RECLAMATION

Managing Water in the West

2006 Southwestern Willow Flycatcher Study Results

Selected Sites Along the Rio Grande From Velarde to Elephant Butte Reservoir, New Mexico

U.S. Department of the Interior
Bureau of Reclamation
Fisheries and Wildlife Resources
Denver, Colorado

December 2006

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Selected Sites Along the Rio Grande From Velarde to Elephant Butte Reservoir, New Mexico

prepared for

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Executive Summary

Overview

During the summer of 2006, the Bureau of Reclamation (Reclamation) conducted surveys and nest monitoring of the federally endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*) (SWFL) in eight distinct reaches along approximately 200 kilometers of the Middle Rio Grande in New Mexico: adjacent to Velarde and between the Pueblo of Isleta and Elephant Butte Reservoir. Surveys were performed to contribute to current baseline population data of the SWFL along the Middle Rio Grande and also to meet Reclamation's Endangered Species Act (ESA) compliance commitments. There were 314 resident SWFLs documented in 179 territories forming 135 breeding pairs. As in previous years, the San Marcial and Sevilleta reaches of the river were most productive containing 142 and 21 territories, respectively.

Nest monitoring was conducted at all sites where nesting pairs were detected. Nests were monitored for success rates, productivity, and Brown-headed Cowbird (*Molothrus ater*) (BHCO) parasitism. The San Marcial reach proved most productive, producing 148 nests and fledging at least 213 SWFL young. The Sevilleta reach produced 18 nests and fledged at least 20 SWFL young. Overall, nest variables (success, predation, BHCO parasitism, and productivity) remained similar to 2005.

Other studies were initiated or continued in 2006. These include: (1) BHCO point counts, (2) livestock grazing study, (3) SWFL habitat suitability assessment, (4) vegetation mapping, and (5) SWFL nest site vegetation quantification study. These studies are designed to provide further insight into potential threats to and habitat requirements of SWFL populations.

Survey Results

Reclamation funded:
Velarde – 1 territory
San Acacia – 0 territories
San Marcial – 142 territories

ESA Collaborative Program funded:
Belen – 1 territory
Sevilleta National Wildlife Refuge (NWR)/La Joya – 21 territories
Escondida – 1 territory
Bosque del Apache NWR – 4 territories
Tiffany – 9 territories

Recommendations

1. Continue annual surveying and nest monitoring within the San Marcial and Sevilleta/La Joya reaches to determine reproduction, nest success, recruitment, and population trends of SWFLs within the Middle Rio Grande Basin.

2. Give special attention to the "core concentration area" between sites LF-17/17a and the Elephant Butte delta to document expansion of SWFLs into the Elephant Butte conservation pool.
3. Survey suitable/potential habitat in various reaches (e.g., Velarde, Belen, San Acacia, Bosque del Apache NWR) every 3 to 5 years to document new occupation by resident SWFLs.
4. Continue nest monitoring and addling/removal of BHCO eggs/chicks from parasitized SWFL nests in lieu of cowbird trapping.
5. Conduct habitat monitoring, utilizing data from the nest vegetation quantification study, at any restoration sites to document the effectiveness of various restoration practices.

Introduction

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) (SWFL) is a State-listed and federally-endangered subspecies of the Willow Flycatcher (*Empidonax traillii*) (WIFL). It is an insectivorous, Neotropical migrant that nests in dense riparian or wetland vegetation in the Southwestern United States (Figure 1). SWFLs generally arrive at their breeding grounds between early May and early June; by late July or August, they depart for wintering areas in Mexico, Central America, and northern South America (Sogge et al. 1997, USFWS 2002).

Recent studies indicate that SWFL populations have declined across their range (USFWS 2002). The primary causes of declining populations are likely habitat loss or modification and brood parasitism by the Brown-headed Cowbird (*Molothrus ater*) (BHCO) (USFWS 2002). The U.S. Fish and Wildlife Service (USFWS) officially listed the SWFL as endangered in February 1995 (USFWS 1995). The SWFL is also listed as endangered or a species of concern by the States of Arizona, California, Colorado, New Mexico, Texas, and Utah (Sogge et. al. 1997, TPWD 2005). A recovery plan for the SWFL was finalized in August 2002. To accompany the recovery plan, a series of issue papers associated with the recovery of the endangered SWFL has also been prepared by the Recovery Team. These papers address current issues and recommend management alternatives in regard to BHCO parasitism, livestock grazing, water management, exotic vegetation, habitat restoration, fire management, and recreational impacts (USFWS 2002).

In October 2005, USFWS designated Critical Habitat for the SWFL along the Middle Rio Grande in three separate segments, separated by the Sevilleta and Bosque del Apache National Wildlife Refuges (NWR) which were excluded from the designation. The designated reaches include "from the southern boundary of the Isleta Pueblo for 44.2 miles to the northern boundary of the Sevilleta NWR. The middle Rio Grande segment extends for 27.3 miles from the southern boundary of the Sevilleta NWR to the northern boundary of the Bosque del Apache NWR. The most southern Rio Grande segment extends for 12.5 miles from the southern boundary of the Bosque del Apache NWR to the overhead powerline near Milligan Gulch…"(USFWS 2005). This designation does not include the active pool of Elephant Butte Reservoir.

Presence/absence surveys are conducted to determine the distribution and abundance of the endangered SWFL during the relatively brief breeding season when they become a seasonal resident of the Southwestern United States. Bureau of Reclamation (Reclamation) personnel have conducted presence/absence surveys and nest monitoring during the May to July survey season within the Rio Grande Basin since 1995. In 1994, the New Mexico Natural Heritage Program (NMNHP 1994) conducted presence/absence surveys and nest monitoring within the San Marcial reach under a contract with the U.S. Army Corps of Engineers.

The 2006 presence/absence surveys for SWFLs were conducted at selected sites along the Rio Grande from Velarde downstream to the delta of Elephant Butte Reservoir (Figure 2). Surveys were conducted between May 18 and July 27, 2006. Nest searches and nest monitoring of SWFL nests were conducted in conjunction with survey efforts by permitted biologists. In addition to conducting

Figure 1. Breeding range of the SWFL (adapted from Unitt 1987 and Browning 1993).

presence/absence surveys for the SWFL, surveyors were instructed to document occurrences of five additional avian species of special concern: Yellow-billed Cuckoo *(Coccyzus americanus)*, Bell's Vireo *(Vireo bellii)*, Yellow Warbler *(Dendroica petechia)*, Summer Tanager (*Piranga rubra*), and Common Ground-Dove (*Columbina passerina*). Formal Yellow-billed Cuckoo surveys, based on protocol developed in cooperation with the Arizona Game and Fish Department and the U.S. Geological Survey (Halterman et. al. 2002, Laymon 1998), were conducted in the San Marcial reach (Johanson, *in prep.*).

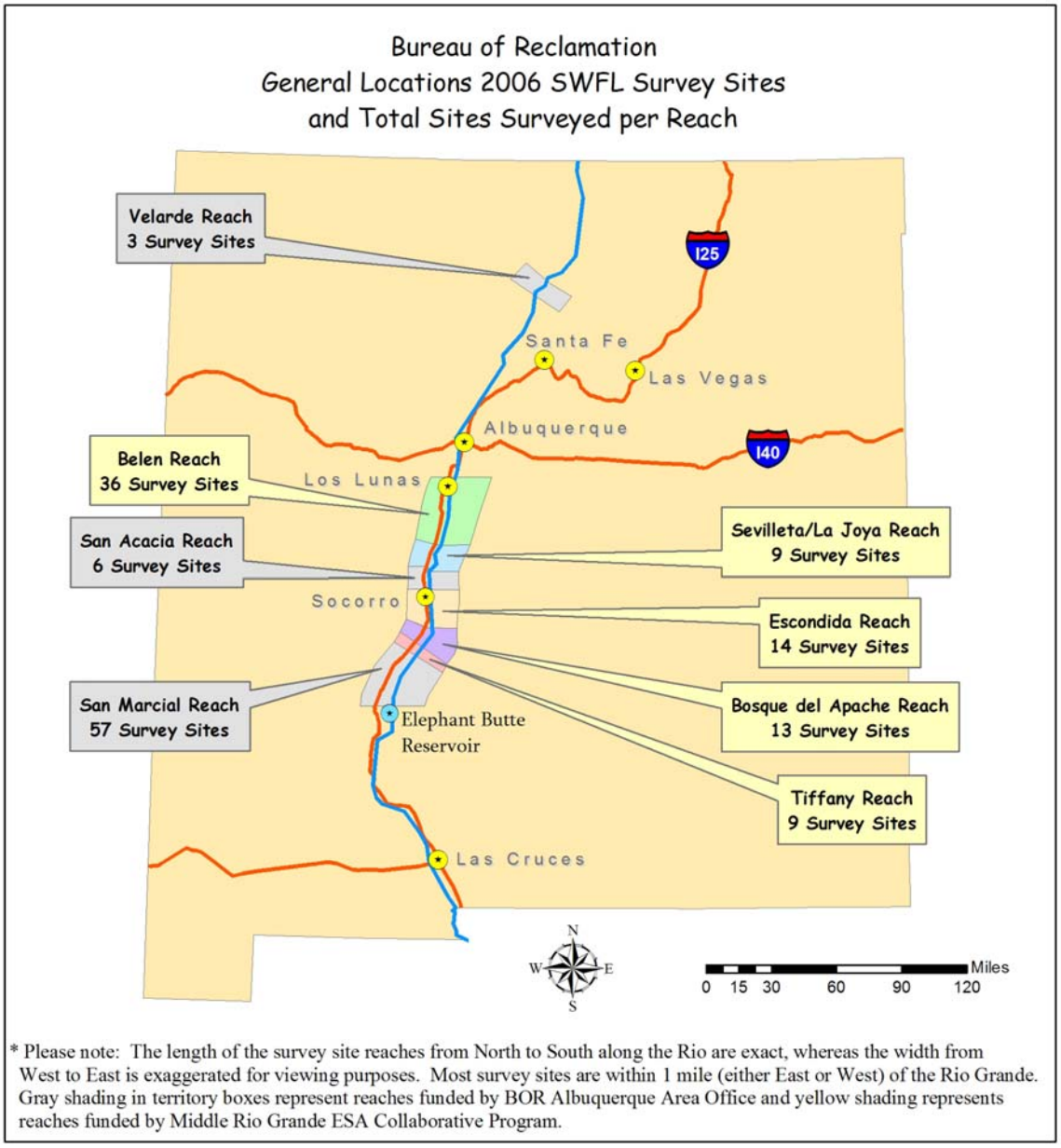

Figure 2. General locations of 2006 survey sites.

Goals and Objectives

Primary goals of the field studies performed in 2006 were:

1. Contribute to current baseline data regarding the population status, distribution, and habitat requirements of the SWFL in the Middle Rio Grande Basin, and
2. Meet Reclamation's Endangered Species Act (ESA) compliance commitments for ongoing and proposed projects and monitoring of completed projects.

Specific objectives included:

- Maintain project compliance in specific action areas with five surveys.
- Monitor SWFL nests to determine productivity, parasitism and predation rates, population recruitment, and limiting factors.
- Assess nest site habitat characteristics.
- Provide assessment of general features of occupied habitat patches.
- Document occurrences of other special status avian species within surveyed project lands.

Related Studies

In addition to the presence/absence surveys and nest monitoring conducted in 2006, the following related studies were either previously conducted or continued in 2006:

- Using a modified Breeding Biology Research and Monitoring Database (BBIRD) protocol (Martin et al. 1997), a nest monitoring study was conducted from 1999 to 2004. Potential BHCO host nests were monitored to determine the effectiveness of the discontinued cowbird trapping effort and to gain a better understanding of the effects and intensity of factors such as brood parasitism and predation on productivity of riparian obligate species. Parasitism levels, predation, nest success, and nest productivity of SWFLs and comparable riparian obligate species in various sites within the former trapping area were compared to those within two adjacent areas at least 12 kilometers (km) from the trapping area. Neither of the adjacent areas had been subject to cowbird trapping. One of the areas supported year-round grazing, and the other did not support any livestock grazing. Results suggest that trapping may reduce brood parasitism; however compensatory factors such as habitat, predation, and nest abandonment appear to make up for the increased success due to decreased BHCO parasitism. Further information on this study can be found in *Riparian Obligate Nesting Success as Related to Cowbird Abundance and Vegetation Characteristics Along the Middle Rio Grande, New Mexico* (Moore 2006).

- Avian point counts were continued to determine the distribution and abundance of BHCOs and host bird species within the Middle Rio Grande Basin. Transects were established within four study areas to determine the distribution and density of BHCOs and to determine the effectiveness of the cowbird trapping program. Based on 1999 – 2006 data, BHCO abundance has decreased within the Sevilleta and Bosque del Apache NWRs and increased within the San Marcial reach during the past six years. However, the ratio of mean hosts to mean BHCOs remained relatively steady. Average BHCO abundance between 1999 and 2006 was highest in the Sevilleta and Bosque del Apache reaches – areas not grazed by livestock. Livestock grazing was present adjacent to each of these areas, however, based on telemetry data, cowbirds in this reach of the Rio Grande Basin traveled less than 2 km on a daily basis between feeding and breeding areas (Ahlers and Sechrist 2000). The higher numbers of BHCOs could be a result of greater host densities and/or the availability of alternative food sources. Also, BHCO densities within the trapping area were less than that of another adjacent study area that has not been subject to cowbird trapping and supports year-round livestock grazing. The methods and results of this study can also be found as a component of the following: *Riparian Obligate Nesting Success as Related to Cowbird Abundance and Vegetation Characteristics Along the Middle Rio*

Grande, New Mexico (Moore 2006), *Cowbird Control Program: Middle Rio Grande, New Mexico, 2001* (Ahlers and Sechrist 2002) and *Brown-headed Cowbird Movement and Home Range Analysis in the Middle Rio Grande, New Mexico 1999* (Ahlers and Sechrist 2000).

- A study to monitor and evaluate the impacts of livestock grazing on the establishment and development of riparian vegetation was also continued. This study was initiated in 1997 to determine the effects of seasonal livestock grazing on the potential future habitat of the endangered SWFL and the physical disturbance to existing occupied habitats. Data from a series of established livestock exclosures and photo stations are currently being collected and processed. Study data are presented in the draft report *A Long Term Assessment of Livestock Impacts on Riparian Vegetation: Elephant Butte Project Lands* (Ahlers et al. 2005, *in prep*).

- Development of a SWFL habitat suitability model was initiated in 1998 for the Middle Rio Grande Basin and continues to be refined based on changes in hydrology and updated vegetation maps. Riparian vegetation in the Middle Rio Grande Basin between San Acacia Diversion Dam and Elephant Butte Reservoir had been classified using the Hink and Ohmart (1984) classification system through a cooperative effort with the U.S. Forest Service. This system identifies vegetation polygons based on dominant species and structure. Plant community types are classified according to the dominant and/or codominant species in the canopy and shrub layers. During the summer and fall of 2002, as part of the ESA Collaborative Program, Reclamation personnel updated vegetation maps from Belen to San Marcial using a combination of ground truthing and aerial photo analysis. During the summer of 2004, the conservation pool of Elephant Butte Reservoir was again aerially photographed (true color) and vegetation heights were remotely-sensed using Light Detection and Ranging (LIDAR) methods. The area was ground truthed again during the summer of 2005. These data are currently being processed and will be used to update the current SWFL habitat model.

- A study to quantify the vegetation at known SWFL breeding sites began in 2003. Data gathered included nesting height and substrate, vegetation density, height diversity, canopy cover, and hydrology. Methodologies were refined in 2004 and a formal study was initiated. Between 2004 and 2006, data were gathered at 112 nests and will be used to increase overall knowledge of the nesting and general habitat requirements of the species. The resulting analysis of these data will also help to provide guidelines for riparian restoration projects targeted for SWFL habitat. Data were analyzed following the 2006 field season and a summary report will be forthcoming.

Methods

Study Area

Survey sites were selected based on environmental compliance mandates related to Reclamation projects and an overall desire to obtain baseline population data of SWFLs in the Middle Rio Grande Basin. The 2006 survey area encompassed selected sites along the Rio Grande between Velarde and

Elephant Butte Reservoir. This stretch contained eight distinct survey reaches: Velarde, Belen, Sevilleta/La Joya, San Acacia, Escondida, Bosque del Apache, Tiffany, and San Marcial. Table 1 shows a summary of the survey effort within each reach.

Table 1. Number of sites and surveys per reach – Middle Rio Grande 2006.

Survey reach	Total sites surveyed	Number of surveys
Velarde	3	3
Belen	36	3
Sevilleta/La Joya[1]	9	3
San Acacia	6	5
Escondida[1]	14	3: all sites but LF-45, LF-43, LF-08 (5 surveys) and LF-34 (2 surveys – landowner issues)
Bosque del Apache	13	3: all sites but BA-01, BA-02, BA-03S, and BA-04S (5 surveys)
Tiffany[2]	9	3: all sites but LF-21 and LF-35 (5 surveys)
San Marcial[3]	57	5: All sites but EB-16 and 17
Total	147	See above

[1] One site in the Sevilleta/La Joya reach was not surveyed due to landowner issues.
[2] Site LF-26 was not surveyed in 2006 because the entire site burned in May 2006.
[3] Pre-season reconnaissance in sites EB-16 and 17 determined that habitat in these sites was unsuitable for breeding SWFLs, so no surveys were conducted.

Presence/Absence Surveys

All sites were surveyed using the repeated tape-playback method in accordance with the protocols established in Sogge et al. (1997) and the USFWS revised protocol (USFWS 2000). Surveys in individual sites were conducted a minimum of 5 days apart, generally between 0530 and 1030 or 1100 MDT (depending on weather conditions) by trained and permitted personnel. Survey forms were completed daily for each respective site. Survey dates are summarized in Table 2.

The first survey conducted in late May increases the likelihood of detection, since territorial males are more vocal when establishing territories than after nesting has begun. It was anticipated that migrant WIFLs (Willow Flycatchers that are not the subspecies *extimus*) would also be detected. The second and third surveys were conducted between early June and early July to (1) confirm the establishment of territories and/or nesting, (2) detect late settling males, and (3) determine which sites remained occupied throughout the breeding season. The fourth and fifth surveys, conducted during mid-July, were initiated in 2002 to derive a greater degree of confidence regarding the breeding status, habitat association, or presence/ absence of SWFLs at the selected sites. WIFLs documented on or after June 10 were considered resident birds (i.e., SWFLs). Each site was surveyed as thoroughly as conditions would allow. Many sites surveyed during 2006 were flooded

by high flows in the Rio Grande or the Low Flow Conveyance Channel (LFCC), making access difficult.

Table 2. SWFL survey schedule for the 2006 field season

Survey number	Survey period*
1	May 15 – May 31
2	June 1 - June 21
3	June 22 – July 27
4	July 3 - July 14
5	July 15 - July 27

* For general surveys, a minimum of three surveys per site are required; one each during the first three survey periods. In project-related sites, a minimum of five surveys are required. The final three surveys are performed during the third survey period and must be at least 5 days apart.

Species of Special Concern

In 2006, special emphasis was placed on documenting incidental detections of other avian species of special concern within survey sites. These species included the Yellow-billed Cuckoo, Bell's Vireo, Yellow Warbler, Summer Tanager, and Common Ground-Dove. Every effort was made to avoid duplicate recording of these individuals, and, when possible, individuals that were recorded multiple times were sorted out during data processing. When an individual was detected by either sight or sound, UTM coordinates were obtained and the detection was added to the Species of Special Concern database.

Nest Searches/Monitoring

Nest searches were conducted upon discovery of a breeding or suspected breeding SWFL pair by a permitted biologist and/or technicians under the direct supervision of a permitted biologist. To minimize disturbance and maximize accuracy of monitoring efforts, nest searches and monitoring were conducted using methods outlined in Martin and Geupel (1993) and the Southwestern Willow Flycatcher Nest Monitoring Protocol (Rourke et al. 1999). The nest area was located by observing diagnostic SWFL breeding behavior and listening for calls within the habitat patch. Once located, the nest site was approached cautiously with minimum disturbance to vegetation. Typically, adult SWFLs did not immediately reveal nest locations. All suitable midstory trees and shrubs in the suspected area were carefully inspected until the characteristic small, cup-shaped nest, as described in Tibbitts et al. (1994), was found. Nests were usually located within a few minutes of nest search initiation.

At all nest sites, physical data required by the Willow Flycatcher Nest Site Data Form were collected. Nest contents were not monitored during the nest building/egg laying stages—the period when disturbance is most likely to cause adults to abandon the nest—or as the suspected fledging

date approached when nestlings are likely to be force-fledged. Nests with eggs/young were examined quickly using a mirror mounted on a telescopic pole. Nesting chronology was subsequently estimated following the initial search and examination. Subsequent visits were minimized and timed so at least one inspection would be made of eggs and nestlings, and pertinent data were recorded on the Willow Flycatcher Nest Record Form.

At the conclusion of the first or early-season nesting attempts, the nesting pair was not monitored for approximately 1 week to minimize disturbance and allow for possible initiation of another nesting attempt. Then a re-nest/second brood search was performed to detect any subsequent nesting attempts. A re-nest is a nesting attempt that occurs after a failed nesting attempt, and a second brood occurs after a nest successfully fledges young. When possible, nests were monitored through completion. However, the few nests that were not monitored to completion and had nestlings at least eight days old at the last visit were considered successful.

