. At each stop we first looked and listened for flycatchers for 1-2 min, after which, if a flycatcher was not detected, we broadcasted a 20 sec recording of a flycatcher song, and then again looked and listened for responding flycatchers. Total number of adult flycatchers was recorded.

*Reproductive Success*
We attempted to locate and monitor all active flycatcher and warbler nests throughout the 2015 breeding season following standard methods (Martin et al. 1997, Rourke et al. 1999). We searched for nests primarily by observing adult behavior and systematically searching vegetation. We generally checked nests every three to four days, but increased nest check frequency to every one to two days in anticipation of nest stage transitions. We monitored nests from a distance when possible, but approached nests closely to observe nest contents and thus determine nest stage transition dates, clutch size, hatching success, and nest fate. During appropriate nest stages (i.e. laying or incubating) and if nest location allowed, we used a six foot stepladder and replaced or addled Brown-headed Cowbird (*Molothrus ater*) eggs from active flycatcher nests.

*Breeding Habitat and Nest Site Characteristics*
During mid-late August, following flycatcher departure from breeding territories, we sampled vegetation associated with nests active in 2015. We used standard methods (Martin et al. 1997) to quantify canopy cover, canopy height, foliage height density, and shrub-sapling stem density within a 5 m radius plot, and tree density within an 11.3-m radius plot centered on nest sites (use plots) and randomly selected sites (nonuse plots). We also measured distance to habitat edge, distance to nearest water, and other nest site characteristics (e.g., nest height, nest substrate height).

*Banding and Re-sighting*
Toward the goal of understanding flycatcher demography, SWCA Environmental Consultants (Flagstaff, Arizona; hereafter SWCA) maintains a long-term banding program throughout much of the Lower Colorado River Recovery Unit, including the St George study area (McLeod and Koronkiewicz 2009). We thus attempted to re-sight color-banded flycatchers returning or dispersing to breeding sites along the Virgin River throughout the 2015 breeding season. Additionally, when appropriate conditions allowed, SWCA personnel placed federal metal and plastic color bands on 6-9 day old flycatcher nestlings.

## RESULTS AND DISCUSSION

*Population Size and Distribution*
Eleven flycatcher territories, distributed among four breeding sites in the St George study area (Riverside Marsh, Seegmiller Marsh, Y-Drain Marsh, and Snipe Pond), were occupied in 2015 (Figure 1). At least one additional male flycatcher was observed at various sites throughout the breeding season. Although this bird(s) did exhibit territorial behavior (i.e. singing) it was not included in the population size data due to its sporadic movement among breeding sites and is

classified as a "floater." During the 2015 breeding season, two male flycatchers at Seegmiller Marsh and one at Y-Drain Marsh were observed in polygynous relationships; each with two nesting females.

The number of flycatcher territories in 2015 was higher than three of the past four breeding seasons (Figure 1). These data support a possible trend shift from the ongoing decline in the number of active territories since 2008-2009, when effects of the Tamarisk Leaf Beetle (*Diorhabda carinulata)* were first apparent at flycatcher breeding areas. In 2015, the number of territories at Riverside Marsh, Seegmiller Marsh, Y-Drain, and Snipe Pond were identical to those in 2014 (Figure 1). With an exception to Snipe Pond, these breeding sites contain a mixed tamarisk and coyote willow habitat structure and standing water. Ten female flycatchers were observed and monitored through the 2015 breeding season. This continued the relatively stable trend in the St George, Utah study area (Figure 2). However, the number of females at Seegmiller Marsh remained high and is the largest number since 2009.

Additionally, during a survey conducted on July 16, 2015 at Sand Wash, a male flycatcher responded to a broadcasted recording and continued singing throughout the duration of the survey. This was the first detection of a potential breeding flycatcher on Sand Wash. This observation presents a significant question concerning flycatcher distribution in the St George study area and suggests that distribution is potentially expanding. Sand Wash is a tributary to the Santa Clara River and is located approximately 9.5 km (6 mi) from the nearest flycatcher breeding site along the Virgin River (Figure 3).