In 2002, the practice of addling BHCO eggs from parasitized nests was initiated when necessary and possible. This activity was continued in 2006. SWFL eggs were never disturbed and time spent at the nest was minimized. Frequently it was determined that the BHCO egg would not have a chance to hatch, based on nesting chronology. In these cases nests were monitored normally to minimize disturbance.

Hydrology Monitoring

In conjunction with SWFL nest monitoring, a hydrology monitoring project was implemented in 2004 and continued through 2006. Nineteen "hydrostations" (custom-built staff gauges) were installed in proximity to the "core" SWFL population in the headwaters of Elephant Butte Reservoir. These hydrostations were placed in locations representative of the overall site's hydrology and were monitored approximately once a week during the 2004, 2005 and 2006 SWFL breeding seasons. These data were used to determine the relationship between flows in the LFCC and depth of water within the "core" SWFL breeding areas. Data were also compared to SWFL nest variables (i.e., success, productivity, predation, parasitism, distance to water) from the 2004 through 2006 breeding seasons to determine any relationships between hydrology and nesting.

Results

Presence/Absence Surveys

During presence/absence surveys conducted from May 18 through July 27, 431 WIFLs were documented (296 males and 135 females). Based on detections prior to June 10 and the birds' lack of territorial behavior, 117 were believed to have been migrants (all of which were considered males

due to singing). The remaining 314 (179 males and 135 females) were assumed to be resident SWFLs.

These 314 SWFLs established 179 territories and 135 pairs. Documented nesting attempts confirmed 111 pairs; they produced 168 nests. Twenty four additional pairs were observed and, although nesting was suspected, nests were not located in any of these occupied territories. Of the 168 confirmed nesting attempts, 92 were believed successful, 70 failed, and the outcome of six was unknown. Successful nests include those which supported chicks at least 8 days old on the last nest visit; however, two nests that were not monitored into the late nestling stage were considered likely to have fledged young and were thus included in the successful nest count. These nests contained nestlings 7 days old on the last visit of the nesting cycle. SWFL detection results for 2006 are summarized in Table 3.

During the 2006 season, five surveys were completed in project-related sites, which comprised approximately 49 percent of the sites surveyed. Within these 72 sites, nine new SWFL territories were found during the fourth or fifth surveys in four sites (LF-20, LFCC-01, DL-01, and DL-07). The majority of these territories were discovered during meticulous territory/nest searching by experienced and permitted biologists and were in very close proximity to other territories. Therefore, it is likely that these birds were originally undetected or mistaken for the other territorial SWFLs nearby. One unpaired male was documented for the first time in LF-20 during the fourth survey on July 11 and it is likely that this bird was either a "floater" male or a dispersing young-of-the-year bird. Additional surveys also provide greater confidence to the absence of the species in unoccupied sites. Presence/absence survey forms are presented in Appendix A.

Site descriptions

The following section contains an overview of the 30 sites where resident SWFLs were detected during the 2006 season. SWFL detections within the Velarde, Belen, Sevilleta/La Joya, San Acacia, Escondida, Bosque del Apache, Tiffany, and San Marcial reaches are presented in Figures 3 through 11, respectively.

Site BA-03N is located on the Bosque del Apache NWR approximately 7 km north of the southern refuge boundary and immediately north of the Bosque Channel Widening Project (UTM NAD 83 Zone 13 south – 3741030 N 327004 E to 3738796 N 326371 E). The majority of the habitat in this site is dense, monotypic saltcedar (*Tamarix* sp.) with a few patches of native vegetation on the riverside. There is an older riverbar on the south end of the site that contains native vegetation in the form of large overstory cottonwoods (*Populus deltoides* var. *wislizenii*) and patches of coyote willow (*Salix exigua*) and *Baccharis* sp (seepwillow).

Site BA-03S is located approximately 5 km north of the southern refuge boundary (UTM Zone 13 south – 3738912 N 325977 E to 3736870 N 325421 E). The entire site is very dry but has been modified by the Bosque Channel Widening Project to create some high-flow channels through the site. Vegetation consists of saltcedar away from the river and natives along the river and on large river bars. High river flows flooded much of this site during the 2006 survey season.

Site BA-04N is across the river from site BA-03N in the Bosque del Apache NWR (UTM NAD 83 Zone 13 south – 3740664 N 327026 E to 3738231 N 326491 E). Vegetation within this site is

dominated by sparse saltcedar with the exception of recently developed river bars that contain Russian olive (*Elaeagnus angustifolia*) and native willows. These riverbars contain the best SWFL habitat within this site. The site is also relatively dry with the exception of lower lying areas and high flow channels that receive overbank flooding during high river flows.

Site DL-01 is immediately south of LF-17 in the conservation pool of Elephant Butte Reservoir (UTM NAD 83 Zone 13 south – 3718303 N 307471 E to 3716976 N 306739 E). This site has been one of the most heavily utilized SWFL site in the Middle Rio Grande for the past two seasons. Because of this, prior to the 2004 survey season, it was split into two sites, DL-01 and DL-01a, to allow increased attention to the high quality habitat on the western side of this site. Formal surveys were not conducted within this site. Instead, experienced/permitted (nest monitoring) biologists conducted extensive nest searches/surveys. Thorough "survey" results were achieved without the additional disturbance/stress of "formal" surveys. However, for purposes of documentation survey forms were completed to reflect abundance during the five survey periods. Habitat within this site is highly suitable for SWFL habitation. Due to its location, vegetation has developed extensively as reservoir levels receded. Vegetation is composed of extensive Goodding's willow (*Salix gooddingii*) stands interspersed with occasional saltcedar shrubs. This site also receives regular flooding caused by the breach in the LFCC.

Site DL-02 is immediately south of DL-01 in the Elephant Butte Reservoir conservation pool (UTM NAD 83 Zone 13 south – 3716809 N 307932 E to 3715299 N 306713 E). Habitat on the western edge is very similar to DL-01. This site contained the most SWFL territories of any site in our study area in 2006. SWFLs in this site are concentrated in the high quality native habitat on the western edge along the LFCC. On the interior of the site dense, dry saltcedar dominates. Flooding occurs due to the LFCC outfall.

Site DL-03 is immediately southeast of DL-02, adjacent to the Rio Grande (UTM NAD 83 Zone 13 south – 3716385 N 307767 E to 3714748 N 307408 E). Habitat is composed of high quality coyote and Goodding's willow on the eastern edge adjacent to the river and dense saltcedar throughout the remainder of the site. The native habitat in this site developed when the river was realigned but, due to the embankment paralleling the new pilot channel, it receives no overbank flows. Due to the drying of this site and the lowering of the water table, the high quality willow habitat adjacent to the river seems to be slowly dying out.

Site DL-04/04a is located immediately southeast and across the Rio Grande from DL-03 (UTM NAD 83 Zone 13 south – 3716400 N 307841 E to 3715271 N 307545 E). Site DL-04 was split into DL-04 and DL-04a prior to the 2003 survey season to allow for increased attention to the high quality SWFL habitat adjacent to the river. Along the western edge, highly suitable SWFL habitat is composed of mature native species such as Goodding's willow and coyote willow. The interior of the site is composed of a mixture of mature saltcedar, Russian olive, and native species including coyote willow, Goodding's willow, and cottonwood. Habitat within this site, other than that immediately adjacent to the river, is fairly dry and decadent due to the disconnection from the active river channel. Consequently, habitat quality within this site appears to be declining. A portion of the high quality habitat containing SWFLs along the western edge of this site was impacted by high river flows in 2005 and this site experienced a decrease in SWFL numbers in 2006. For the first time since this group of SWFLs was discovered, several of the territories occurred in saltcedar.

Site DL-06, immediately south of Site DL-03 (UTM NAD 83 Zone 13 south – 3714748 N 307408 E to 3713090 N 306690 E), is composed of an approximately equal amount of mid-aged saltcedar and Goodding's willow. Several large patches of native habitat have developed in the central and southern portions of the site. Much of the site is dry, due its disconnection from the active river channel and distance from the LFCC outfall. SWFL territories were located for the first time in this site in 2006.

Site DL-07 is located directly south of DL-02 on the east side of the LFCC outfall (UTM NAD 83 Zone 13 south – 3715299 N 306713 E to 3713826 N 305732 E). This site contains several patches of highly suitable SWFL habitat in the form of mature Goodding's willow and coyote willow, particularly in the northwestern end of the site along the LFCC outfall and former high-flow channels. The rest of the site is a mix of dead or decadent saltcedar and open areas with low-growing herbaceous vegetation such as grasses and emergent aquatics. There is a fair amount of marshy habitat within this site if water from the LFCC is present in sufficient quantity.

Site DL-08 is located on the west side of the LFCC outfall south of Dryland Road (UTM NAD 83 Zone 13 south – 3715506 N 306009 E to 3711922 N 304339 E). It is a narrow, linear site that is dominated by marshy areas interspersed with young to mid-age saltcedar and Goodding's willow. Portions of this site adjacent to the LFCC outfall receive regular overbank flooding. Territories within this site were immediately adjacent to the LFCC outfall in mid-age stands of native willows and saltcedar.

Site DL-09, located directly south of DL-07 along the LFCC outfall (UTM NAD 83 Zone 13 south – 3713826 N 305732 E to 3711830 N 304474 E), contains habitat that is very similar to DL-07. Several patches of high quality Goodding's willow habitat exist within the site; however, the majority of vegetation within the site is mid-age saltcedar or mixed herbaceous vegetation. This site was either flooded or saturated throughout the survey season.

Site EB-09 is located within the pool of Elephant Butte Reservoir immediately upstream of the section of the reservoir called "The Narrows" (UTM NAD 83 Zone 13 south – 3701931 N 299615 E to 3698740 N 298618 E). Habitat within this site consists of intermediate aged saltcedar, seepwillow and Goodding's willow that is developing rapidly due to a high water table and seepage from the uplands. Several areas of ponded water contain willows and cattails (*Typha* sp.).

Site LF-10 is located in the San Marcial reach of the Rio Grande approximately 2 km south of the railroad bridge on the west side of the river (UTM NAD 83 Zone 13 south – 3726335 N 314291 E to 3724372 N 315264 E). The site is situated between the western bank of the Rio Grande and the LFCC levee. Some fairly suitable WIFL habitat in the form of mature Goodding's willow exists, however, much of it has dried out during the recent drought and is dying. The rest of the site is composed of saltcedar and some large cottonwoods.

Site LF-13 is just south of site LF-12 on the west side of the river between the LFCC and the Rio Grande (UTM NAD 83 Zone 13 south – 3721226 N 313069 E to 3719842 N 311418 E). Habitat is very similar to other sites in the area. Vegetation consists of dense patches of saltcedar interspersed within the overall mosaic of multi-story Goodding's willow and a few overstory cottonwoods. This site receives overbank flooding during periods of high river flows. Over the past 3 or 4 years,

however, this habitat has begun to die back and self-thin due to the lack of high river flows and a presumably lowered groundwater table.

Site LF-14 is immediately adjacent to the powerline right-of-way south of Fort Craig, on the west side of the Rio Grande (UTM NAD 83 Zone 13 south – 3719842 N 311418 E to 3718850 N 310126 E). This site receives regular overbank flooding during high river flows and contains some medium quality SWFL habitat. Habitat is composed of mature Goodding's willow interspersed with decadent saltcedar and overstory cottonwoods. Similar to sites LF-12 and 13, habitat within this site has begun to die back due to a reduction in river flows and a possible lowered water table.

Site LF-17 is located in the northern end of the conservation pool of Elephant Butte Reservoir, and to the south of the breach in the LFCC (UTM NAD 83 Zone 13 south - 3718796 N 308899 E to 3718303 N 307471 E). The area encompassed by LF-17 in 2003 was split in two (LF-17 and LF-17b) prior to the 2004 survey season to allow more attention to the high quality, occupied habitat on the western side of the site. Formal surveys were not conducted within this site. Instead, experienced/permitted (nest monitoring) biologists conducted extensive nest searches/surveys. Thorough "survey" results were achieved without the additional disturbance/stress of "formal" surveys. For purposes of documentation, survey forms were completed to reflect abundance during the five survey periods. Due to water provided by the LFCC outfall, standing water or saturated soil was present in much of this site throughout the 2006 survey season. Habitat is very high quality with mature Goodding's willow dominant and occasional coyote willow, saltcedar, and cottonwoods mixed in. Habitat within this site seems to be becoming more decadent and less attractive to nesting SWFLs as time progresses, as beaver activity takes its toll, and as understory trees are shaded out by large, overstory willows.

Site LF-17a is located immediately north of LF-17 adjacent to the LFCC outfall (UTM NAD 83 Zone 13 south - 3719016 N 309039 E to 3718308 N 309016 E). Habitat is a mixture of native willow habitat interspersed by high-flow channels filled with cattails. Over the past several years, habitat has expanded in this site so that the once fairly large cattail marsh component has been nearly filled in by native willows. This site, due to its proximity to the LFCC, was flooded during most of the 2006 survey season. Formal surveys were not conducted within this site. Instead, experienced/permitted (nest monitoring) biologists conducted extensive nest searches/surveys. Thorough "survey" results were achieved without the additional disturbance/stress of "formal" surveys. For purposes of documentation, survey forms were completed to reflect SWFL abundance during the five survey periods.

Site LF-20, located on the east side of the Rio Grande approximately 6 km south of the powerline at Fort Craig, is a mosaic of sparse saltcedar, openings containing herbaceous vegetation and cottonwood/Goodding's willow habitat. This site is relatively isolated from the Rio Grande by berms adjacent to the active river channel and some of the native vegetation has begun to suffer because of a lack of hydrology.

Site LF-21 is located immediately south of the southern boundary of the Bosque del Apache NWR on the west side of the Rio Grande (UTM NAD 83 Zone 13 south – 3732924 N 322831 E to 3732177 N 321944 E). Habitat is a mixture of native and exotic vegetation with the Goodding's willow/cottonwood community and mature saltcedar being co-dominant. Further from the river,

decadent saltcedar becomes dominant. This site was very dry during this season and does not appear to receive much overbank flooding.

Site LF-23 is approximately 3 km south of the southern Bosque del Apache NWR boundary on the west side of the river (UTM NAD 83 Zone 13 south – 3731409 N 321097 E to 3730314 N 320381 E). It is dominated by monotypic saltcedar and contains a few strips of gallery cottonwoods and some coyote willow along the river. This site was flooded as a result of a sediment plug in the Rio Grande in 2005 but received no overbank flooding in 2006.

Site LF-35's northern boundary is the southern boundary of the Bosque del Apache NWR. It is located on the east side of the river and stretches approximately 1.5 km to its southern boundary (UTM NAD 83 Zone 13 south – 3732924 N 3223831 E to 3731979 N 321672 E). Habitat within this site varies highly from dense saltcedar in the interior and eastern portion of the site to dense Russian olive and canopy cottonwoods on the western edge, adjacent to the river. There is a large earthen berm running through the middle of the site that acts as a barrier to floodwaters and even the western side of the site does not appear to receive much overbank flooding.

Site LF-36 is a large site located 3 km upstream of the San Marcial railroad trestle on the east side of the Rio Grande (UTM NAD 83 Zone 13 south – 3730728 N 320792 E to 3728521 N 318082 E). Much of the site is monotypic saltcedar, particularly the areas that are distant from the river, and a portion of the saltcedar in the northern part of the site has been cleared. There are also several patches of willows and cottonwoods in the southern end of the site and this area also frequently holds surface water from a high water table and/or overbank flooding.

Site LF-44a, located approximately 8 km north of Highway 380 on the east side of the river (UTM NAD 83 Zone 13 south – 3766128 N 328071 E to 3762828 N 327956 E), consists of a mixture of exotic and native habitat dominated by sparse, mid-aged saltcedar. Patches of native willows and cottonwoods occur where hydrology is suitable.

Site LFCC-01 is on the west side of the LFCC just north of site LF-17a and the conservation pool of Elephant Butte Reservoir (UTM NAD 83 Zone 13 south – 3719889 N 310952 E to 3718675 N 309560 E). It is a large site that contains vast expanses of open water that is bordered by either dense saltcedar, cattail marsh or cottonwood/willow community. Small patches of moderately-suitable SWFL habitat occur throughout the site. 2006 is the first year that nesting SWFLs have been documented in this site.

Site SV-03 is approximately 5 km upstream of the San Acacia Diversion Dam on the west side of the river (UTM NAD 83 Zone 13 south – 3797415 N 329795 E to 3794541 N 330046 E). Habitat is composed almost entirely of very dense saltcedar interspersed with Russian olive and gallery cottonwoods. It is very dry and receives infrequent overbank flooding. Soil underneath the saltcedar canopy is occasionally moist due to rains or moisture trapped in the thick layer of saltcedar duff. SWFLs were first discovered in this site in 1999, and the population has slowly grown over the past 8 years.

Site SV-06 is located on the La Joya State Waterfowl Area on the west side of the Rio Grande (UTM NAD 83 Zone 13 south – 3801755 N 328855 E to 3797415 N 329795 E). This site is long

and narrow and vegetation consists of sparse saltcedar interspersed with patches of Russian olive and coyote willow. Territories documented in this site in 2006 were located in Russian olive dominated habitat along high flow channels. This site received moderate overbank flooding during high flow periods.

Site SV-07, located on the west side of the river approximately 7 km north of the San Acacia diversion dam (UTM NAD 83 Zone 13 south – 3800075 N 329074 E to 3797415 N 329795 E) consists of a few different habitat types. On the eastern side of the site, away from the river, habitat consists of sparse saltcedar and occasional Russian olive. Several strips of gallery cottonwoods exist within this site. On recently formed riverbars adjacent to the active river channel, there are dense patches of native willows and Russian olive. Similar to 2004 and 2005, it is in these patches that SWFLs were located in 2006. Portions of this site, particularly lower lying areas such as the riverbars, receive regular overbank flooding.

Site SV-09 is approximately 8 km south of Highway 60 on the west side of the river (UTM NAD 83 Zone 13 south – 3805506 N 330744 E to 3801755 N 328855 E). Habitat is a mixture of native and exotic vegetation, including saltcedar, Russian olive, coyote willow, Goodding's willow, and cottonwood. Habitat near the river is of higher quality than that away from the river and receives periodic overbank flow in certain areas. SWFLs were documented in the mixed habitat adjacent to the active river channel.

Site SV-11 is directly north of the Rio Puerco and Rio Grande confluence on the west side of the Rio Grande (UTM NAD 83 Zone 13 south - 3805122 N 330783 E to 3806837 N 331875 E). Habitat within the site is predominantly composed of dense saltcedar and Russian olive. On the eastern edge of the site, coyote willow and seepwillow are intermixed with the saltcedar and Russian olive. At the southern end of the site adjacent to the river, a high-flow channel contains saltcedar, Russian olive, coyote willow, seepwillow, Goodding's willow, and cottonwood.

Site VL-02 is adjacent to Velarde in northern New Mexico on the east side of the Rio Grande (UTM NAD 83 Zone 13 S – 4001412 N 410620 E). It is a small site (approx. 150 m long by 30 m wide) bordered by the Rio Grande on the west and agricultural fields/pasture on the east. Habitat within the site consists of overstory cottonwoods and mid-canopy coyote willow and Russian olive. There is an irrigation canal running through most of the site that supports native vegetation. The WIFL documented in this site was only observed during the second survey on June 10 and did not act territorial. However, due to its late date of occurrence, this bird is treated as a resident.

Table 3. Summary of WIFL detections – Middle Rio Grande – 2006

Site Name	WIFLs Observed[1]	Est. Number of Pairs	Est. Number of *E.t. extimus*[2]	Est. Number of Territories	Nest(s) Found[3]	Nest Success	Comments
VL-02	1M	0	1M	1	N/A	N/A	Detected on June 10th – Possible Late Migrant
Velarde Reach Summary	1M	0	1M	1	N/A	N/A	1 Possible Late Migrant – Unpaired Male
BL-01	1M	0	0	0	N/A	N/A	Detected only on May 26th – Migrant
BL-07	1M	0	0	0	N/A	N/A	Detected only on May 22nd – Migrant
BL-09	1M	0	0	0	N/A	N/A	Detected only on May 26th – Migrant
BL-11	1M	0	0	0	N/A	N/A	Detected only on June 7th – Migrant
BL-14	3M	0	0	0	N/A	N/A	One detected only on May 24th, and two detected on June 5th – Migrants
BL-16	2M	0	0	0	N/A	N/A	Detected only on June 5th – Migrants
BL-17	1M	0	0	0	N/A	N/A	Detected on May 20th and June 3rd – Migrant
BL-18	1M	0	0	0	N/A	N/A	Detected only on May 24th – Migrant
BL-19	3M	0	0	0	N/A	N/A	One detected only on May 18th, and two detected on June 1st – Migrants
BL-20	1M	0	0	0	N/A	N/A	Detected only on June 2nd – Migrant
BL-21	5M	0	0	0	N/A	N/A	All detected only on June 1st – Migrants
BL-25	2M	0	0	0	N/A	N/A	Both detected only on June 6th – Migrants
BL-30	2M	0	0	0	N/A	N/A	Both detected only on May 31st – Migrants
SV-11	2M	0	1M	1	N/A	N/A	Two detected on May 26th – Migrant: One detected on May 26th and June 16th – Possible late Migrant
SV-14	2M	0	0	0	N/A	N/A	Both detected only on May 26th – Migrants
Belen Reach Summary[4]	28M	0	1M	1	N/A	N/A	27 Migrants 1 Lone Male SWFL

Site Name	WIFLs Observed[1]	Est. Number of Pairs	Est. Number of *E.t. extimus*[2]	Est. Number of Territories	Nest(s) Found[3]	Nest Success	Comments
SV-01	2M	0	0	0	N/A	N/A	Both detected only on May 19th – Migrants
SV-02	2M	0	0	0	N/A	N/A	Both detected only on May 19th – Migrants
SV-03	10M 6F	6	8M 6F	8	4	1 successful, 1 failed (BHCO parasitism), 2 unknown	Two detected only on May 19th – Migrants Two Unpaired Male SWFLs Six Pairs
SV-04	3M	0	0	0	N/A	N/A	All detected only on June 2nd – Migrants
SV-05a/SV-05b	2M	0	0	0	N/A	N/A	One detected only on May 19th, other detected only on June 2nd – Migrants
SV-06	6M 1F	1	3M 1F	3	1	Abandoned	Three detected only on May 19th – Migrants Two Unpaired Male SWFLs One Pair
SV-07	6M 3F	3	3M 3F	3	3	2 successful, 1 predated	Three detected only on May 19th – Migrants Three Pairs
SV-09	9M 5F	5	7M 5F	7	10	5 successful, 5 failed (4 predated, 1 failed due to parasitism)	Two detected only on May 19th - Migrants Two Unpaired Male SWFLs Five Pairs
SV-10	2M	0	0	0	N/A	N/A	Detected only on May 19th , and one detected only on June 2nd – Migrants
Sevilleta/La Joya Reach Summary[5]	42M 15F	15	21M 15F	21	18	8 successful, 8 failed (5 predated, 2 failed due to parasitism, 1 abandoned), 2 unknown	21 Migrants 6 Unpaired Male SWFLs 15 Pairs
LF-01	3M	0	0	0	N/A	N/A	One detected only on May 19th ; and two detected only on June 3rd – Migrants
LF-02	2M	0	0	0	N/A	N/A	Both detected only on June 3rd - Migrants
LF-38	4M	0	0	0	N/A	N/A	One detected only on May 19th ; and three detected only on June 3rd – Migrants
LF-41	2M	0	0	0	N/A	N/A	One detected only on May 21st ; and one detected only on June 3rd – Migrants

Site Name	WIFLs Observed[1]	Est. Number of Pairs	Est. Number of *E.t. extimus*[2]	Est. Number of Territories	Nest(s) Found[3]	Nest Success	Comments
San Acacia Reach Summary[6]	11M	0	0	0	N/A	N/A	11 Migrants
LF-06	1M	0	0	0	N/A	N/A	Detected only on May 18th – Migrant
LF-07	1M	0	0	0	N/A	N/A	Detected only on May 18th – Migrant
LF-33	2M	0	0	0	N/A	N/A	Both detected only on May 30th – Migrants
LF-44a	1M	0	1M	1	N/A	N/A	Detected on June 28th – Possible late Migrant
LF-44b	2M	0	0	0	N/A	N/A	Both detected only on June 4th – Migrants
LF-45	1M	0	0	0	N/A	N/A	Detected only on May 29th – Migrant
Escondida Reach Summary[7]	8M	0	1M	1	N/A	N/A	7 Migrants 1 Unpaired Male (SWFL)
BA-03N	1M 1F	1	1M 1F	1	1	Predated	One Pair
BA-03S	7M	0	2M	2	N/A	N/A	Four detected only on May 26th; and one detected only on June 1st – Migrants Two Unpaired Male - SWFLs
BA-04N	2M	0	1M	1	N/A	N/A	One detected on May 27th and June 8th – Migrant; One Unpaired Male - SWFL
BA-05	1M	0	0	0	N/A	N/A	Detected only on May 26th – Migrant
BA-08/BA-08a	1M	0	0	0	N/A	N/A	Detected only on June 8th – Migrant
Bosque del Apache Reach Summary[8]	12M 1F	1	4M 1F	4	1	Predated	8 Migrants 3 Unpaired Male SWFLs 1 Pair
LF-21	2M	0	1M	1	N/A	N/A	One male detected on May 20th – Migrant; One Unpaired Male - SWFL
LF-22	1M	0	0	0	N/A	N/A	Detected only on May 20th – Migrant
LF-23	2M	0	2M	2	N/A	N/A	Both Unpaired Male SWFLs

Site Name	WIFLs Observed[1]	Est. Number of Pairs	Est. Number of *E.t. extimus*[2]	Est. Number of Territories	Nest(s) Found[3]	Nest Success	Comments
LF-35	3M 2F	2	3M 2F	3	1	Fledged	One Unpaired Male SWFL Two Pair
LF-35a	3M	0	0	0	N/A	N/A	Three detected only on May 20th – Migrants
LF-36	4M	0	3M	3	N/A	N/A	One detected only on May 28th – Migrant Three Unpaired Male SWFLs
LF-37	4M	0	0	0	N/A	N/A	All detected only on May 30th – Migrants
Tiffany Reach Summary[9]	19M 2F	2	9M 2F	9	1	Fledged	10 Migrants 7 Unpaired Male SWFLs 2 Pair
LF-09/LF-09a	2M	0	0	0	N/A	N/A	One detected only on May 24th and one detected only on June 5th – Migrants
LF-10	1M	0	1M	1	N/A	N/A	One Unpaired Male SWFL
LF-13	4M	0	2M	2	N/A	N/A	Two detected only on May 22nd – Migrants Two Unpaired Male SWFLs
LF-14	3M	0	2M	2	N/A	N/A	One detected only on May 31st – Migrant Two Unpaired Male SWFLs
LF-16	1M	0	0	0	N/A	N/A	Detected only on May 22nd – Migrant
LF-17	21M 17F	17	20M 17F	20	24	15 successful, 7 failed (6 predated, 1 abandoned), 2 unknown	One detected only on May 23rd – Migrant Three Unpaired Male SWFLs Seventeen Pairs
LF-17a	18M 18F	18	18M 18F	18	25	16 successful, 8 failed (4 predated, 3 abandoned, 1 failed due to parasitism), 1 unknown	Eighteen Pairs
LF-18	1M	0	0	0	N/A	N/A	Detected only on May 24th – Migrant
LF-19	1M	0	0	0	N/A	N/A	Detected on May 24th and June 7th – Migrant
LF-20	1M	0	1M	1	N/A	N/A	One Unpaired Male SWFL

Site Name	WIFLs Observed[1]	Est. Number of Pairs	Est. Number of *E.t. extimus*[2]	Est. Number of Territories	Nest(s) Found[3]	Nest Success	Comments
LF-29	3M	0	0	0	N/A	N/A	Two detected only on May 23rd and One detected only on June 5th – Migrants
LF-30	1M	0	0	0	N/A	N/A	Detected only on May 22nd – Migrant
LF-31	3M	0	0	0	N/A	N/A	All detected only on May 22nd – Migrants
LF-32	3M	0	0	0	N/A	N/A	All detected only on May 22nd – Migrants
LFCC-01	2M 2F	2	2M 2F	2	3	1 successful, 2 failed (1 predated, 1 abandoned)	Two Pairs
LFCC-05b	1M	0	0	0	N/A	N/A	Detected on May 23rd – Migrant
DL-01a	3M	0	0	0	N/A	N/A	All detected only on May 29th – Migrants
DL-01	22M 16F	16	19M 16F	19	19	14 successful, 5 predated	Three detected only on May 23rd – Migrants Three Unpaired Male SWFLs Sixteen Pairs
DL-02	32M 27F	27	31M 27F	31	24	14 successful, 9 failed (7 predated, 2 abandoned), 1 unknown	One detected only on May 22nd – Migrant Four Unpaired Male SWFLs Twenty-seven Pairs
DL-03	8M 7F	7	8M 7F	8	9	3 successful, 6 predated	One Unpaired Male SWFL Seven Pairs
DL-04/DL-04a	4M 4F	4	4M 4F	4	8	1 successful, 7 failed (6 predated, 1 failed due to parasitism)	Four Pairs
DL-06	6M 3F	3	6M 3F	6	2	2 failed (1 predated, 1 failed due to parasitism)	Three Unpaired Male SWFLs Three Pairs
DL-07	14M 12F	12	14M 12F	14	19	9 successful, 10 failed (6 predated, 4 abandoned)	Two Unpaired Male SWFLs Twelve Pairs
DL-08	7M 5F	5	6M 5F	6	6	3 successful, 3 predated	One detected only on May 25th – Migrant One Unpaired Male SWFL Five Pairs
DL-09	8M 6F	6	7M 6F	7	9	7 successful, 2 predated	One detected only on May 29th – Migrant One Unpaired Male SWFL Six Pairs

Site Name	WIFLs Observed[1]	Est. Number of Pairs	Est. Number of *E.t. extimus*[2]	Est. Number of Territories	Nest(s) Found[3]	Nest Success	Comments
DL-12	1M	0	0	0	N/A	N/A	Detected only on May 29th – Migrant
EB-01	1M	0	0	0	N/A	N/A	Detected only on May 25th – Migrant
EB-07	1M	0	0	0	N/A	N/A	Detected only on May 25th – Migrant
EB-09	1M	0	1M	1	N/A	N/A	One Unpaired Male SWFL
EB-12	1M	0	0	0	N/A	N/A	Detected only on June 2nd – Migrant
San Marcial Reach Summary[10]	175M 117F	117	142M 117F	142	148	83 successful, 61 failed (47 predated, 11 abandoned, 3 failed due to parasitism), 4 unknown	33 Migrants 25 Unpaired Male SWFLs 117 Pairs
Total All Sites Surveyed In 2006	296M 135F	135	179M 135F	179	168	92 successful, 70 failed (53 predated, 12 abandoned, 5 failed due to parasitism), 6 unknown	117 Migrants 44 Unpaired Male SWFLs 135 Pairs

[1] When a single WIFL responded to the tape playback, and there was no evidence of pairing, it was considered to be an unpaired male. It is possible that some WIFLs counted as males may have been females, especially during the migration period.

[2] A documented WIFL was considered to be a resident *Empidonax traillii extimus* if it was documented on or after June 10 or nesting activity could be confirmed.

[3] A second brood occurs after a SWFL pair has had a successful nesting attempt (i.e., young are fledged). A re-nest commonly occurs after an unsuccessful first nesting attempt.

[4] Belen Reach – From the south boundary of Isleta Pueblo, downstream to the confluence of the Rio Puerco and Rio Grande.

[5] Sevilleta/La Joya Reach – From the confluence of the Rio Puerco and Rio Grande downstream to San Acacia Diversion Dam.

[6] San Acacia Reach – From San Acacia Diversion Dam downstream to Escondida Bridge.

[7] Escondida Reach – From Escondida Bridge downstream to the north boundary of the Bosque del Apache NWR.

[8] Bosque del Apache Reach – within the active floodplain of the Bosque del Apache NWR

[9] Tiffany Reach – From the south boundary of the Bosque del Apache NWR downstream to the railroad trestle.

[10] San Marcial Reach – From the railroad trestle downstream to South Monticello Point (below the Narrows of EB Reservoir Pool).

M = male, F = female

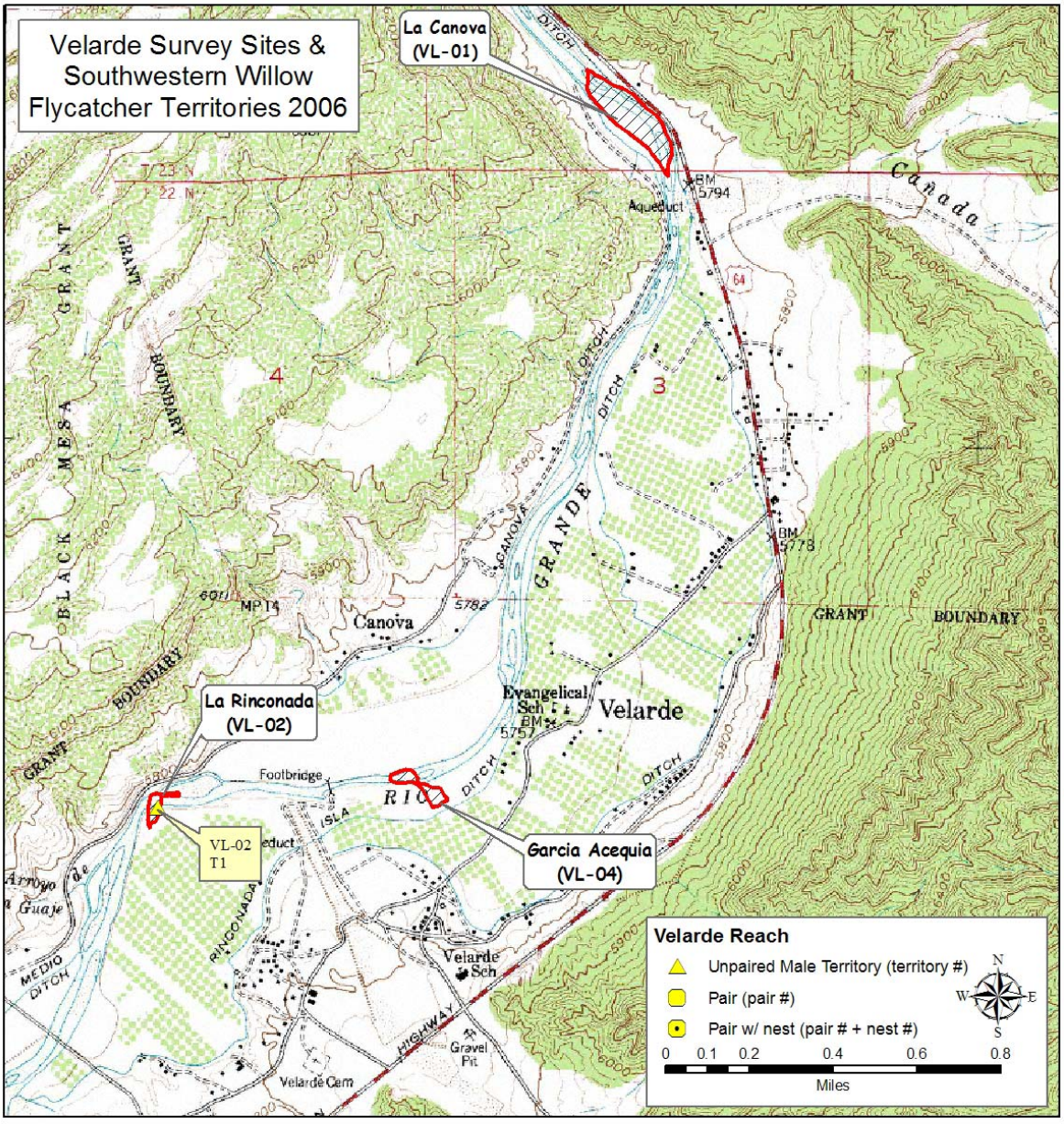

Figure 3. Overview of SWFL detections within the Velarde survey sites.

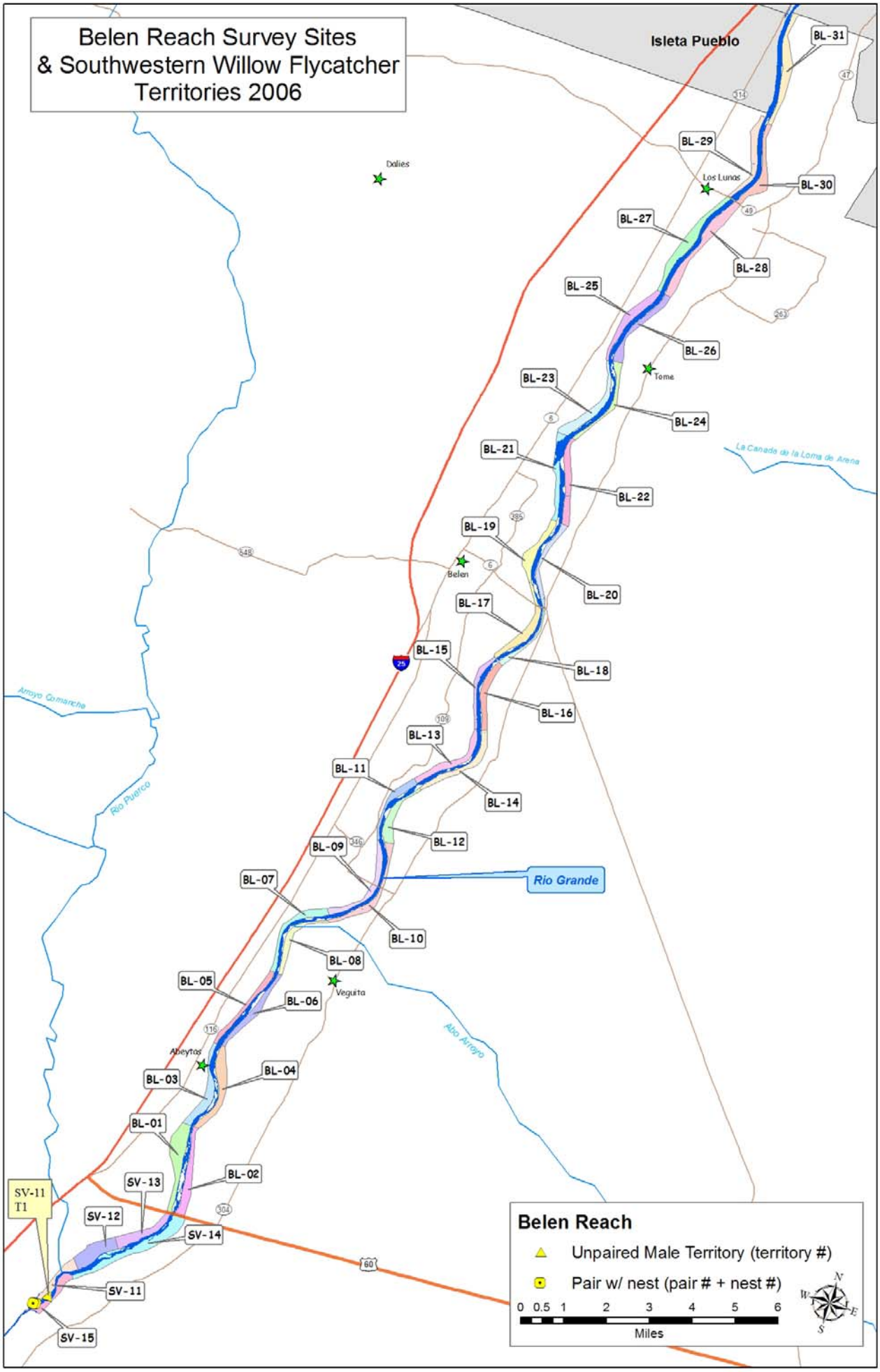

Figure 4. Overview of SWFL detections within the Belen survey sites.

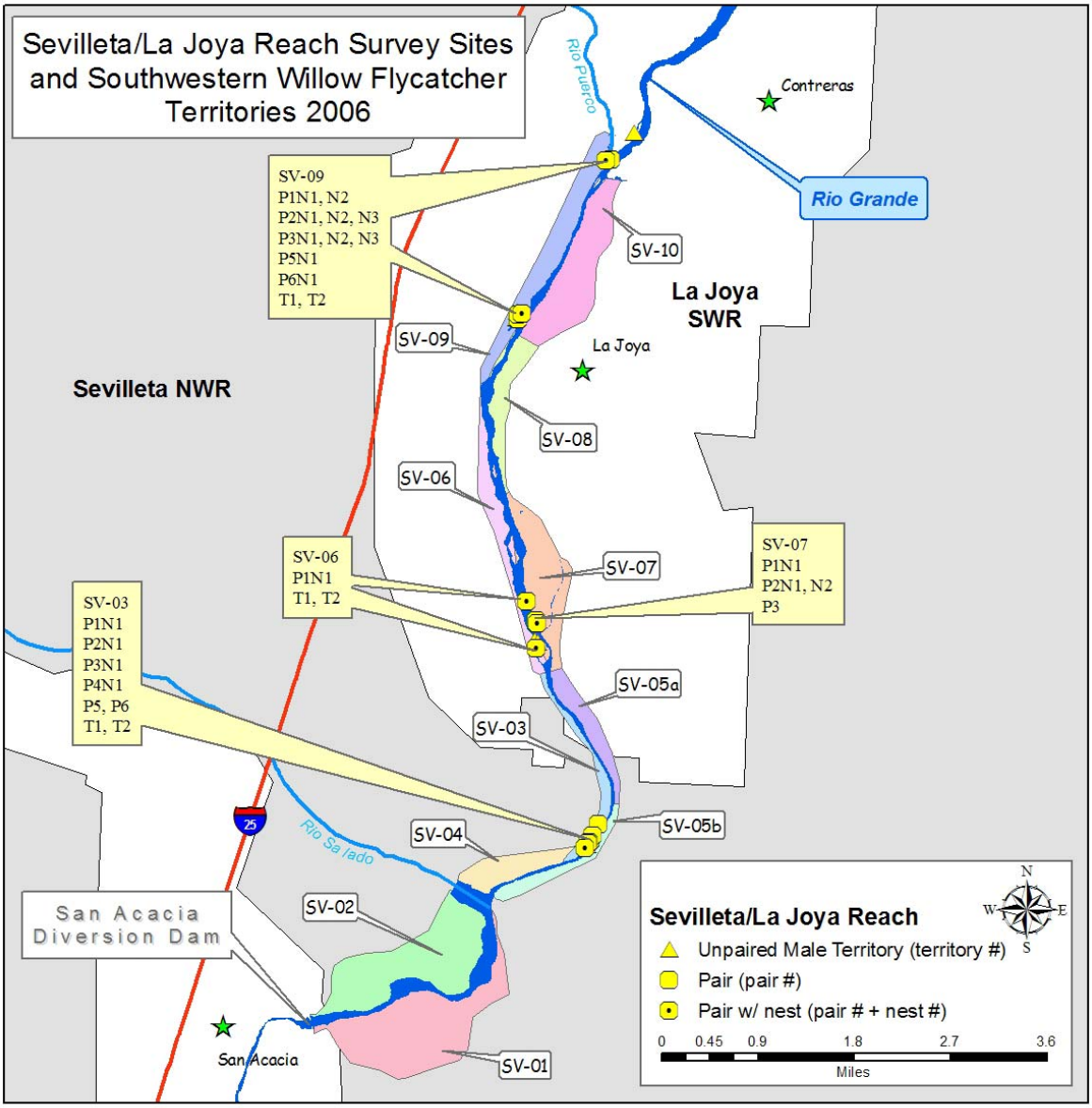

Figure 5. Overview of SWFL detections within the Sevilleta/La Joya survey sites.