*Reproductive Success*

We monitored a total of 17 active nests (i.e., with confirmed flycatcher eggs or nestlings) in 2015 (Table 1). We located four additional nest that were constructed or partially constructed and abandoned by the female prior to confirmation of egg-laying; these nests were not included in nest success calculations or subsequent monitoring activities (e.g. vegetation sampling). Seven females had eight successful nests, producing a total of 15 fledglings (Table 1). Five females were successful with their first nest attempt and two were successful with renest attempts following nest failure. One female, following a successful nest, attempted and successfully fledged a second nest. Three females were unable to successfully fledge any young.

Six of the nine unsuccessful nest attempts (66 %) failed due to nest predation. No predator was positively identified. However, a video camera recording of an active flycatcher nest at Y-Drain Marsh captured footage of an adult Cooper's Hawk (*Accipiter cooperii*) perching next to and observing a flycatcher nest containing eggs only. The hawk left the nest unharmed but we assume that it is a potential nest predator, especially if there are nestlings present. Six of the 17 total active nests (35 %) were parasitized by Brown-headed Cowbirds. However, three of the nests successfully fledged flycatchers and zero failed directly due to parasitism (Table 2). UDWR personnel removed and replaced or addled cowbird eggs from three active flycatcher nests which reduced flycatcher nest failures due to parasitism and increased overall reproductive success.

In 2015, average daily survival rate for a flycatcher nest was 97.6 % which continued a downward trend since the 2013 breeding season (Figure 4) but remained high compared to previous years (2009-2012). There was a 50 % probability of a flycatcher nest surviving to fledge at least one young flycatcher (Mayfield survival probability) in 2015 (Figure 5). In 2015, apparent nest success (active nests which successfully fledged at least one young flycatcher) was 47 %. Mayfield survival probability for Yellow Warblers in 2015 was 29 % and apparent nest success was 38 %.

*Nest Site Characteristics and Breeding Habitat*

In 2015, flycatchers built 13 active nests in tamarisk trees, three in coyote willow, and one in seepwillow. The total number of nests found in tamarisk trees has not drastically changed among the eight years of this study although a steady increase has been observed since 2012 (Figure 6). However, the use of willow as a nest substrate has been inconsistent with significant changes between years. The number of nests placed in willow increased dramatically between the 2009 and 2010-2012 breeding seasons and was followed by a dramatic decrease in 2013 (Figure 6). The increase from 2009 to 2012 is likely a result of increased willow availability as flycatchers shifted from nonnative-dominated breeding areas to more native-dominated breeding areas (Figure 7) due to the negative effects of the tamarisk leaf beetle on nest microhabitat. The decrease in willow use as a nest substrate observed in 2013 is likely a result of concealment from predators which tamarisk provide because they are structurally more complex and collect more debris than willow. It is assumed that flycatchers select tamarisk over willow substrates to decrease the risk of nest failure from predation and increase overall nesting productivity. The greatest nesting success occurred during the 2008 and 2013 breeding seasons which coincide with the years of highest tamarisk use by nesting flycatchers (Figure 8).

Proportionately, the use of tamarisk as a nest substrate has drastically changed over the eight years of monitoring (Figure 8). During the 2008 breeding season 90 % of flycatcher nests were placed in tamarisk trees. However, a steady decrease was observed over the next four years and by 2012, <50 % were located in tamarisk. In 2013, a shift was observed as flycatchers began to select tamarisk over willow as a nest substrate (Figure 8). The trend continued and during the 2013-2015 breeding seasons, 33 of 43 total active nests (77 %) were placed in tamarisk trees.

In 2009, beetle-induced tamarisk defoliation occurred during peak flycatcher breeding and negatively affected hatching success by exposing active nests to predators and extreme abiotic conditions (nest success in 2009 was 13 %, compared to 70 % in 2008). An increased use of willow substrates by flycatchers was observed from 2010 to 2012, during which time tamarisk defoliation occurred after peak flycatcher breeding. In 2013 and 2014, tamarisk defoliation continued to occur after breeding season and we observed flycatchers returning to tamarisk substrates to build their nests. In 2015, both trends continued as we observed flycatchers selecting both tamarisk-dominated habitats and tamarisk trees over native species to build nests. These data suggest first, that in the absence of defoliation by the tamarisk leaf beetle during peak flycatcher breeding season, female flycatchers prefer to nest in tamarisk trees which provide better concealment for nests from predators and second, that the greatest threat to successful nests for flycatchers in the St George, Utah study area is depredation.