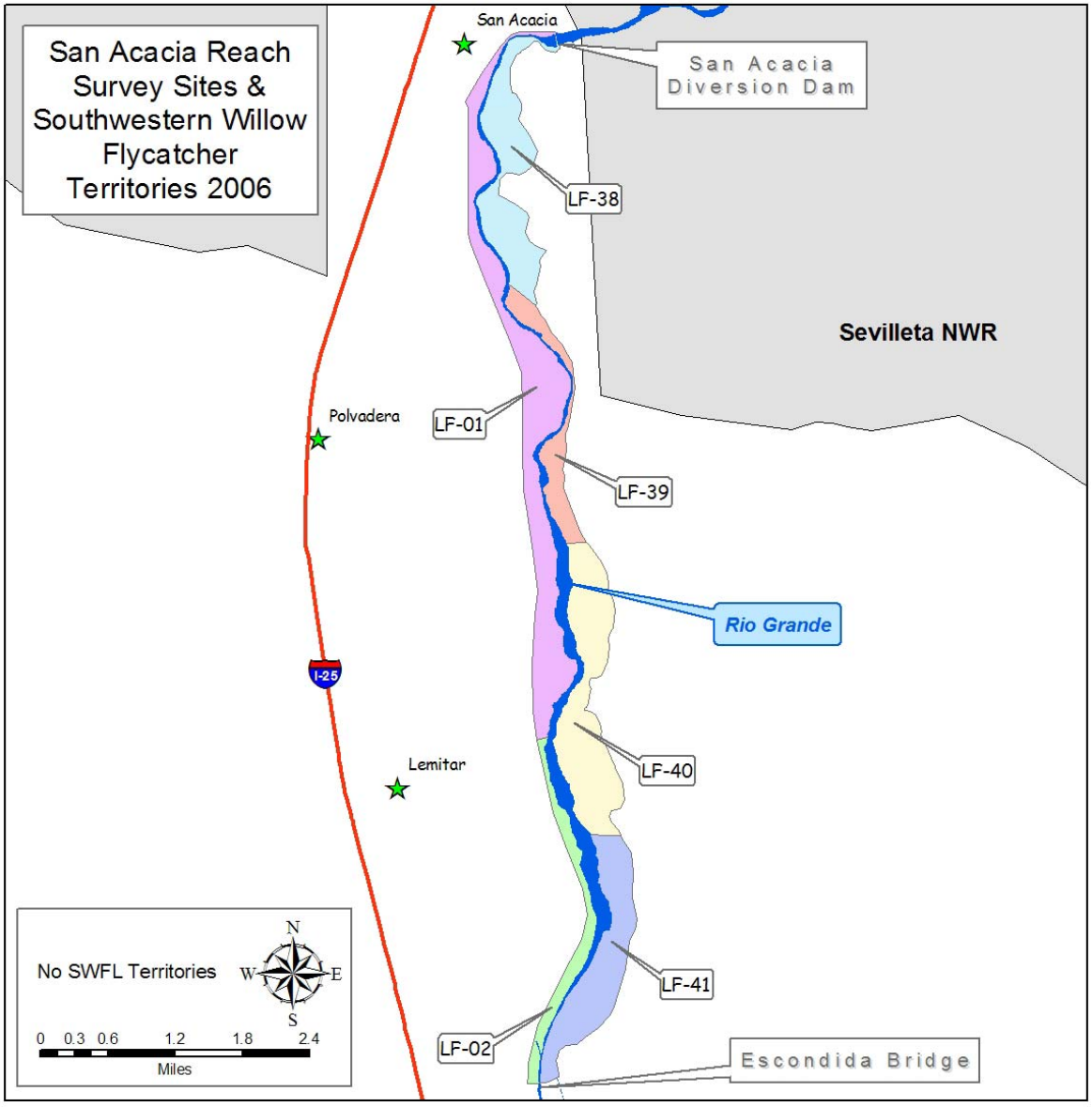

Figure 6. Overview of SWFL detections within the San Acacia survey sites.

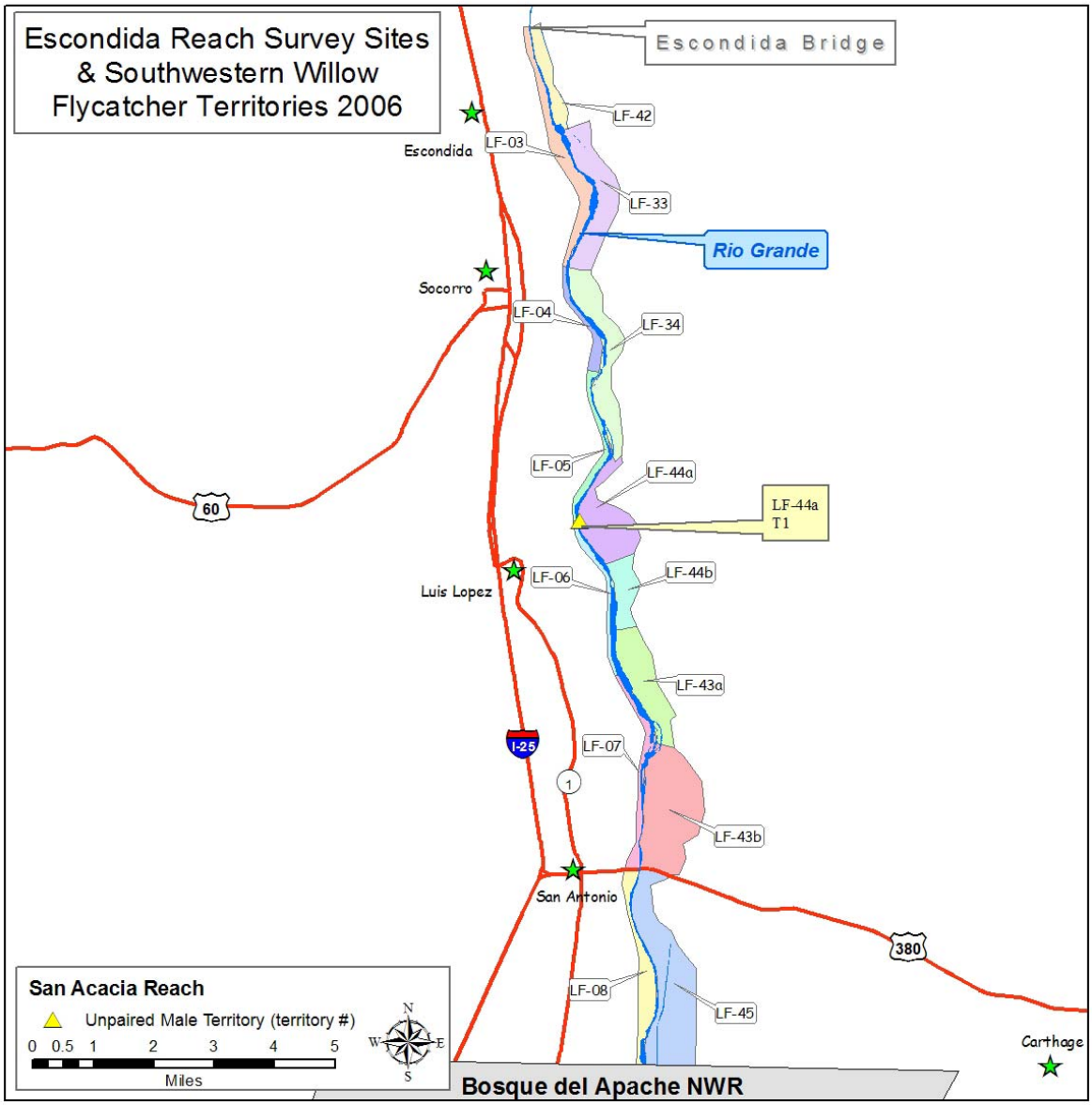

Figure 7. Overview of SWFL detections within the Escondida survey sites.

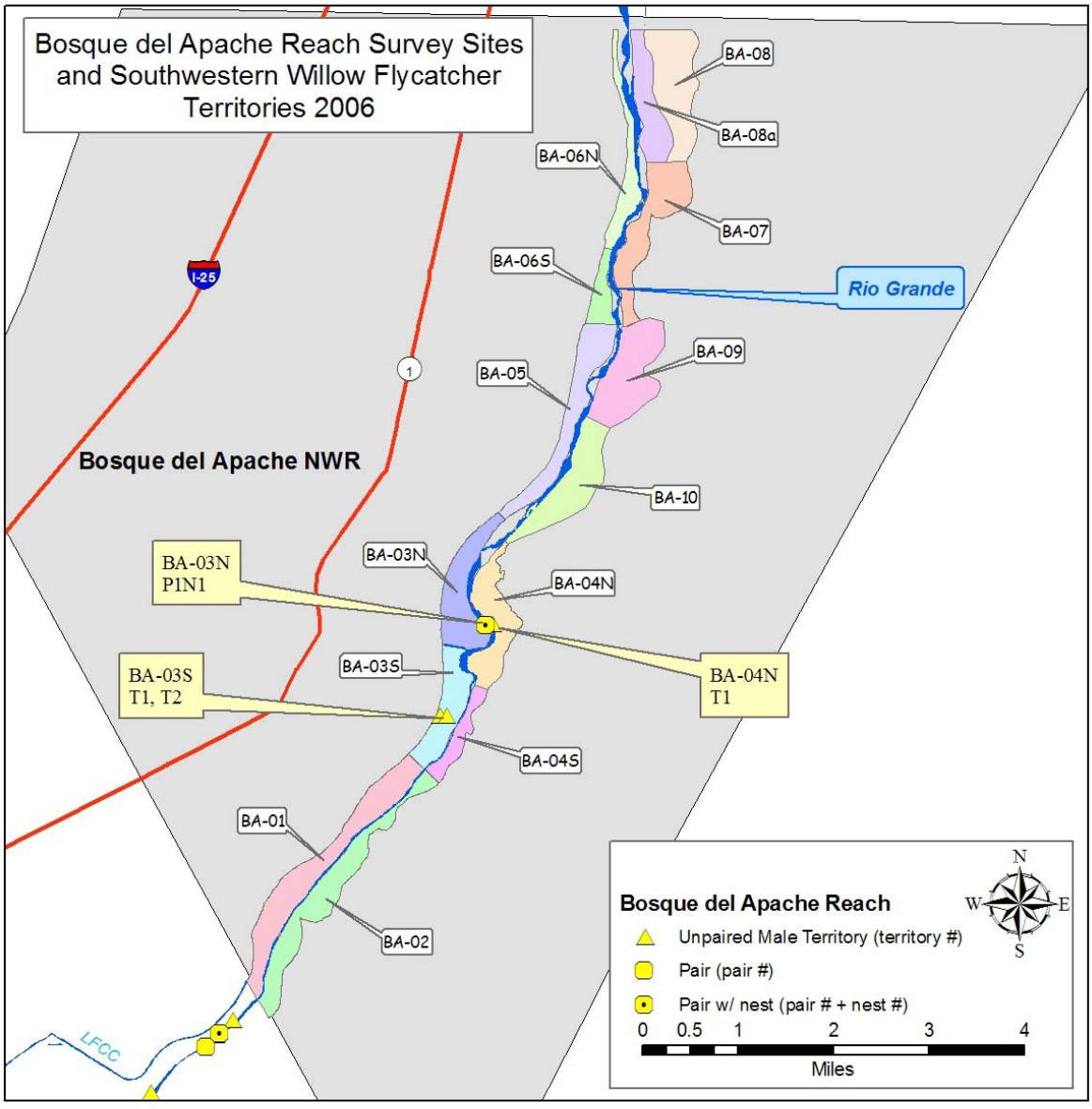

Figure 8. Overview of SWFL detections within the Bosque del Apache survey sites.

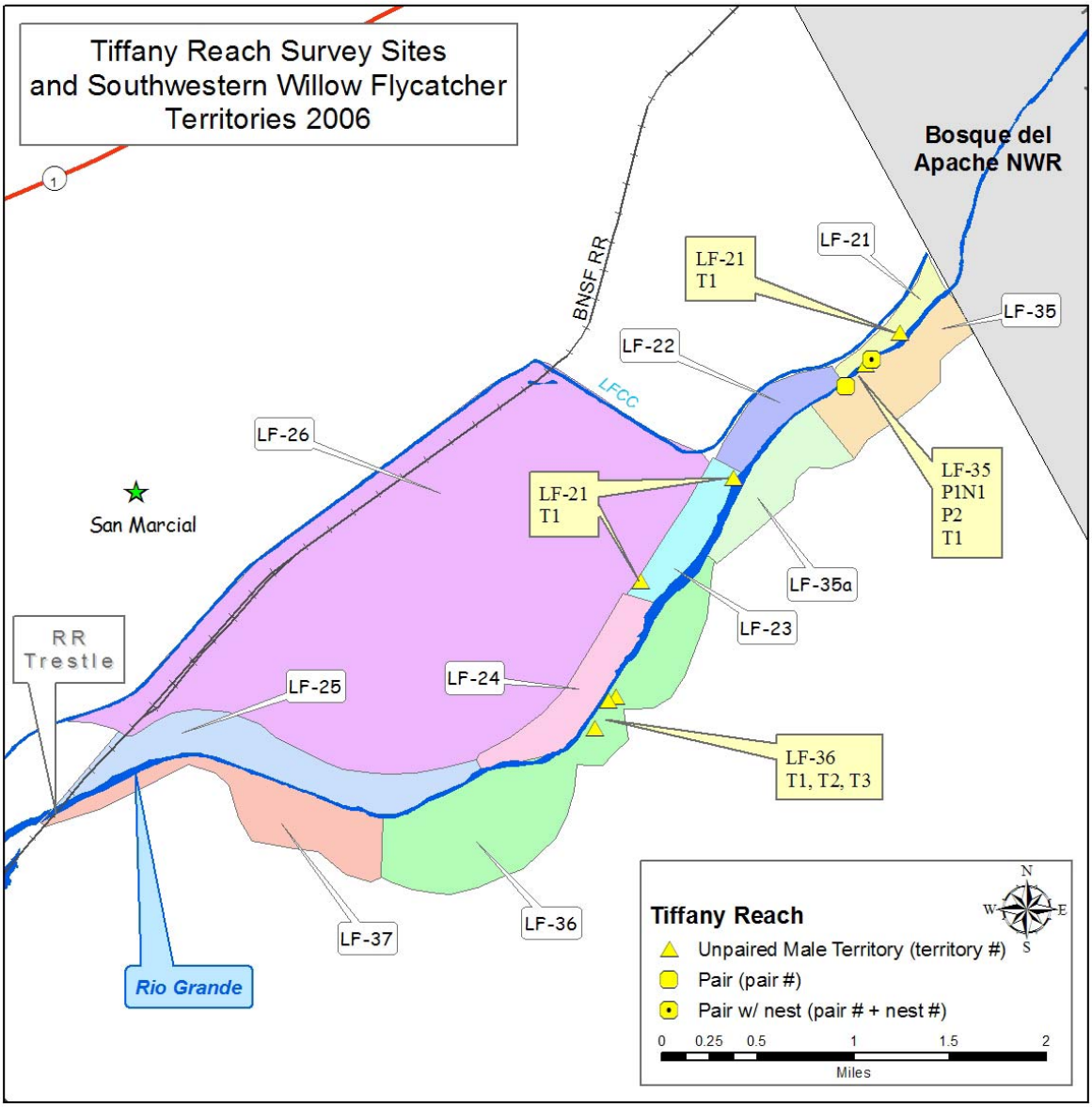

Figure 9. Overview of SWFL detections within the Tiffany survey sites.

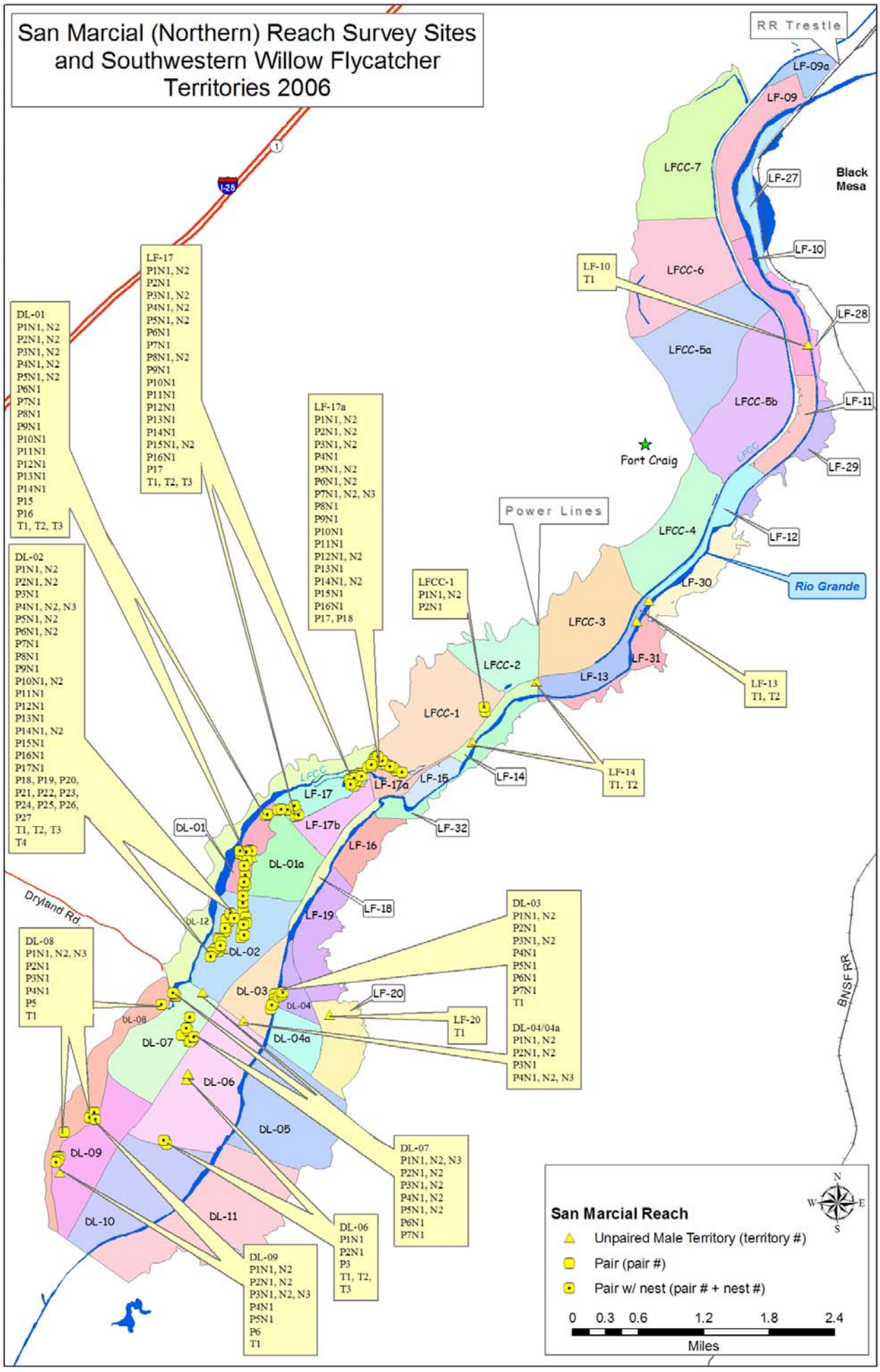

Figure 10. Overview of SWFL detections within the northern San Marcial survey sites.

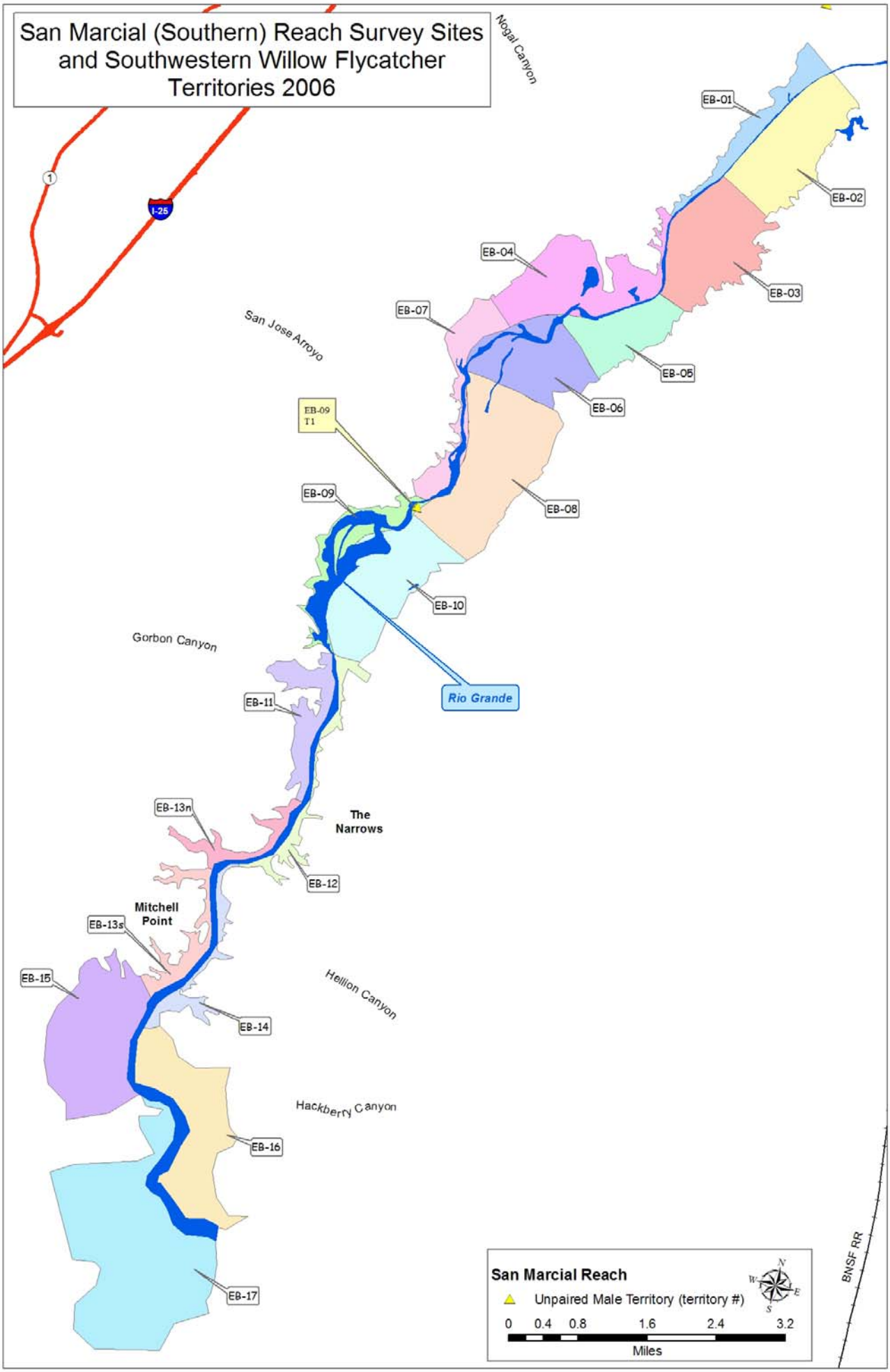

Figure 11. Overview of SWFL detections within the southern San Marcial survey sites.

Species of Special Concern

Occurrences of special status species were recorded in all survey reaches except the Velarde reach. Due to the emphasis placed on Species of Concern detections in 2006, the abundance of these detections increased greatly from 2004 and 2005. Results for the Belen, Sevilleta/La Joya, San Acacia, Escondida, Bosque del Apache, Tiffany, and San Marcial reaches are presented in Figures 12 through 16, respectively. As has been the case over the past several years, the Summer Tanager and Bell's Vireo were the most abundant of the special-concern species with 399 and 118 detections, respectively. Tanagers were distributed evenly throughout the study area, often associated with canopy cottonwoods, willows and Russian olive. Vireos were more specific to the riverside patches of native habitat between Highway 60 and San Acacia and south of the Bosque del Apache NWR. Yellow-billed cuckoos were distributed throughout the study area (47 casual detections) but were more concentrated in the native habitat south of the Tiffany reach. Formal survey results for the San Marcial reach and casual detections are discussed further in the 2006 Yellow-billed Cuckoo Report (V. Johanson, *in prep*). The species occurring in the lowest abundance was Yellow Warbler; ten detections were recorded. All, with the exception of one detection in the Velarde reach, were documented from the Bosque del Apache reach south. No Common Ground-Doves were detected during the 2006 season.

Nest Searches/Monitoring

In 2006, Reclamation personnel monitored a total of 168 nests in the Middle Rio Grande. Of these, 92 were successful, 70 failed, and the outcome of 6 were unknown (mostly due to high nest placement and the inability to monitor them). Nineteen nests were parasitized, and BHCO eggs or nestlings were manipulated (eggs addled, eggs or nestlings removed) in nine of them. Of those nine nests, five were predated, one failed directly due to BHCO parasitism, and three successfully fledged SWFL young. Of the other ten parasitized nests in which BHCO egg manipulation was either impossible or not warranted, four failed due to parasitism, two were predated and four fledged SWFL young. The following is a reach-by-reach and site-by-site summary of the SWFL nest monitoring efforts of 2006:

Sevilleta/La Joya reach

SWFLs were first discovered in this reach during the 1999 SWFL breeding season. Unlike the native plant-dominated habitats which supported most other SWFL territories in the Middle Rio Grande, this reach is dominated by exotic species (saltcedar and Russian olive). Territory numbers in this reach have remained between 17 and 21 for the past four years. Pair and nest numbers decline slightly in 2005 but recovered in 2006, during which 15 pairs and 18 nests were documented. Of the 18 nests discovered, 6 were re-nests. Eight nests were successful, eight failed, and the outcomes of two were unknown. At least 20 young are believed to have successfully fledged from these nests. Four nests were known to be parasitized. See Appendix B for detailed nest site and nest monitoring data forms.

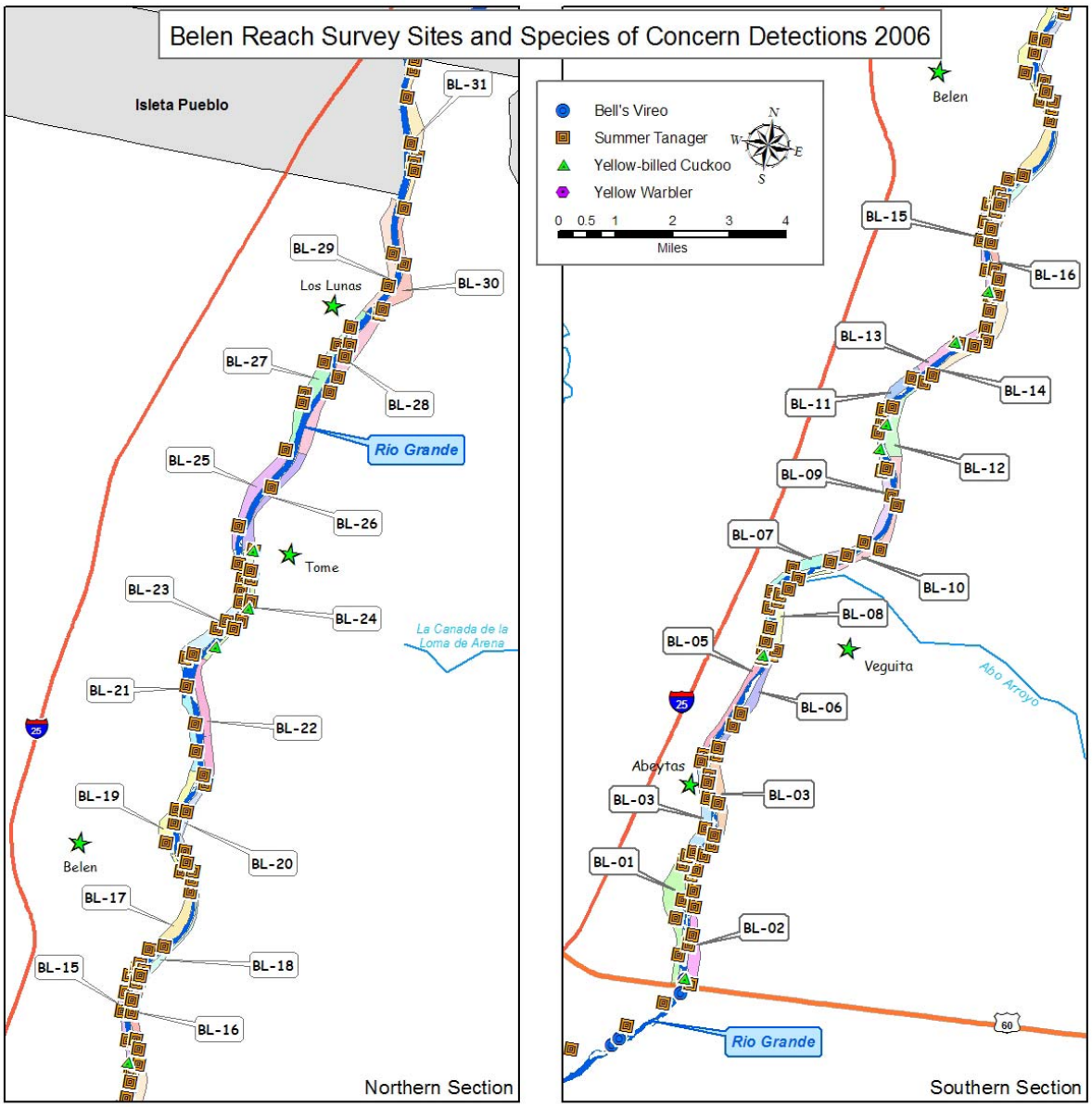

Figure 12. Species of concern occurrences – Belen reach – 2006.

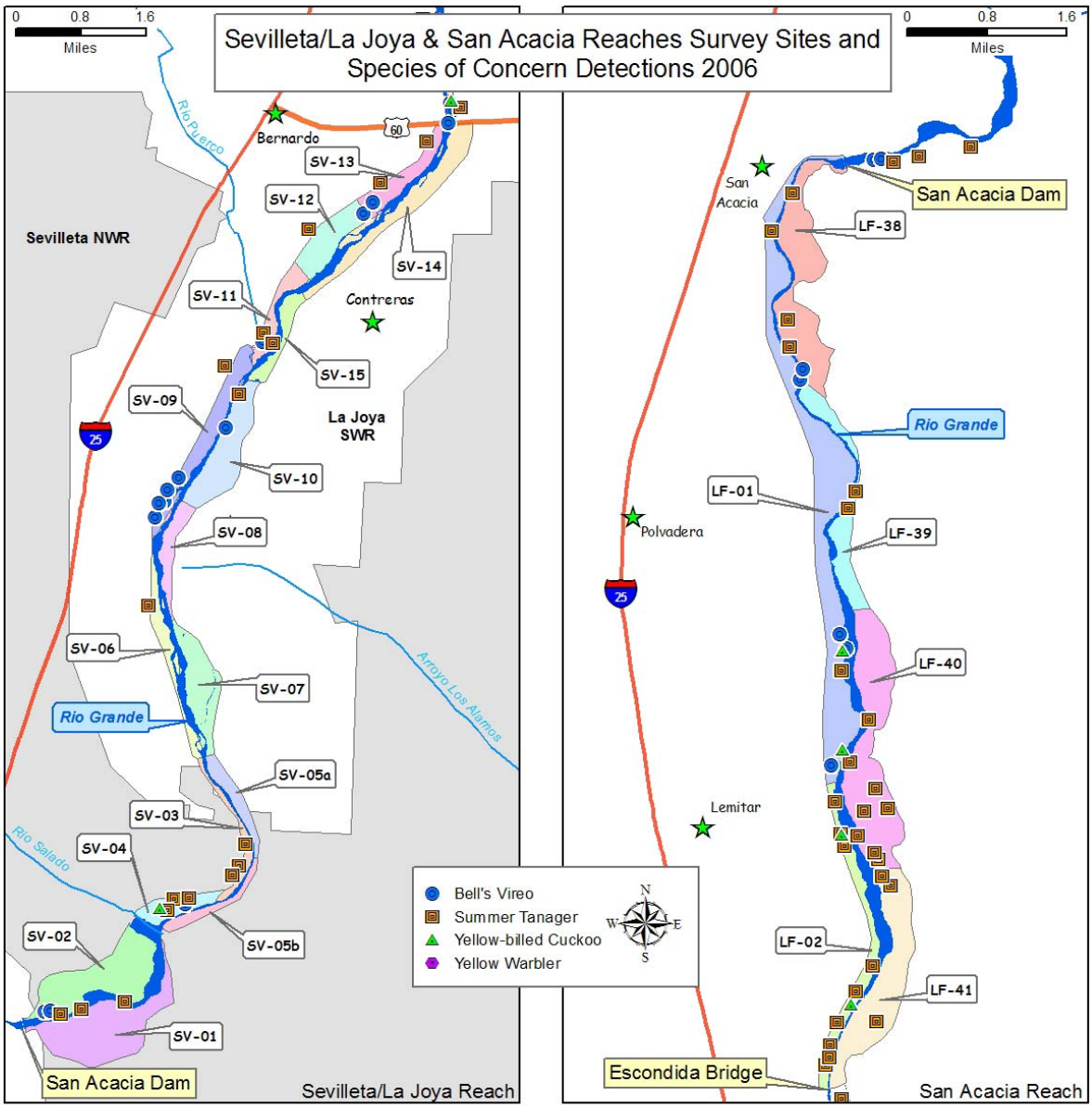

Figure 13. Species of concern occurrences – Sevilleta/La Joya and San Acacia reaches – 2006.

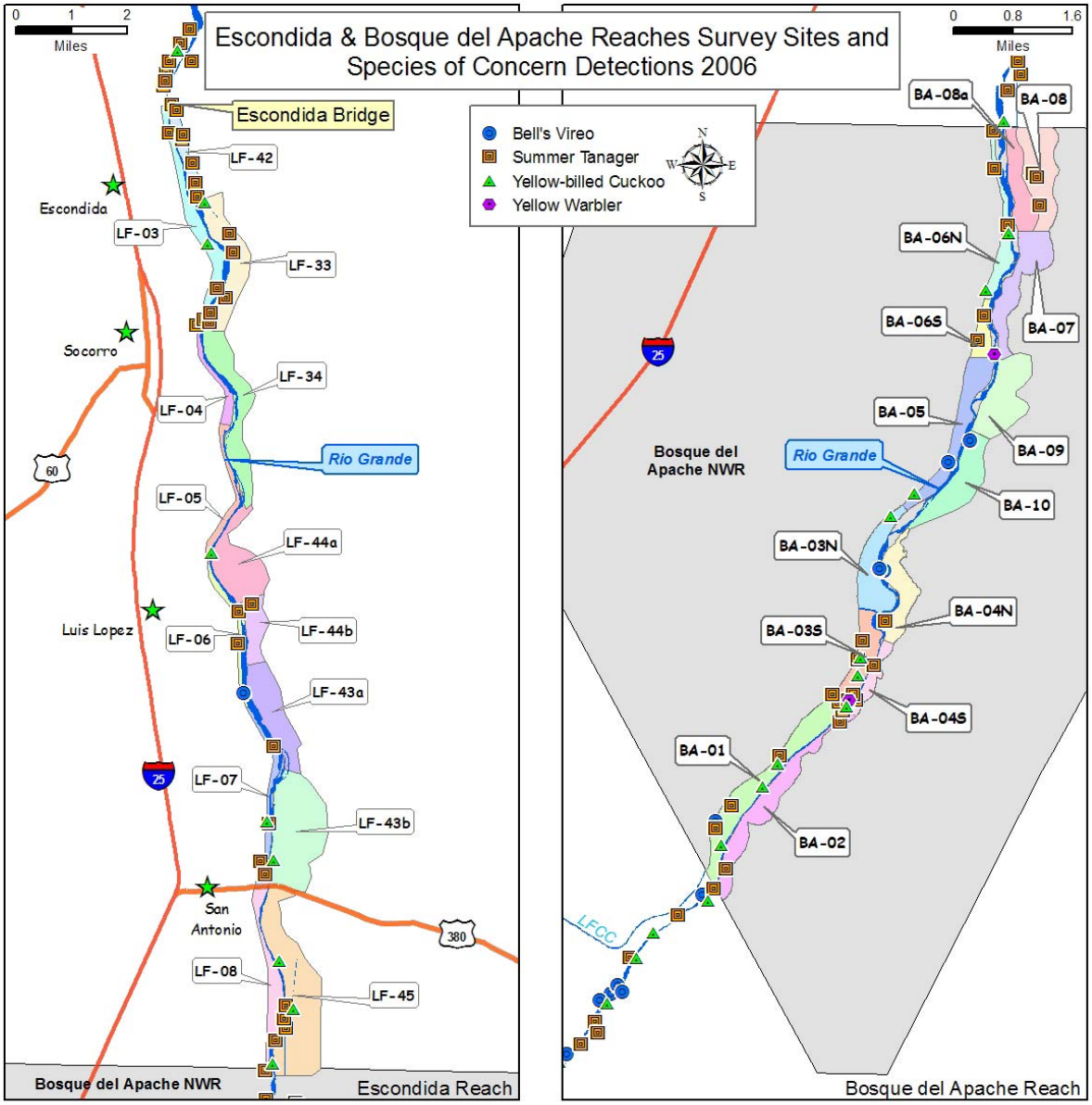

Figure 14. Species of concern occurrences – Escondida and Bosque del Apache reaches – 2006.

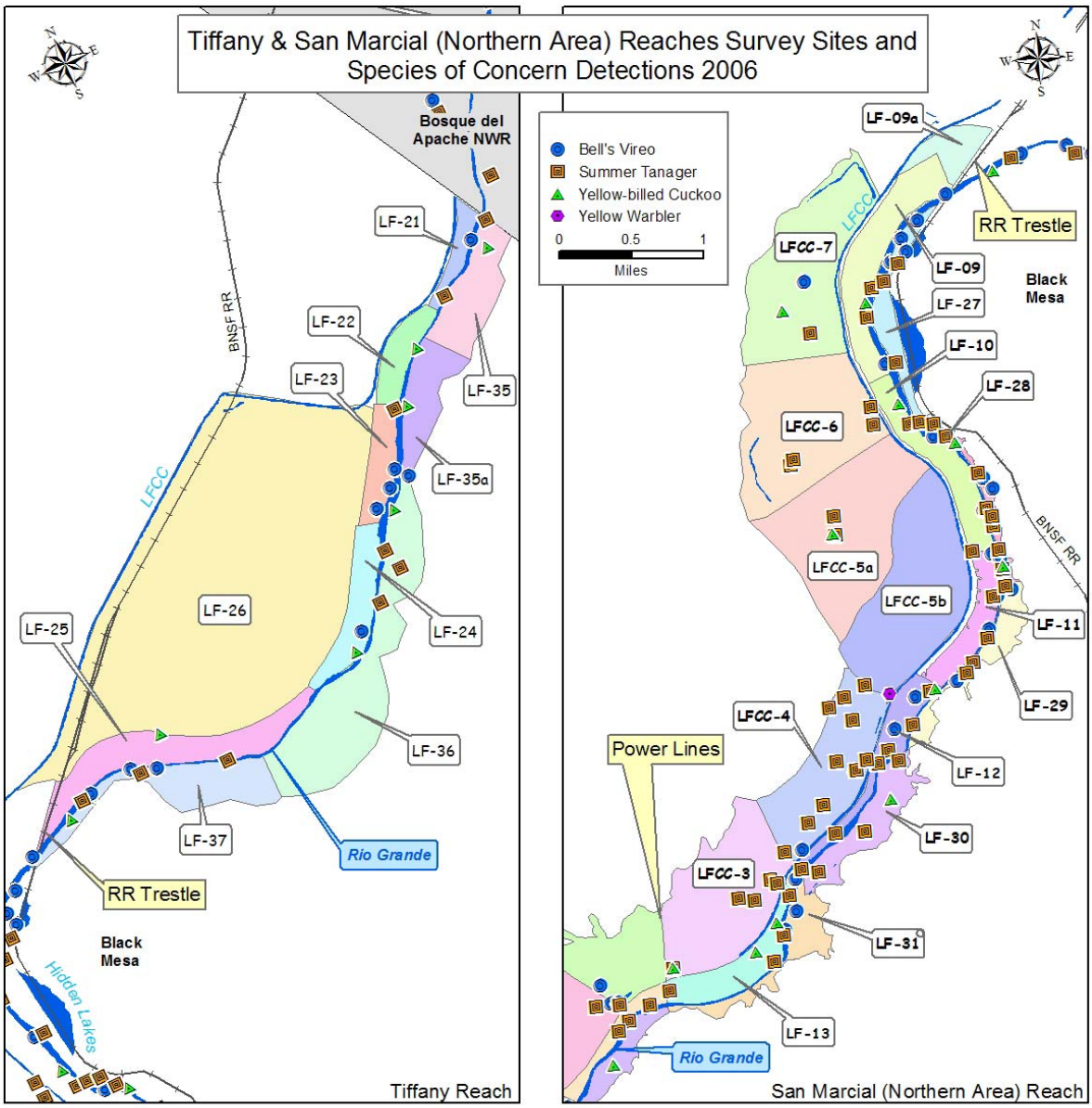

Figure 15. Species of concern occurrences – Tiffany and northern San Marcial reaches – 2006.