*Banding and Re-sighting*

SWCA personnel banded five flycatcher nestlings in the St George study area in 2015 (Table 3). One nestling from one nest was banded at Riverside Marsh and four nestlings from two nests were banded at Seegmiller Marsh. Additionally, eight banded adult flycatchers were re-sighted at breeding sites in 2015. Seven were confirmed as previously occupying the Virgin River in St George, Utah prior to the 2015 breeding seasons; four of which were banded by SWCA personnel at Y-Drain Marsh in 2013.

**LITERATURE CITED**


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**Table 1.** Number of active nests, nests parasitized by Brown-headed Cowbirds, nests failed, nests successful, and total fledglings produced by Southwestern Willow Flycatchers at previously occupied breeding sites along the Virgin River in St George, Washington Co., Utah in 2015.

| Site | Active nests[1] | Parasitized nests | Failed nests | Successful nests[2] | Total fledglings |
|---|---|---|---|---|---|
| Riverside Marsh | 7 | 4 | 4 | 3 | 5 |
| Riverside East | 0 | 0 | 0 | 0 | 0 |
| River Road Bridge | 0 | 0 | 0 | 0 | 0 |
| Seegmiller Marsh | 4 | 1 | 0 | 4 | 8 |
| Y-Drain Marsh | 6 | 1 | 5 | 1 | 2 |
| Snipe Pond | 0 | 0 | 0 | 0 | 0 |
| **All sites combined** | **17** | **6** | **9** | **8** | **15** |

[1] Nests with confirmed Southwestern Willow Flycatcher eggs or nestlings.
[2] Nests producing ≥ 1 fledgling.

**Table 2.** Active Southwestern Willow Flycatcher nests which were parasitized by Brown-headed Cowbirds along the Virgin River in St George, Washington Co., Utah in 2015. Fate and cause are referring to the final outcome of the flycatcher nest. Nest ID codes represent year, breeding site (R=Riverside Marsh, SM=Seegmiller Marsh, YD=Y-Drain Marsh), territory number, and nesting attempt.

| Nest ID | Fate | Cause | Cowbird eggs | Cowbird egg fate |
|---|---|---|---|---|
| 15R1B | Fail | Predation | 1 | Depredated |
| 15R1C | Fail | Abandoned | 1 | Replaced by UDWR and abandoned by host |
| 15R2B | Success | - | 1 | Addled by UDWR |
| 15R4AA | Success | - | 1 | Replaced by UDWR |
| 15SM11A | Success | - | 1 | Buried by host to prevent incubation |
| 15YD1B | Fail | Predation | 1 | Depredated |

**Table 3.** Southwestern Willow Flycatchers banded at nests along the Virgin River in St George, Washington Co., Utah in 2015.

| Site | Nest # | Color-band combination[1] | Federal-band number |
|---|---|---|---|
| Riverside Marsh | 4A | VI:RWR | 2660-23232 |
| Seegmiller Marsh | 11A | OYO:VI | 2660-23233 |
| Seegmiller Marsh | 2A | TQ:KBK | 2540-58368 |
| Seegmiller Marsh | 2A | VI:WBW | 2660-23240 |
| Seegmiller Marsh | 2A | VY:VI | 2660-23241 |

[1] Color-band codes: TQ = turquoise federal band, VI = violet federal band, XX = standard silver federal band, G = green, R = red, O = orange, Y = yellow, G = green, D = dark blue, B = light blue, V = violet, W = white, K = black, Z = gold. Color combinations are read as the bird's left leg and right leg, top to bottom.

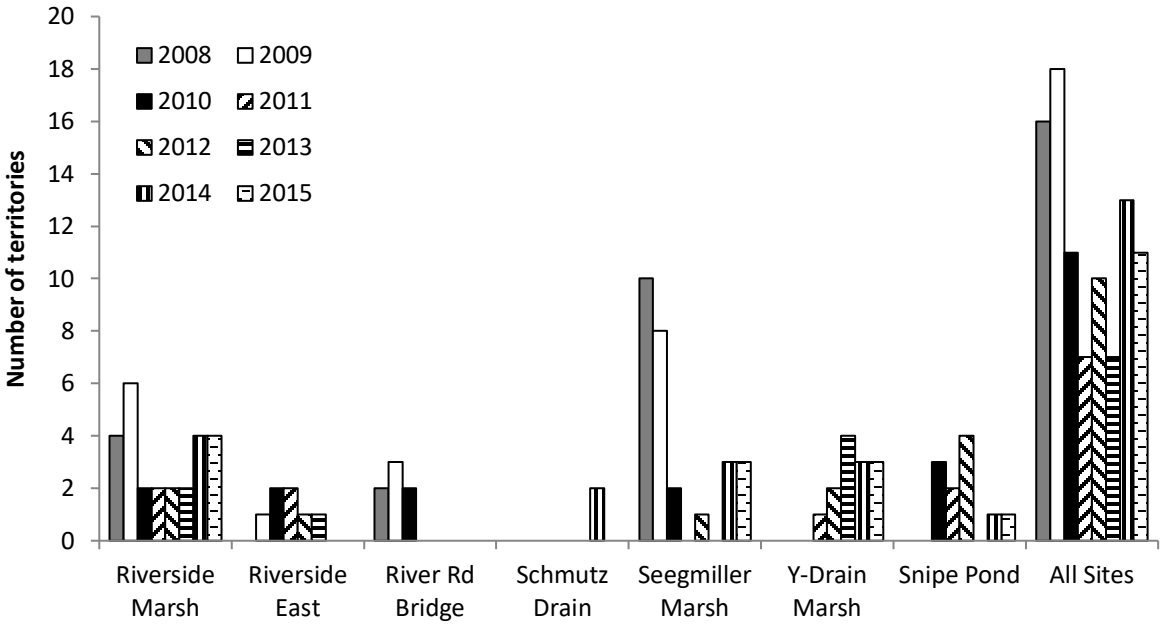


**Figure 1.** Number of Southwestern Willow Flycatcher territories (males exhibiting territorial behavior beyond 31 May) among years (2008-2015) at seven breeding sites, and overall, along the Virgin River in St George, Washington Co., Utah.

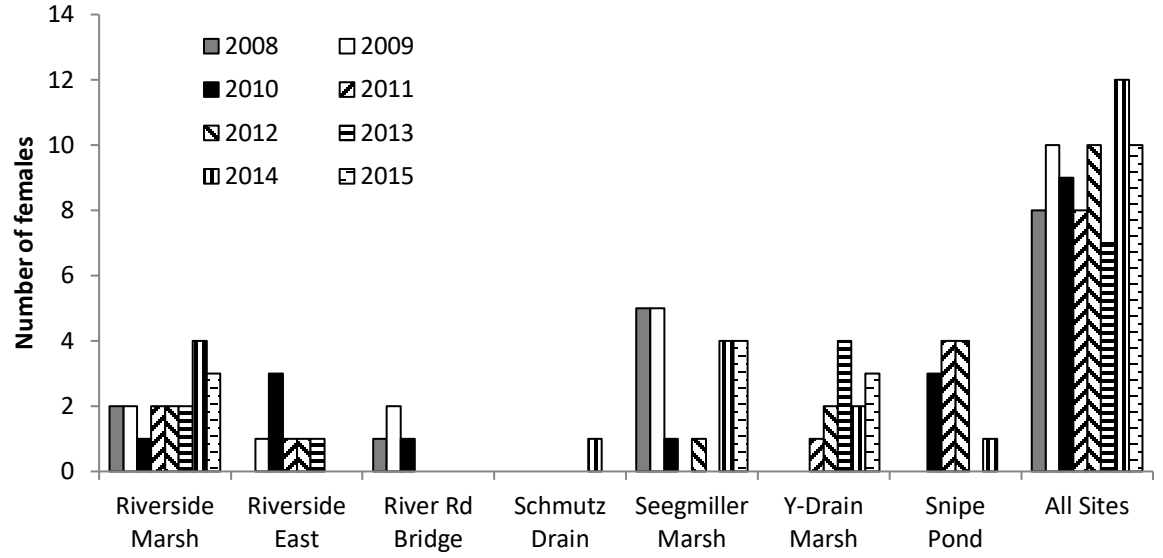


**Figure 2.** Number of confirmed Southwestern Willow Flycatcher breeding pairs among years (2008-2015) at seven breeding sites, and overall, along the Virgin River in St George, Washington Co., Utah.