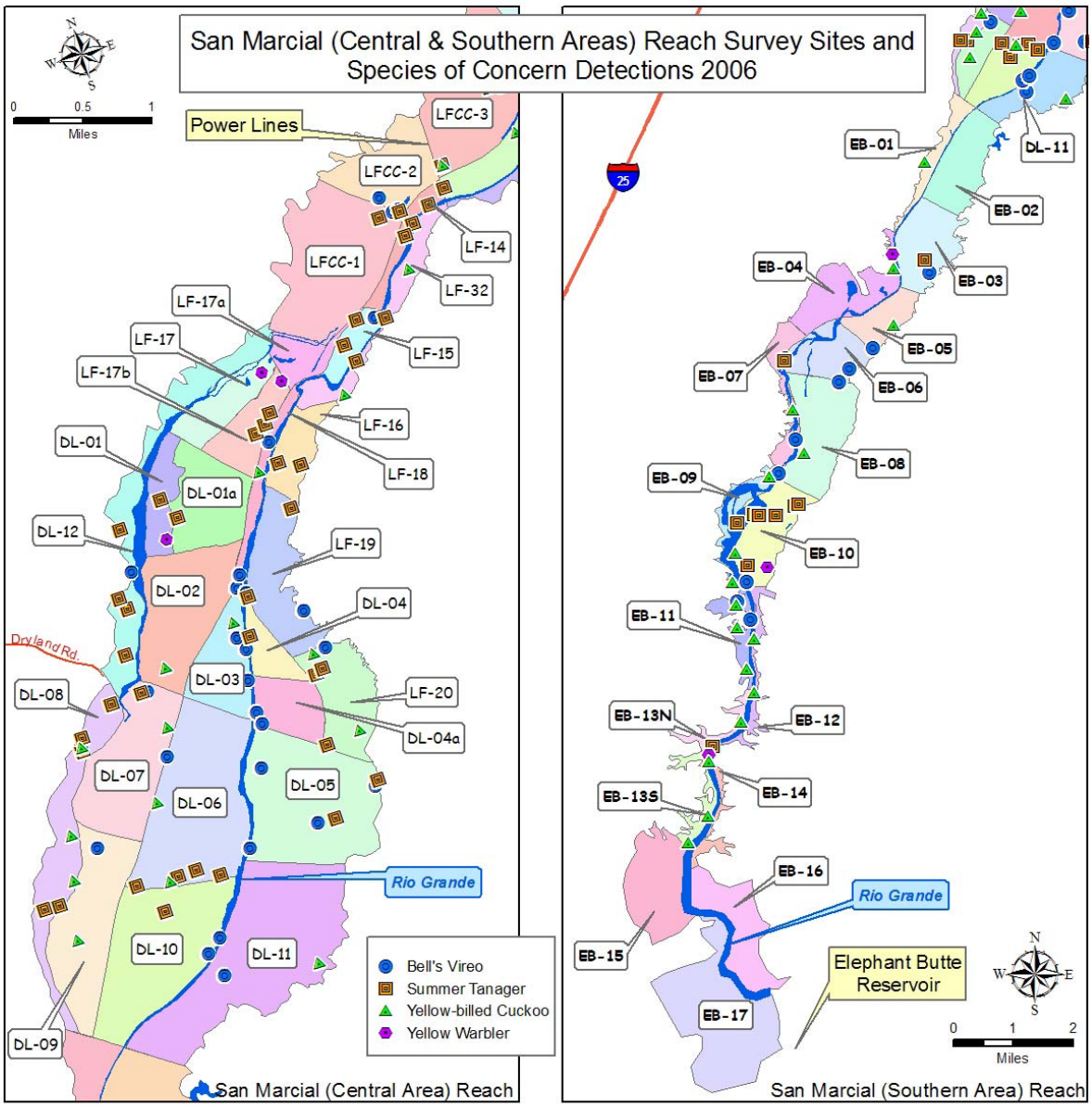

Figure 16. Species of concern occurrences – remainder of San Marcial reach – 2006.

The following is a site-by-site breakdown of all SWFL nesting in the Sevilleta/La Joya reach during 2006:

SV-03 - Four pairs produced four nests during the 2006 breeding season. One nest successfully fledged 1 SWFL, one nest failed and fledged a BHCO, and fates of two were unknown. Two nests were known to be parasitized; one failed and one fledged one SWFL nestling. Two more pairs were present in this site and either did not nest or nests were not found.

SV-06 – One pair in this site produced one nest that was abandoned after being built. It was not parasitized.

SV-07 – Two pairs in this site produced three nests, including one re-nest. Two of the nests successfully fledged, producing five young, and the third was predated. None of the nests were parasitized. The third pair in this site either did not nest or the nest was not found.

SV-09 – Five pairs in this site produced 10 nests, including five re-nests. Five of the nests successfully fledged 14 SWFL young, four were predated and one was abandoned after being parasitized. One other nest was parasitized and it successfully fledged two SWFLs.

Bosque del Apache reach

SWFL nesting in this reach has been sporadic during the past four breeding seasons; three nests total have been produced during this period. In 2006, one pair in **BA-03N** produced one nest that was predated soon after construction.

Tiffany reach

SWFL nesting in this reach has declined precipitously since 2004. Numbers have declined from a high of 13 pairs and 11 nests in 2004 to two pairs and one nest in 2006. The cause of this dramatic decline is unknown. Habitat had not changed significantly during this period. The one nest in site **LF-35** fledged 3 SWFL young.

San Marcial reach

A total of 117 pairs and 148 nests (including 28 re-nests and 23 second or third broods) were documented in this reach in 2006. All but two pairs and three nests occurred within the Elephant Butte Reservoir conservation pool. In 2006, 97 pairs were confirmed by the presence of nesting activity, the other 20 did not construct nests or nests were not found. Fledging of SWFL young occurred in 83 of the 148 nests, 47 were predated, 11 were abandoned, three failed directly due to parasitism, and the fates of four were unknown. The 97 nesting SWFL pairs in this reach produced at least 213 fledglings.

This reach contained 15 parasitized nests; three failed directly due to BHCO parasitism, seven were subsequently predated, and five successfully fledged young SWFLs. Nine of the parasitized nests were accessible enough and timed right to mandate addling; five were subsequently predated, one failed directly due to BHCO parasitism, and three fledged. The following is a site-by-site breakdown of nest monitoring efforts for each of the survey sites inhabited by nesting SWFLs in the San Marcial reach during the 2006 SWFL breeding season. See Appendix B for detailed nest site

and nest monitoring data forms and Table 4 for a history of the SWFL nest monitoring done in the San Marcial reach since 1994.

Table 4. Summary of SWFL nest monitoring (1994-2006) - downstream of railroad bridge to Elephant Butte Reservoir delta

Year	# Territories	# Pairs	# Nests found	# Nests parasitized (%)	# Nests predated (%)	# Nests abandoned (%)	Unknown success	# Successful nests (%)	Estimated total # chicks fledged	Estimated productivity (# chicks per successful nest)
1994	0	0	0	---	---	---	---	---	0	---
1995	3	0	0	---	---	---	---	---	0	---
1996	13	1	1	0	0	1 (100%)	---	0	0	---
1997	10	3	2	0	0	0	0	2 (100%)	4	2.0
1998	11	4	2	0	0	0	0	2 (100%)	7	3.5
1999	12	5	5	1 (20%)*	1 (20%)*	1 (20%)*	0	4 (80%)	10	2.5
2000	23	20	19	2 (12%)*	1 (6%)	2 (12%)*	2	14 (82%)	29	2.1
2001	25	25	36**	0	7 (19%)	2 (6%)	0	27 (75%)	79	2.9
2002	60	50	66**	11 (17%)*	19 (29%)*	6 (9%)*	0	36 (55%)	≥86	2.4
2003	82	67	96**	17 (18%)*	31 (33%)*	13 (14%)*	3	48 (52%)	≥126	2.6
2004	113	92	153**	25 (17%)*	48 (32%)*	15 (10%)*	4	71 (48%)	187	2.6
2005	107	77	127**	16 (13%)*	37 (31%)*	7 (6%)*	7	68 (57%)	≥197	2.9
2006	142	117	148**	15 (10%)*	47 (33%)*	11 (8%)	4	83 (58%)	≥213	2.6

Unknowns not included in nest variable calculation.
* Some nests were parasitized, predated, and/or abandoned.
** Some pairs re-nested after failed attempt or attempted a second, third, or fourth brood.

DL-01 – SWFL pair and nest numbers in this site have remained relatively steady for the past two years. In 2005, 15 pairs produced 24 nests. In 2006, 14 pairs were documented producing 19 nests, including two re-nests and three second broods. Two pairs either did not nest or nests were not found. Fourteen nests were determined to be successful and five were predated. No nests were parasitized. At least 38 SWFLs were assumed to have fledged from this site.

DL-02 – This site experience an increase in SWFL pairs from 11 in 2005 to 27 in 2006. 17 pairs were confirmed by nesting and 10 either did not nest or nests were not found. Twenty-four nests were monitored in this site; 14 were successful, seven were predated, 2 were abandoned and the fate of one was unknown. Four of the nests were re-nests and three were second broods. Two nests were parasitized; one was predated after the BHCO egg was addled and the other fledged SWFL young without addling. At least 35 SWFL young fledged from this site.

DL-03 – Seven pairs were documented in this site by confirmed nesting. Nine nests were monitored including two re-nests. Three nests fledged SWFL young and six were predated. Two nests were parasitized; one fledged SWFL young after the BHCO egg was addled and the other was predated. At least 7 SWFL nestlings fledged from this site.

DL-04 – Nesting in this site decreased from 10 nesting pairs and 14 nests in 2005 to four nesting pairs and 8 nests (including four re-nests) in 2006. One nest was successful, six were predated and one failed due to BHCO parasitism. In total 4 nests were parasitized; eggs were addled in three and all three were subsequently predated. The fourth parasitized nest was not manipulated and it was abandoned. Three SWFLs fledged from the only successful nest in this site.

DL-06 – Nesting occurred in this site for the first time in 2006. Two pairs produced two nests and nesting was not documented for a third pair. One of the nests was predated and one was abandoned after being parasitized.

DL-07 – Pair numbers in this site increased from seven in 2005 to 12 in 2006. Ten of the pairs produced nests and two additional pairs either did not nest or nests were not found. Nineteen nests (including six re-nests and 3 second broods) were monitored in this site in 2006; nine successfully fledged, six were predated, and four were abandoned. Two of the nests were parasitized; only one was addled but both successfully fledged. Twenty-two SWFLs fledged from this site.

DL-08 – Six pairs were documented in this site. Four pairs produced nests while two did not (or those nests were not found). Six nests were monitored including one re-nest and one second brood. Three nests were successful, three were predated, and none were parasitized. Eight SWFLs fledged from this site.

DL-09 – Six pairs were documented in this site in 2006, which is an increase from the one pair in 2005. Five pairs produced nine nests (including one re-nest and three second broods) and nesting was not documented for one pair. Of the nine nests, seven successfully fledged SWFLs and two were predated. No nests were parasitized. 20 SWFLs fledged from this site.

LF-17 – This site contained 24 nests from 16 SWFL pairs, including five re-nests and three second broods. An additional pair was not known to have nested. Fifteen nests were assumed to have successfully fledged SWFL young, six were predated, one was abandoned, and the fates of two were unknown. Three nests were parasitized, one was predated during or after parasitism, one fledged SWFLs after the BHCO egg was addled, and the other was predated after addling. 36 SWFLs fledged from this site.

LF-17a – Eighteen pairs were documented in this site in 2006, which represents a large increase from the ten found in 2005. Sixteen of the pairs nested, producing 25 nests (including two re-nests and seven second broods). Sixteen of the nests successfully fledged, four were predated, 3 were abandoned, one failed due to parasitism, and the fate of one was unknown. Only one nest was parasitized and failed after the BHCO hatched and the SWFL nestling starved. 41 SWFLs fledged from this site.

LFCC-01- Nesting was documented in this site for the first time in 2006. Two pairs produced three nests (including one re-nest). One nest successfully fledged three SWFLs, one nest was predated, and one was abandoned. None of the nests were parasitized.

Hydrology Monitoring

As shown in Figure 17, all but four hydrostations were flooded when LFCC flows reached 100 cfs between 2004 and 2006. Fourteen of 19 hydrostations were flooded when flows were at least 80 cfs. Stations that dried out at the highest flows were those stations located in survey site LF-17a. These stations are the first downstream of the LFCC breach where the LFCC begins to branch out over a larger floodplain, resulting in slower water velocities. These sites have aggraded during the past several years of sediment deposition, making them slightly higher in elevation (and thus, the first to dry out) than downstream sites that receive less sediment deposition. Consequently, it is likely that site LF-17a will continue to aggrade at a much faster rate than downstream sites and will be less prone to flooding as this occurs.

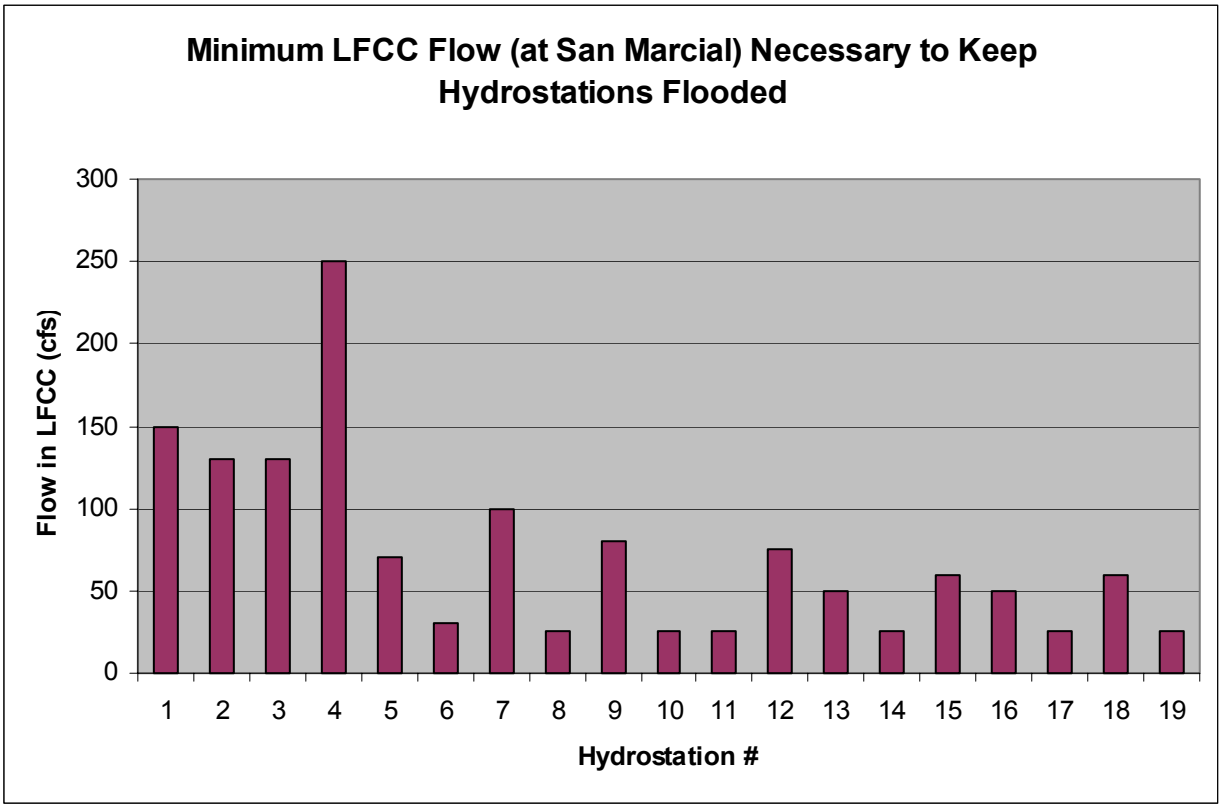

Figure 17. Minimum LFCC flows at San Marcial necessary to keep each hydrostation (and the adjacent habitat) flooded.

Hydrology data were compared to SWFL nest variables (i.e., success, productivity, predation, parasitism, and distance to water) from the 2004 through 2006 breeding seasons. Over the entire study area, 93 percent of nests (n=466) were within 100 m (0.06 mi) of water and 87 percent were within 50 m (0.03 mi) of water. Overall, based on current data, hydrology did not influence nest

variables greatly. Nest success, predation rate, and parasitism rate were all similar based on distance to water and hydrology immediately under the nest. Successful nests that were either above saturated soil all season or above floodwater all season (a subset of saturated all season) produced more fledglings than successful nests that were above dry soil all season (ANOVA, $P = 0.04$, df = 2, F-ratio = 3.35). Also, first nests in flooded areas were more successful than subsequent nests (Chi-square with Yates' correction, $P = 0.03$, df = 1, $\chi^2 = 4.74$). See Attachment for graphical representations of hydrology and nest variable comparisons.

Discussion

Presence/Absence Surveys

Velarde reach

SWFL territories in this survey reach have declined from a high of six in 1995 to one or less between 2002 and 2006 (Table 5). Habitat quality in this reach has not declined greatly during this period suggesting that the amount of available breeding habitat in this reach may be insufficient to support a viable SWFL population. It is likely that limiting factors such as predation and brood parasitism are acting in concert with restricted amounts of available habitat to affect this local population that is unable to sustain itself. This local population is likely to fluctuate depending on local habitat conditions and reproductive success of nearby populations such as on the San Juan Pueblo. Current trends seem to indicate that this population has become unsustainable.

Belen reach

Six SWFL territories have been documented in this reach since in was first surveyed in 2002. With the exception of a breeding pair in 2005, all have been either unpaired male territories or late migrants that were considered territorial due to their date of detection. Suitable SWFL habitat within this reach is limited. The majority of habitat consists of sparse, decadent saltcedar and Russian olive. Cottonwoods and grassy meadows are also interspersed throughout this reach. There are occasional stands of native willows adjacent to the river, most often mixed with Russian olive or saltcedar, which is where the SWFL territory was documented in 2006. This reach also receives very little overbank flooding, with the exception of a few areas. Small patches of habitat continue to improve in quality, particularly in areas where restoration projects have occurred and/or natural recruitment of native willows has occurred. Considering the habitat available and the presence of "source" populations on the Pueblo of Isleta and in the Sevilleta/La Joya reach, this reach has the potential for colonization by SWFLs in the near future.

Sevilleta/La Joya reach

SWFLs in the Sevilleta/La Joya reach were first documented in 1999, and territory numbers increased through 2002. Since then, territory numbers have remained relatively constant. In 2006, numbers increased slightly (Table 5), mostly due to new SWFL territories in sites SV-06 and SV-07. These sites contained two and one territories in 2004 and 2005, respectively. In 2006, six territories were

documented in these sites. Habitat in these sites has improved to the point that possible dispersing SWFLs from sites SV-03 and SV-09 (or elsewhere) establish territories here. Also, considering that several territories (and pairs) established in these sites reinforces the fact that this habitat is suitable and is likely to continue to be occupied by breeding SWFLs.

Table 5. Reach summary of SWFL territories/pairs in lands within the active floodplain of the Rio Grande surveyed by Reclamation between 1995 and 2006.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Velarde	6 T 1 P	4 T 0 P	5 T 5 P	2 T 2 P	2 T 1 P	2 T 2 P	1 T 1 P	0	n/s	1 T 0 P	0	1 T 0 P
Belen	n/s	n/s	n/s	n/s	n/s	n/s	n/s	1 T 0 P	n/s	0	4 T 1 P	1 T 0 P
Sevilleta/La Joya	n/s	n/s	n/s	n/s	4 T 4 P	8 T 5 P	11 T 10 P	13 T 10 P	17 T 9 P	19 T 18 P	17 T 10 P	21 T 18 P
San Acacia	n/s	0	0	0	0	0	0	0	0	0	0	0
Escondida	n/s	n/s	0	0	0	0	0	4 T 0 P	0	0	0	1 T 0 P
Bosque del Apache	n/s	n/s	n/s	1 T 0 P	0	0	0	3 T 0 P	3 T 1 P	1 T 1 P	0	4 T 1 P
Tiffany[1]	11 T 7 P	4 T 0 P	n/s	n/s	n/s	n/s	n/s	3 T 2 P	4 T 3 P	16 T 13 P	3 T 2 P	9 T 2 P
San Marcial[2]	3 T 0 P	13 T 3 P	10 T 4 P	11 T 4 P	12 T 5 P	23 T 20 P	25 T 25 P	63 T 52 P	86 T 70 P	113 T 92 P	107 T 77 P	142 T 117 P
Total	20 T 8 P	21 T 3 P	15 T 9 P	14 T 6 P	18 T 10 P	33 T 27 P	37 T 36 P	87 T 64 P	113 T 83 P	150 T 124 P	131 T 90 P	179 T 135 P

n/s = not surveyed, T = territory, P = pair.

(1) Survey results from 1995 and 1996 in the Tiffany reach are a combination of Reclamation and NMNHP surveys. The Tiffany reach, with the exception of sites LF-21 and LF-22 (surveyed in 2002 and 2003), was not surveyed during the years 1997-2003.

(2) The San Marcial reach includes all sites below the railroad bridge including the active flood plain and sites LFCC-1 through LFCC-7, outside the active flood plain.

Habitat within the other occupied sites in this reach (SV-03 and SV-09) has not changed significantly over the past 5 years. Because territory numbers are slowly increasing suggests that recruitment or immigration, not habitat, limits the productivity of this reach. There is still ample suitable habitat within this reach for additional SWFLs to occupy, and it is expected that SWFLs in this reach will continue to increase in number until the habitat is no longer suitable, available, or some other limiting factor impacts population growth.

Population expansion within this reach is also of significant interest due to the type of habitat present. Mature saltcedar and Russian olive dominate the majority of occupied sites in this reach, particularly sites SV-03, 06 and 07. Overbank flooding is rare, especially in times of drought. However, the proximity to water, density, and vertical stratification of vegetation, and scattered patches of native vegetation seem to make certain sites attractive to breeding SWFLs.