**Figure 3**. Location of a Southwestern Willow Flycatcher (SWFL) detected during a survey on Sand Wash on July 16, 2015 in St George, Washington Co., Utah. Additional pins mark various flycatcher breeding sites along the Virgin River.

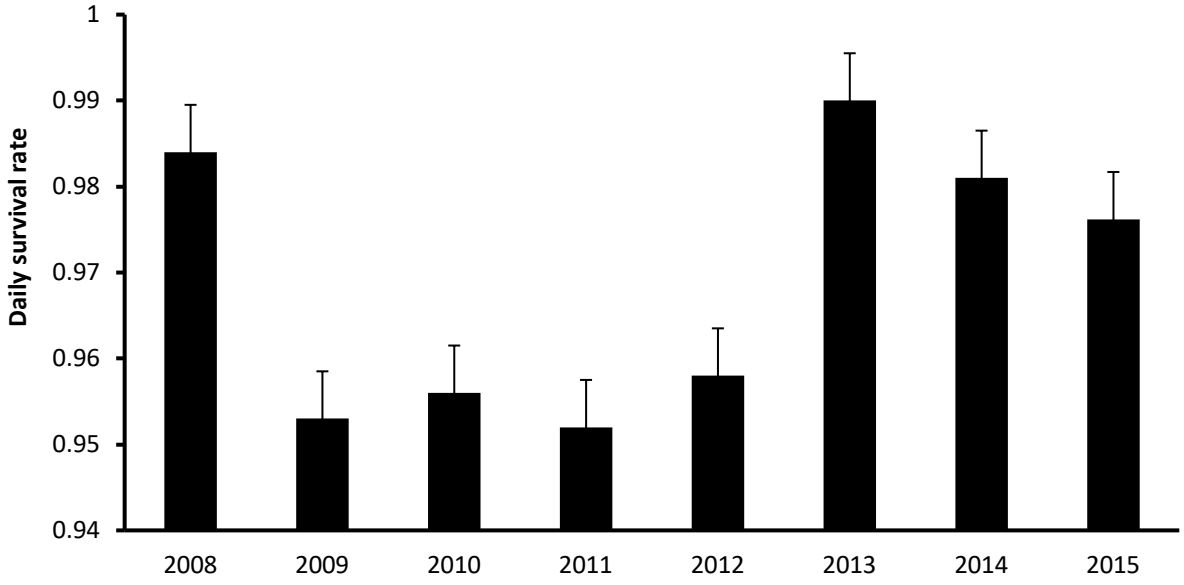


**Figure 4.** Mean (± SE) daily survival rate of active Southwestern Willow Flycatcher nests along the Virgin River in St George, Washington Co., Utah, 2008-2015.