San Acacia reach

Habitat in this reach is dominated by dry, decadent exotic vegetation in the form of saltcedar and Russian olive with an occasional cottonwood overstory. Quality SWFL habitat within this reach is very limited and composed of small patches of native vegetation along the river channel. This reach

did get limited overbank flooding during the summers of 2005 and 2006, which is rare for this location. This flooding that occurred should benefit the habitat in certain areas. However, with the limited suitability of habitat in this reach, no territories or nesting SWFLs have been documented in this reach in the 8 years Reclamation has been surveying it.

Escondida reach

Habitat in this reach is very similar to that in the San Acacia reach. Most of the habitat is sparse exotic vegetation in the form of saltcedar and Russian olive with an occasional overstory of cottonwood. Some suitable SWFL habitat exists or is forming adjacent to the river and on recently formed riverbars. However, this reach of the river seldom receives any overbank flooding and the water table has lowered in recent years so the patches of native vegetation are drying out and dying. Resident SWFLs were documented in this reach for the first time in 2002. Four territories were located early in the survey season. Because of the date of their discovery, these birds were treated as residents. Birds documented between June 10 and July 21 are typically considered resident SWFLs. It is likely that these birds were late migrants because of the habitat they were detected in and they were only detected once early in the season. In 2006, one WIFL was located on June 28 (within the "resident period") but was not found on subsequent surveys. Although it is treated as a resident, it was likely a late migrant or non-territorial male.

Bosque del Apache reach

Four SWFL territories were documented in this reach in 2006. The reduction in territories from three in 2002 and 2003 to zero in 2005 indicated that SWFLs were not able to persist in this reach due to a lack of suitable habitat. The reestablishment of territories in 2006 suggests that there is some suitable habitat present. Monitoring of this reach is warranted to determine if this trend continues and if SWFL numbers in this reach increase as habitat matures to suitability.

Tiffany reach

In 2004 a comprehensive survey of this reach was conducted for the first time since 1996. The entire reach was surveyed again in 2005 and territories decreased from 16 to 3 (Table 5). In 2006, territory numbers increased but not to 2004 levels. It is unclear why this reach experienced such a large decrease in territories. Habitat within the reach has matured, but it doesn't appear to be significantly different from 2004. Some habitat in site LF-37 was lost to high flow events of 2005 and it is possible that this displaced some territories. Also, the abundance of higher quality habitat elsewhere in the Middle Rio Grande may have caused some birds to relocate. Overall, there is still suitable habitat in this reach that may be reoccupied in the future.

San Marcial reach

SWFL surveys have been conducted in this reach since 1994 (Table 5). Since 1995, SWFL territories and available habitat below the railroad bridge have increased greatly. During the 2000 season, a concentration of breeding SWFLs developed within the LF-17 and LF-17a sites. This increase in SWFL population in the "core" areas is likely a result of a consistent water supply provided by the LFCC outfall and the emergence of maturing native vegetation within the receding headwater area of Elephant Butte Reservoir, contributing to high levels of reproductive recruitment in the population. As the reservoir continued to recede during the following years and native vegetation became established, the population of SWFLs expanded in number and extent to inhabit suitable habitat from LF-17a and LF-17 downstream to DL-07 and DL-09. This expansion was

facilitated by a number of factors including an increase in available nesting habitat, high survival rates experience by both adults and fledglings, and consistently high rates of pair nesting success. This population continues to expand, which implies that quality habitat is not limiting the local population's growth.

In the future, as the dynamics of the reservoir cause water levels to rise and fall, it is likely that breeding habitat will continue to be created and destroyed. It is this type of dynamic system that SWFLs depend on for breeding habitat. From year to year there may be net gains and losses of habitat, but as a whole this population should persist and be a valuable source population for the surrounding areas into the foreseeable future.

Nest Searches/Monitoring

Belen reach

SWFL nesting was first documented in this reach in 2005. One pair (the only pair documented in the reach) produced two nests. In 2006, no nesting was documented in this reach. Although some suitable nesting habitat is present, the abundance of habitat elsewhere and the lack of a large nearby "source" population has likely limited SWFLs from breeding in this reach.

Sevilleta/La Joya reach

In 2005, the Sevilleta/La Joya reach experienced a large decrease in SWFL nesting for the first time since SWFLs were discovered in this reach in 1999 (Table 6). This reduction in nesting is due to a decrease in the number of pairs in this reach. Males largely outnumbered females, a phenomenon that was documented throughout the Middle Rio Grande in 2005. During the breeding season of 2006, pair numbers rebounded to 2004 levels. Nest success and BHCO parasitism rates were similar to other reaches.

Nesting SWFLs in this reach have a propensity for nesting higher in the substrate than the San Marcial population of SWFLs. This makes locating nests and monitoring them much more difficult and is the reason for the high percentage of unknown fates among nests in this reach. It is unclear why SWFLs in this reach nest so high in the substrate.

One possible explanation for the greater nest height in this reach is predator avoidance. With the lack of surface water in this site, it is possible that the birds sense a greater potential for predation from terrestrial animals such as snakes and raccoons, and nesting higher keeps them farther from this threat. Another possible reason SWFLs nest higher in this reach than in San Marcial is that the predominately exotic vegetation in this reach provides nest structure at greater heights and SWFLs would nest higher in native vegetation if nest sites were available. Determining why SWFLs are nesting higher in this reach would take extensive study. It is unlikely that knowing why SWFLs are nesting higher in this reach would justify the time and expense needed to explore this issue.

Another variable that could cause concern for the continued productivity of this population is the apparently higher level of BHCO parasitism experienced by SWFLs nesting in this reach. Over the past three years, 10 nests (28 percent of known outcomes, n = 36) were parasitized as compared to

55 in the San Marcial reach (13 percent, n = 413). This difference is likely due to habitat differences and the greater density of BHCOs in the Sevilleta/La Joya reach (Moore 2006, Moore and Ahlers 2003).

Table 6. Rio Grande reach summary of SWFL nests in lands surveyed by Reclamation between 1995 and 2006

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belen	n/s	n/s	n/s	n/s	n/s	n/s	n/s	0	n/s	0	2	0
Sevilleta/ La Joya	n/s	n/s	n/s	n/s	3	6	9	13	12	21	10	18
Bosque del Apache	n/s	n/s	n/s	0	0	0	0	0	1	2	0	1
Tiffany[(1)]	6	0	n/s	n/s	n/s	n/s	n/s	1	2	11	4	1
San Marcial	0	1	2	2	5	19	36	66	96	153	127	148
Total	6	1	2	2	8	25	45	80	111	187	143	168

n/s = not surveyed

(1) Nest monitoring results from 1995 and 1996 in the Tiffany reach are from the NMNHP (1995). The Tiffany reach, with the exception of sites LF-21 and LF-22 (surveyed in 2002 and 2003), was not surveyed during the years 1997-2003.

Tiffany reach

SWFL nesting in this reach has declined from 11 nests in 2004 to four and one nest in 2005 and 2006, respectively. As stated above, the reason for this decline is unknown. Habitat in this reach does not appear to have decreased in quality. The abundance of habitat to the south in the San Marcial reach may be attracting birds that otherwise would have continued north and established territories in the Tiffany reach. Some of the habitat in the Tiffany reach was damaged by high flows in 2005. This may have also impacted the amount and quality of available habitat. Overall, it appears that this population is on the decline and may not persist.

San Marcial reach

During the 2006 survey season, 148 SWFL nests were documented in this reach. After a slight decline in nesting and pair abundance in 2005, this population seems to have rebounded. Several new patches of habitat were occupied and SWFLs in this reach keep expanding into newly developing vegetation. See Attachment for graphical representations of SWFL nesting variables and habitat association in Elephant Butte Reservoir.

In 1995, four of six (66 percent) SWFL nests discovered in the riparian area upstream of the railroad bridge had been parasitized by cowbirds (NMNHP 1995). Cowbird control efforts were implemented between 1996 and 2001 and only 3 of 65 nests (5 percent) downstream of the railroad bridge were parasitized. Between 2002 and 2006 no cowbird trapping was done, and the parasitism rate among San Marcial SWFL nests ranged from 10 to 18 percent (Table 4). These higher numbers seem to indicate that cowbird trapping may be effective at reducing parasitism rates. However, nest success rates, which are the ultimate indicator of BHCO trapping success, were not affected.

A riparian-obligate nest monitoring study was initiated in 1999 and continued through 2004 to study the effectiveness of BHCO trapping at reducing parasitism rates and increasing nesting success.

Data analysis indicates that, while during certain years trapping may significantly lower BHCO parasitism rates, there was no statistically significant difference in nesting success rates between trapped and untrapped locations (Moore 2006). With many variables involved, including hydrology, vegetation characteristics, predator abundance, and the overall dynamism of the Rio Grande floodplain, it is difficult to determine what is responsible for the variation in BHCO parasitism and nest success rates between years. The SWFL recovery plan (USFWS 2002) states that "cowbird control should be considered if parasitism exceeds 20-30% after collection of two or more years of baseline data," so the decision to end the trapping program continues to be justified based on this recommendation.

Overall, during the 1999 to 2006 breeding seasons, 650 SWFL nests have been discovered in this reach, making it one of the most productive SWFL breeding areas in the subspecies' range and the largest source population in the Middle Rio Grande Basin. This holds special implications for the population as a whole. Responsible nest monitoring of this population needs to be continued to detect any significant increases in nest failure, cowbird parasitism, or any other variable detrimental to the survival of this population. Continued efforts should also be made to minimize disturbance both at occupied survey sites and individual nest sites.

Middle Rio Grande as a whole

Over the past eight years, a total of 765 SWFL nests have been monitored along the Middle Rio Grande. Table 7 and the Attachment provide details of habitat comparisons for SWFLs nesting along the Middle Rio Grande between 1999 and 2006. Statistical comparisons between categories were made using Chi-square tests. The following comparisons were considered: nesting success vs. nest substrate and dominant territory vegetation, BHCO parasitism vs. nest substrate and dominant territory vegetation, and BHCO parasitism vs. survey reach. Between 1999 and 2006, 58 nests (7.6 percent) were in saltcedar-dominated territories, 613 (80.1 percent) were in *Salix*-dominated territories, and 94 (12.3 percent) were in mixed-dominance territories. Saltcedar- and *Salix*-dominated territories are defined as >90 percent saltcedar or *Salix*, respectively. Mixed-dominance occurs when a dominant vegetation type is not obvious. In considering nest success for these situations, SWFL nests in *Salix*-dominated (56.1 percent, n = 594) areas were no more successful than those placed in saltcedar-dominated (56.8 percent, n = 44) or mixed-dominance areas (48.3 percent, n = 89) ($\chi^2 = 1.93$, df = 2, $P = 0.38$). Tables 8 and 9 provide details of all statistical tests.

Parasitism rates between different habitat types were compared using a Chi-square test including all three types of dominant vegetation (saltcedar, *Salix*, and mixed). A statistically significant difference ($\alpha = 0.05$) was detected between the three vegetation types ($\chi^2 = 9.49$, df = 2, $P = 0.01$). When parasitism rates from each habitat type were compared to the others (Table 9), the only statistically significant difference was between *Salix*- and saltcedar-dominated territories. The reasons for this difference are likely the higher quality of the habitat provided by native vegetation and the fact that all of the saltcedar dominated territories are located in the Sevilleta/La Joya reach which has historically had the highest abundance of BHCOs (based on point count data, see below). Some of this difference may be attributed to the vast difference in sample size (594 vs. 44).

Productivity of nests, defined as number of birds fledged per successful nest, in *Salix*-dominated habitats was slightly greater (2.64 fledged birds/nest, n = 333) than nests located in both mixed-

Table 7. Habitat comparison of SWFL nesting within the Middle Rio Grande – 1999 to 2006

Territory Vegetation Type		
Number of nests in exotic dominated territories	58	7.6% of total
Number of nests in *Salix* sp. dominated territories	613	80.1% of total
Number of nests in mixed dominance territories	94	12.3% of total
Nest Substrate Species		
Number of nests in *Salix* sp. substrate	458	59.9% of total
Number of nests in saltcedar substrate	272	35.5% of total
Number of nests in Russian olive substrate	32	4.2% of total
Number of nests in other (*Baccharis* sp./cottonwood) substrate	3	0.4% of total
Nest Substrate/Territory Vegetation Combination		
Number of nests in saltcedar substrate within *Salix* sp. dominated territories	173	(28.2% of 613 nests)
Number of nests in *Salix* sp. substrate within saltcedar or mixed dominated territories	19	(12.5% of 152 nests)
Nest Success Per Nest Substrate Species		
Percentage of successful nests in *Salix* sp. substrate	56.1%	(249 out of 444 nests)
Percentage of successful nests in saltcedar substrate	53.8%	(135 out of 251 nests)
Percentage of successful nests in Russian olive substrate.	65.5%	(19 out of 29 nests)
Percentage of successful nests in other (*Baccharis* sp./cottonwood) substrate	33.3%	(1 out of 3 nests)
Nest Success Per Territory Vegetation Type		
Percentage of successful nests in *Salix* sp. dominated territories	56.1%	(333 out of 594 nests)
Percentage of successful nests in saltcedar dominated territories	56.8%	(25 out of 44 nests)
Percentage of successful nests in mixed dominance territories	48.3%	(43 out of 89 nests)
Cowbird Parasitism Per Nest Substrate Species		
Percentage of nests parasitized in *Salix* sp. substrate	13.3%	(54 out of 444 nests parasitized)
Percentage of nests parasitized in saltcedar substrate	17.0%	(42 out of 247 nests parasitized)
Percentage of nests parasitized in Russian olive substrate	20.0%	(4 out of 29 nests parasitized)
Percentage of nests parasitized in other (*Baccharis* sp./cottonwood) substrate	33.3%	(1 out of 3 nests parasitized)
Cowbird Parasitism Per Territory Vegetation Type		
Percentage of nests parasitized in *Salix* sp. dominated territories	12.8%	(76 out of 594 nests)
Percentage of nests parasitized in saltcedar dominated territories	27.3%	(12 out of 44 nests)
Percentage of nests parasitized in mixed dominance territories	20.2%	(18 out of 89 nests)
Productivity[(1)] Per Territory Vegetation Type		
Productivity of nests (n=333) found in *Salix* sp. dominated territories	2.64/nest	(879 young from 333 nests)
Productivity of nests (n=25) found in saltcedar dominated territories	2.20/nest	(55 young from 25 nests)
Productivity of nests (n=43) found in mixed dominance territories	2.48/nest	(107 young from 43 nests)
Productivity[(1)] Per Nest Substrate Species		
Productivity of nests (n=249) found in *Salix* sp. substrate	2.64/nest	(658 young from 249 nests)
Productivity of nests (n=135) found in saltcedar substrate	2.47/nest	(333 young from 135 nests)
Productivity of nests (n=19) found in Russian olive substrate	2.26/nest	(43 young from 19 nests)
Productivity[(1)] Compared to Nest Substrate Species and Territory Vegetation Type		
Productivity of nests in *Salix* substrate within *Salix* sp. dominated territories	2.63/nest	(636 young from 242 nests)
Productivity of nests in saltcedar substrate within *Salix* sp. dominated territories	2.67/nest	(243 young from 91 nests)
Productivity of nests in saltcedar substrate within saltcedar dominated territories	2.10/nest	(42 young from 20 nests)
Total SWFL nests monitored	597	

([1])Productivity is defined as the number of SWFL young fledged per successful nest.

Table 8. Details of habitat comparison statistical tests performed on SWFL nest habitat data from 1999 – 2005 in the Middle Rio Grande.

Chi-square Tests (α = 0.05)			
Comparison	χ^2 value	Degrees of freedom	*P*-value
Success and dominant territory vegetation	1.93	2	0.38
Parasitism and dominant territory vegetation*	9.49	2	0.01
Success and substrate species	1.53	2	0.47
Parasitism and substrate species	1.77	2	0.41

Data including only known nesting outcomes.
* denotes statistical significance documented

Table 9. Details of parasitism comparisons performed on SWFL nest data from 1999 – 2005 in the Middle Rio Grande.

Chi-square Tests with Yates' Correction (α = 0.05)			
Parasitism comparison	χ^2 value	Degrees of freedom	*P*-value
Salix-dominated vs. saltcedar-dominated territories*	6.06	1	0.01
Salix-dominated vs. mixed-dominance territories	3.00	1	0.08
Saltcedar-dominated vs. mixed-dominance territories	0.48	1	0.49
Sevilleta/La Joya vs. San Marcial*	7.02	1	0.01

Data including only known nesting outcomes.
* denotes statistical significance documented

dominance territories (2.48 fledged birds/nest, n = 43) and saltcedar-dominated habitats (2.2 fledged birds/nest, n = 25). Based on these data, SWFLs appear to select native-dominated habitat when available, and appear to have more productive nests in native habitat.

Nest substrate is defined as the species of tree where a SWFL nest is physically located. Though 80.1 percent of SWFL nests over the past 8 years were found in *Salix*-dominated areas, 35.5 percent of all nests and 28.2 percent of nests in *Salix*-dominated habitats were physically located in a saltcedar. Nest success is similar in three substrate categories (*Baccharis*/cottonwood was ignored due to its small sample size of 3): 56.1 percent (*Salix*), 53.8 percent (saltcedar), and 65.5 percent (Russian olive). No statistically significant difference was found to exist between any substrate classes ($\chi^2 = 1.53$, df = 2, $P = 0.47$). Additionally, parasitism rates between nests placed in the three different substrates (*Salix* 13.3 percent, saltcedar 17.0 percent, and Russian olive 20.0 percent) were similar ($\chi^2 = 1.77$, df = 2, $P = 0.41$). Productivity of SWFL nests in *Salix* (2.64 fledged birds/nest, n

= 249) and saltcedar (2.47 fledged birds/nest, n = 135) substrates was slightly greater than those located in Russian olive substrate (2.26 fledged birds/nest, n = 19).

When comparing 8 years of nesting data from the two primary nesting reaches within the Middle Rio Grande, another factor becomes apparent. The rate of parasitism within the Sevilleta/La Joya reach (25.3 percent, n = 75) appears to be greater than that experienced by nesting SWFLs within the San Marcial reach (13.2 percent, n = 629). Parasitism data from the three nesting reaches (Sevilleta/La Joya, Tiffany, and San Marcial) were compared and a significant difference was found ($\chi^2 = 8.10$, df = 2, $P = 0.02$). When the Tiffany reach was removed from the comparison due to a small sample size, the significant difference in parasitism rates remained between the Sevilleta/La Joya and San Marcial reaches. Ignoring the large difference in sample size between the two reaches, the reasons for this difference in parasitism rates can likely be explained by two factors. Territories within the Sevilleta/La Joya reach are either saltcedar-dominated or mixed. There are no native-dominated territories within this reach. Conversely, nearly all territories within the San Marcial reach are dominated by native vegetation. Native habitat likely provides better concealment and protects host nests from BHCO parasitism. Another factor is that BHCOs are more abundant in the Sevilleta/La Joya reach than in the San Marcial reach. Point counts have been conducted for the past 8 years in four different study reaches (Sevilleta/La Joya, San Acacia, Bosque del Apache, and San Marcial). Data from 1999 to 2006 showed that the mean number of cowbird detections per point varied annually but averaged almost two times greater within the Sevilleta/La Joya reach than within the San Marcial reach (Moore 2006). The Sevilleta/La Joya reach supported the greatest density of cowbirds compared to all other monitored reaches within the Middle Rio Grande and this could be responsible for the increased parasitism rate.

In the 2004 report (Moore and Ahlers 2005) attention was given to an apparent trend of decreasing nest success in the Elephant Butte reservoir delta population of SWFLs. However, in 2005 and 2006, 57 and 58 percent of nests in the delta were successful, respectively; the highest success rates since 2001. It is likely that this fluctuation is natural, and that this population is not being limited by habitat or human-caused factors. Additionally, when one factors-in multiple broods and looks at individual pair success and pair success over the entire Elephant Butte population, it is easy to see why this population has continued to expand at such a rapid rate. Even with individual nest success rates declining greatly, the SWFL's tendency for multiple broods per season has allowed this population to continue expanding. See Attachment for a graphical representation of individual and pair nest success.

Lastly, in coordination with the USFWS, addling or removal of BHCO eggs from parasitized SWFL nests is a practice that was begun in 2002 and continued through 2006. Of the 98 SWFL nests parasitized during that period with known outcomes, BHCO eggs were addled or removed from 47 nests, 10 of which successfully fledged SWFL young (21.3 percent success). Parasitized nests over the past six seasons in the Middle Rio Grande that were unaltered were just as successful. Of 51 parasitized nests monitored, 38 failed and 13 successfully fledged young—a 25.5 percent success rate. This is not a statistically significant difference ($\chi^2 = 0.06$, Df = 1, $P = 0.80$) and addling has not been detrimental to parasitized SWFL nests.

Recommendations

Recommendations for future work in the Middle Rio Grande fall under three categories:

1. Annual surveys of SWFL population concentrations
2. Periodic surveys of potential/unoccupied suitable habitat or restoration site
3. Non survey-related

Annual Surveys

- Presence/absence surveys should continue in the occupied reaches of the Middle Rio Grande, such as the Sevilleta/La Joya and San Marcial reaches, to monitor the status of the SWFL population. These surveys will provide data regarding population trends and colonization of new sites adjacent to occupied sites.
- Presence/absence surveys should also continue in project-related areas where ESA compliance mandates.
- Nest monitoring should continue in areas where pairing activity is documented. While it is becoming increasingly difficult to monitor every nest, a sample of at least 100 nests should be monitored each year. These data will provide insight into factors limiting recruitment and population growth such as parasitism and predation rates.
- Addling/removal of BHCO eggs from parasitized SWFL nests should continue, provided it can be done with minimal disturbance to the nest and the adult SWFLs.