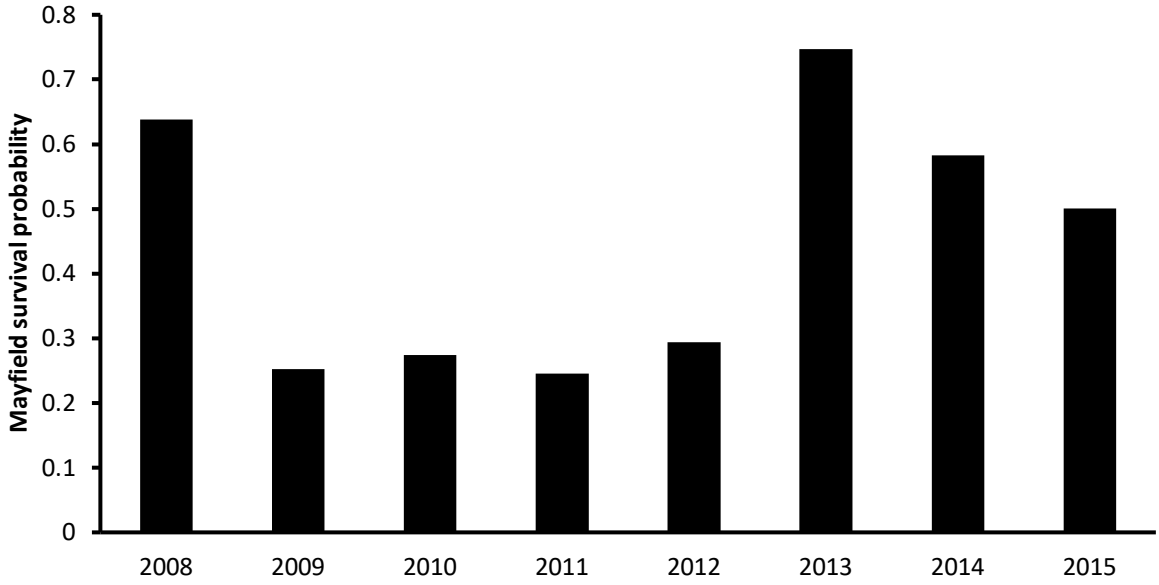


**Figure 5.** Mayfield survival probability of active Southwestern Willow Flycatcher nests along the Virgin River in St George, Washington Co., Utah, 2008-2015.

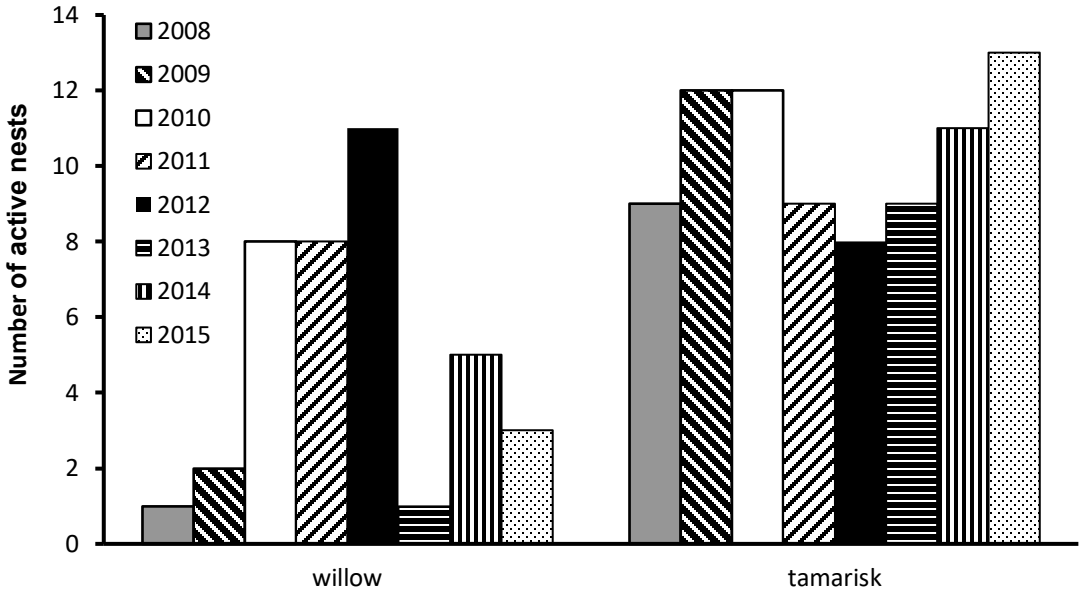


**Figure 6.** Number of Southwestern Willow Flycatcher nests built in coyote willow and tamarisk among years (2008-2015) along the Virgin River in St George, Washington Co., Utah.

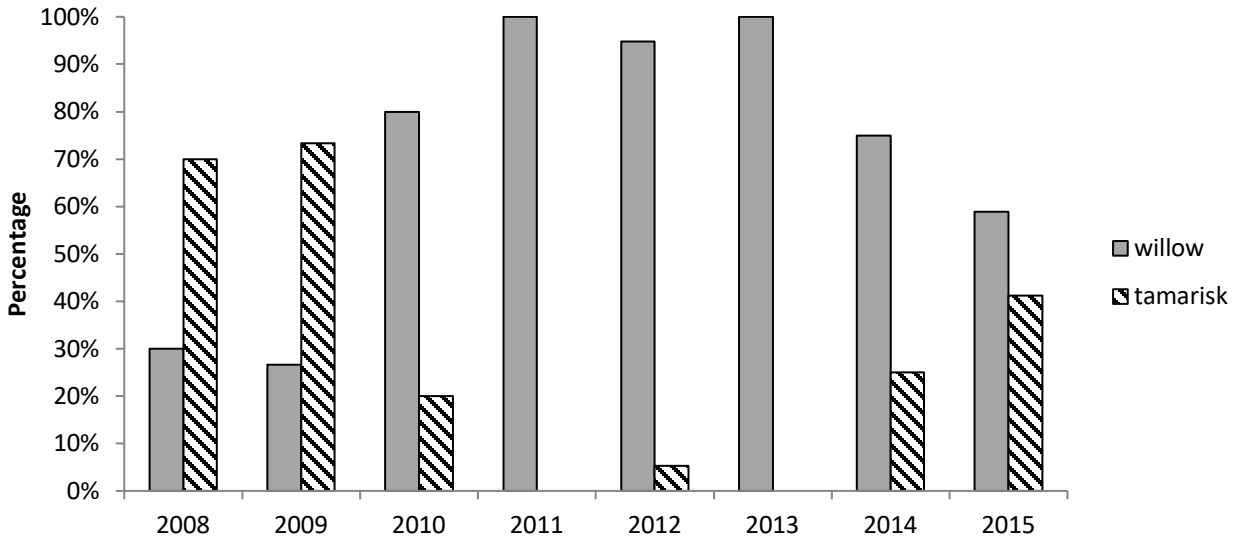


**Figure 7.** Proportion of Southwestern Willow Flycatcher territories in native (willow) and non-native (tamarisk) dominated habitat from 2008-2015 along the Virgin River in St George, Washington Co., Utah.

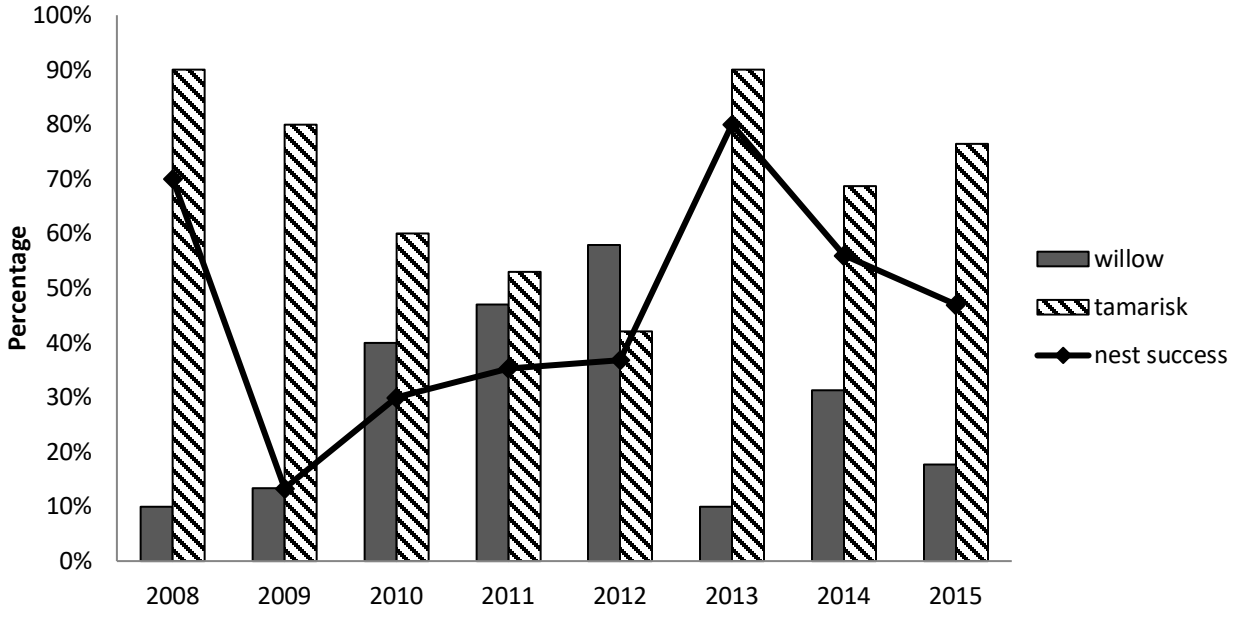


**Figure 8.** Proportion of Southwestern Willow Flycatcher nests placed in tamarisk and coyote willow substrates and apparent nest success from 2008-2015 along the Virgin River in St George, Washington Co., Utah.