Periodic Surveys

- Periodic surveys (every 3 to 5 years by the appropriate land management entity) should be performed in all unoccupied reaches with suitable habitat in the Middle Rio Grande in order to document any colonization of newly suitable habitat.
- In any sites where resident SWFLs are documented, nest searching and monitoring should be conducted by the appropriate management agency.
- The value of documenting the occurrence of Neotropical migrants of special concern should be assessed on an annual basis. If this information continues to be of value to resource managers, the occurrence of these species should be documented concurrent with the presence/absence surveys for the SWFL.
- Assess habitat features at nest sites and occupied patches—both at the territory and patch level—to determine components characteristic of SWFL breeding areas where populations are expanding, remaining stable, or becoming extirpated.

Non Survey-related

- The 2006 SWFL Nest Vegetation Quantification Report will be finalized. Recommendations for further field work will be made.
- Nest monitoring technology that allows nests that are higher than 4 or 5 m to be inspected should be researched.
- The SWFL nesting hydrology study initiated in 2004 should be continued and additional hydrostations should be added in newly colonized habitat.

Conclusions

Presence/absence data will be beneficial when establishing a long-term monitoring plan and will aid in better understanding of the species' distribution, abundance, and potential threats to it. All available data will prove beneficial in the implementation of the Southwestern Willow Flycatcher Recovery Plan. As defined by the Recovery Plan for the Southwestern Willow Flycatcher (USFWS 2002), the Middle Rio Grande Management Unit, a part of the Rio Grande Recovery Unit, extends from just upstream of Cochiti Reservoir to Elephant Butte Dam. The recovery goal for this reach is 100 SWFL territories. Even without considering the territories occurring on the Pueblo of Isleta (14 documented in 2000; NMNHP 2000), the recovery goal for the Middle Rio Grande Management Unit has been sustained for 4 consecutive years (Table 5). Additional population growth is still needed in other Management Units for recovery objectives to be met within the Rio Grande Recovery Unit.

Acknowledgments

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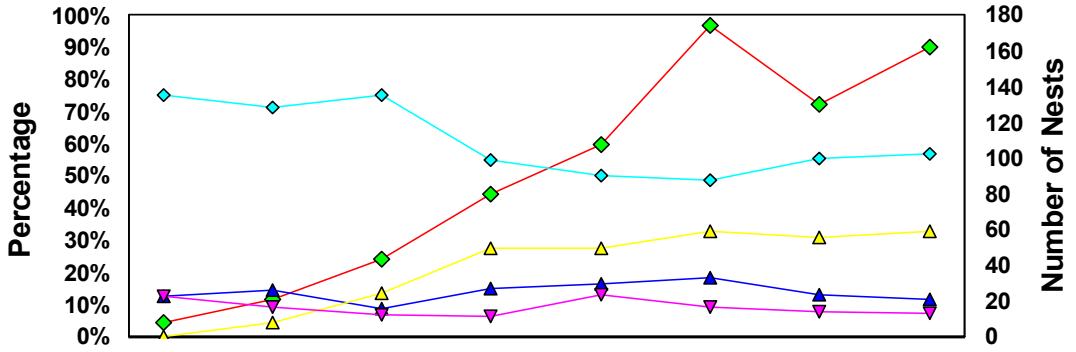
Attachment

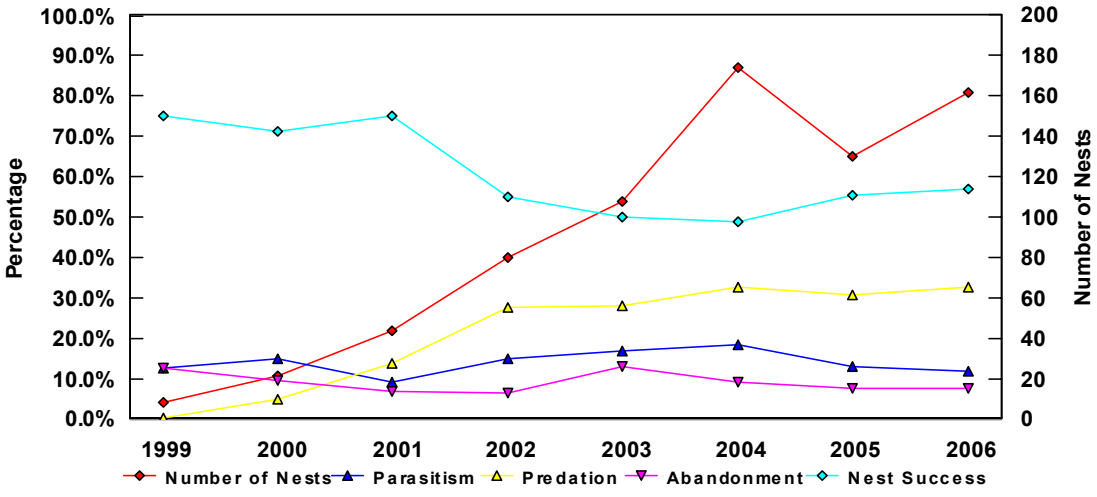
Graphical representations of SWFL habitat selection and nesting variables

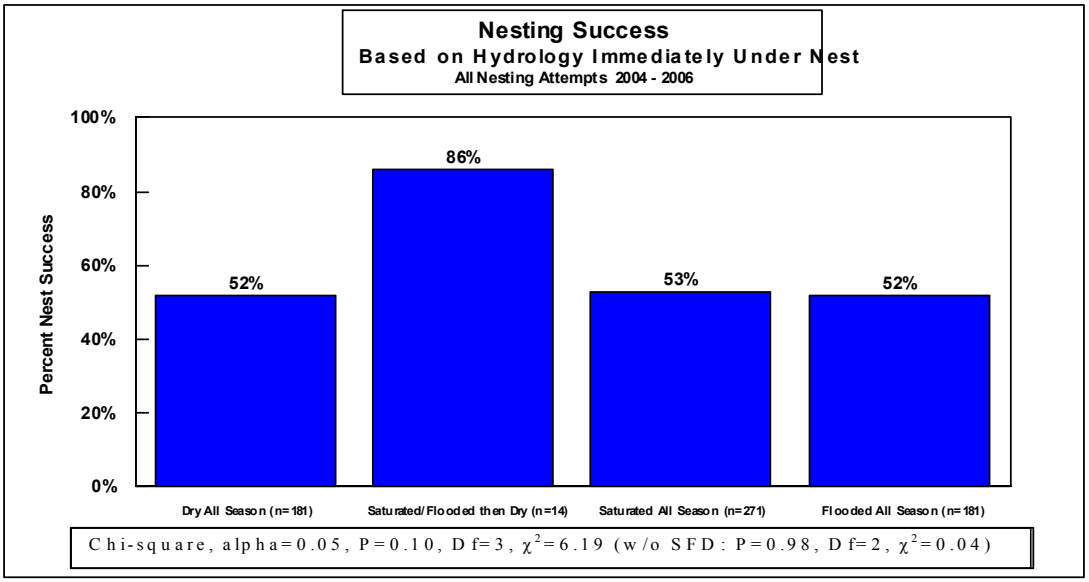
SWFL Nest Monitoring Data Summary
1999-2006

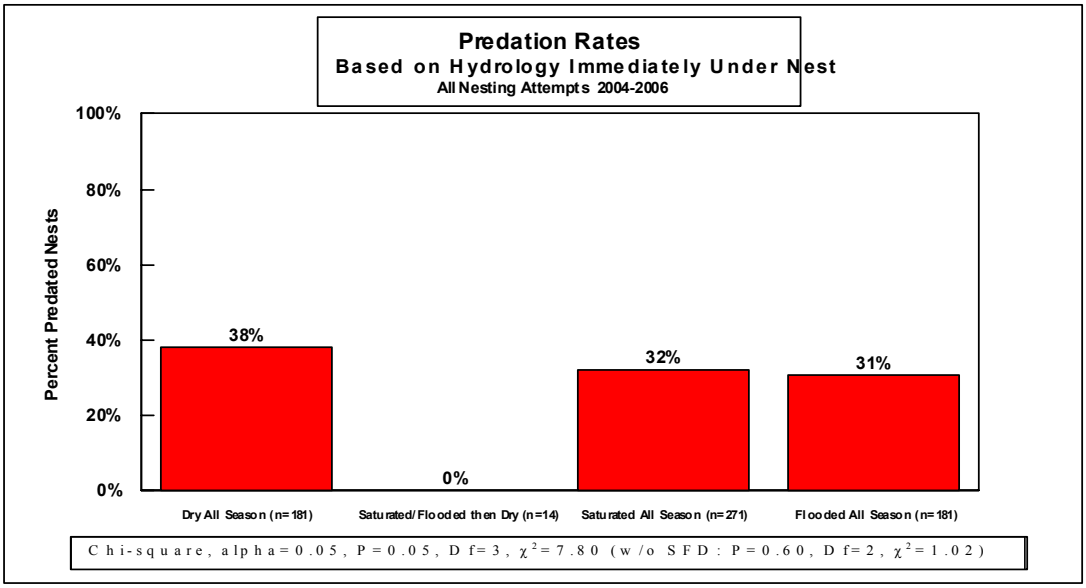


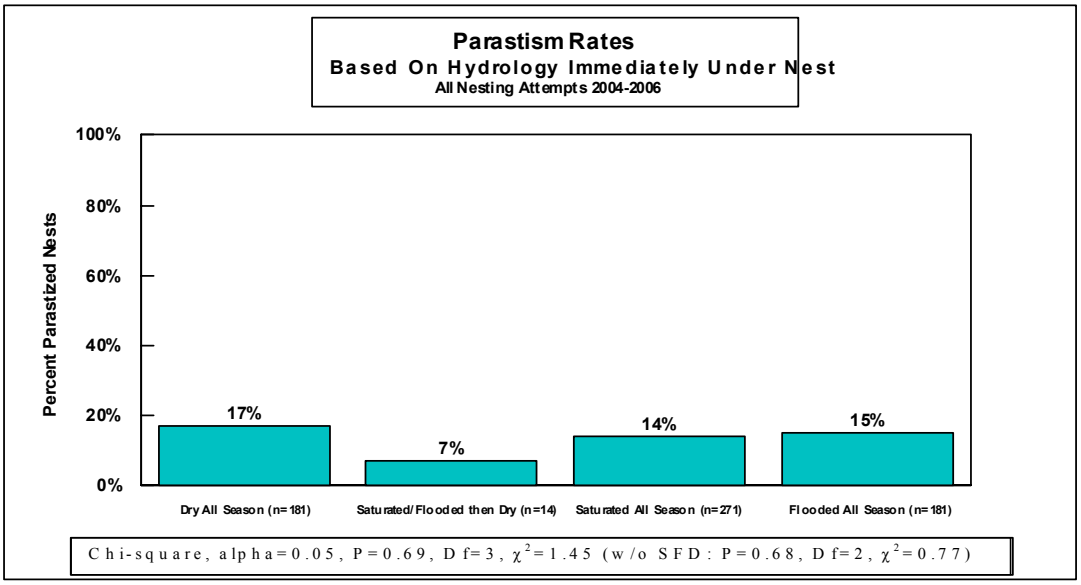
Year	1999	2000	2001	2002	2003	2004	2005	2006
Number of Nests	8	21	44	80	108	174	130	162
Parasitism	13%	15%	9%	15%	17%	19%	13%	12%
Predation	0%	5%	14%	28%	28%	33%	31%	33%
Abandonment	13%	10%	7%	6%	13%	9%	8%	7%
Nest Success	75%	71%	75%	55%	50%	49%	55%	57%

SWFL Nest Monitoring Data Summary
1999-2006




Nesting Success
Based on Hydrology Immediately Under Nest
All Nesting Attempts 2004 - 2006
Percent Nest Success
100%
80%
60%
40%
20%
0%
52%
86%
53%
52%
Dry All Season (n=181)
Saturated/Flooded then Dry (n=14)
Saturated All Season (n=271)
Flooded All Season (n=181)
Chi-square, alpha=0.05, P=0.10, Df=3, χ^2=6.19 (w/o SFD: P=0.98, Df=2, χ^2=0.04)


Predation Rates
Based on Hydrology Immediately Under Nest
All Nesting Attempts 2004-2006
Percent Predated Nests
100%
80%
60%
40%
20%
0%
38%
0%
32%
31%
Dry All Season (n=181)
Saturated/Flooded then Dry (n=14)
Saturated All Season (n=271)
Flooded All Season (n=181)
Chi-square, alpha=0.05, P=0.05, Df=3, χ^2=7.80 (w/o SFD: P=0.60, Df=2, χ^2=1.02)


Parastism Rates
Based On Hydrology Immediately Under Nest
All Nesting Attempts 2004-2006
Percent Parastized Nests
100%
80%
60%
40%
20%
0%
17%
7%
14%
15%
Dry All Season (n=181)
Saturated/Flooded then Dry (n=14)
Saturated All Season (n=271)
Flooded All Season (n=181)
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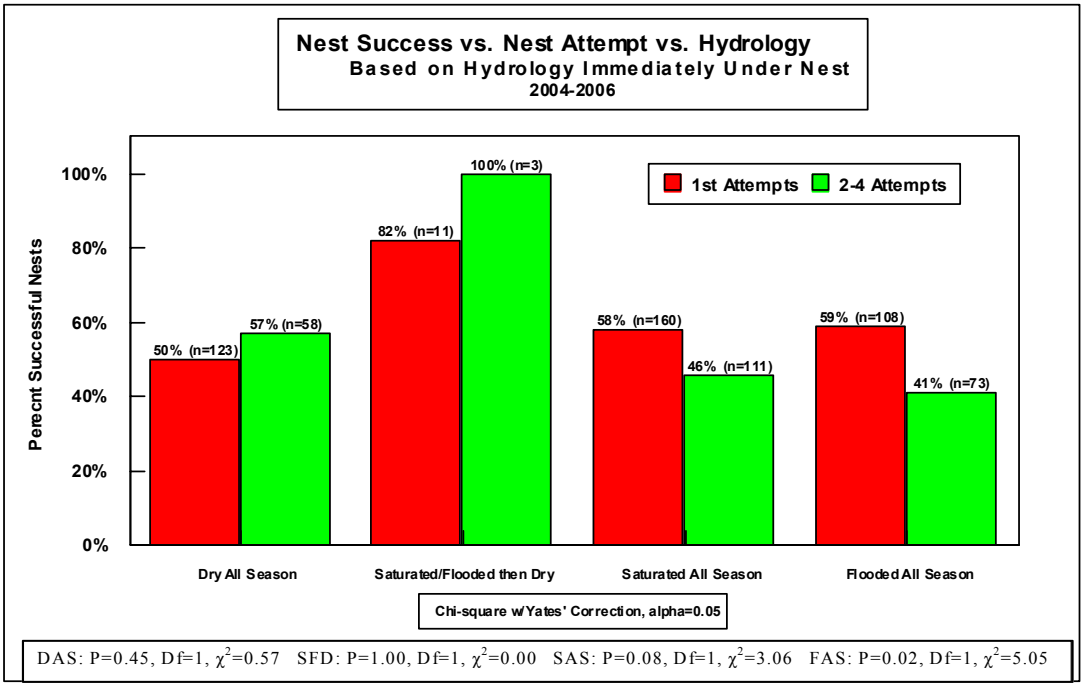
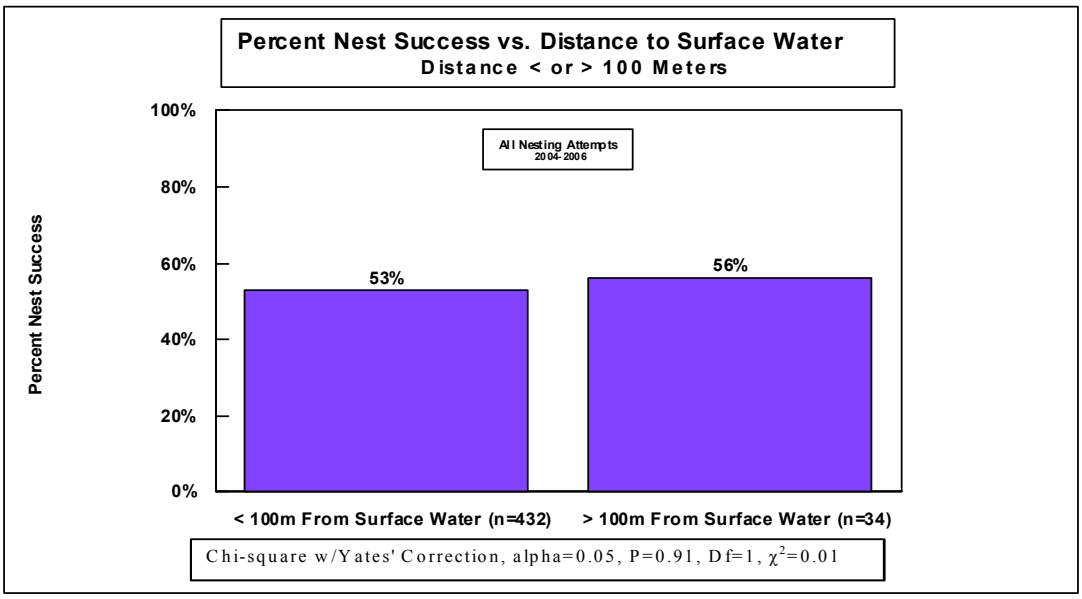
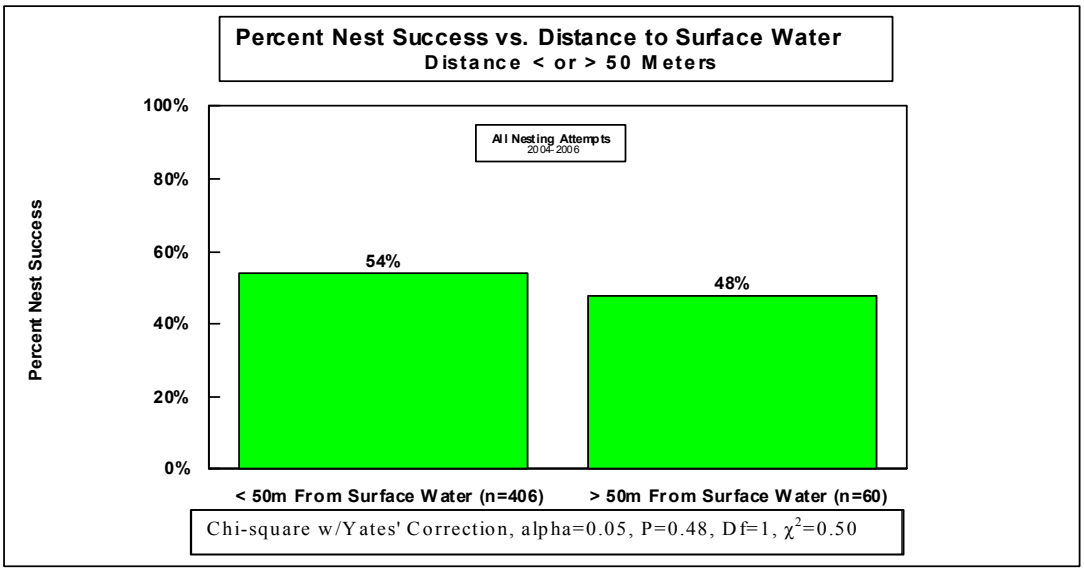
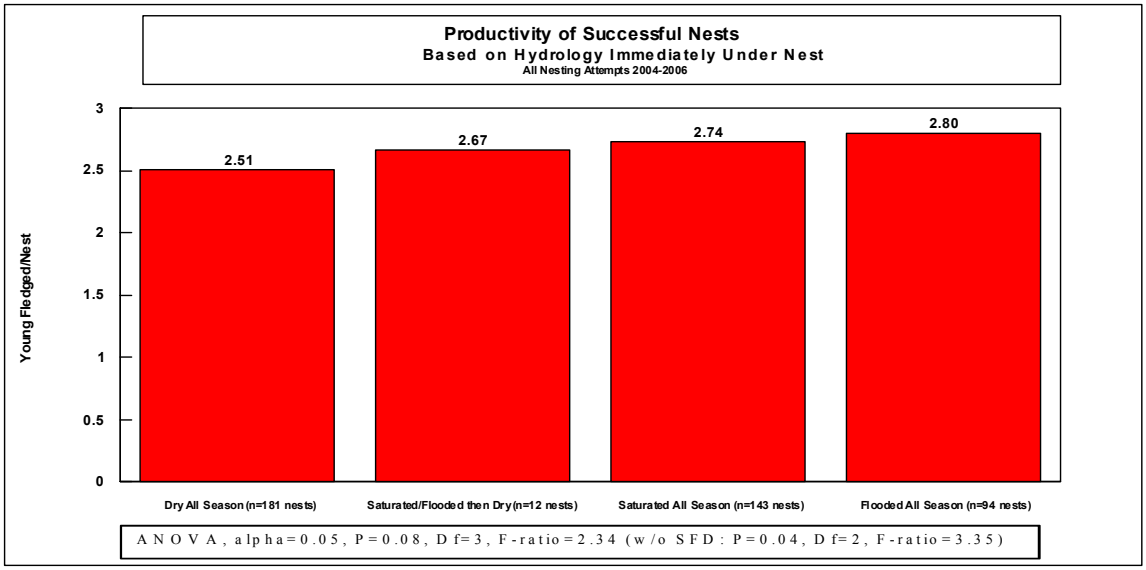
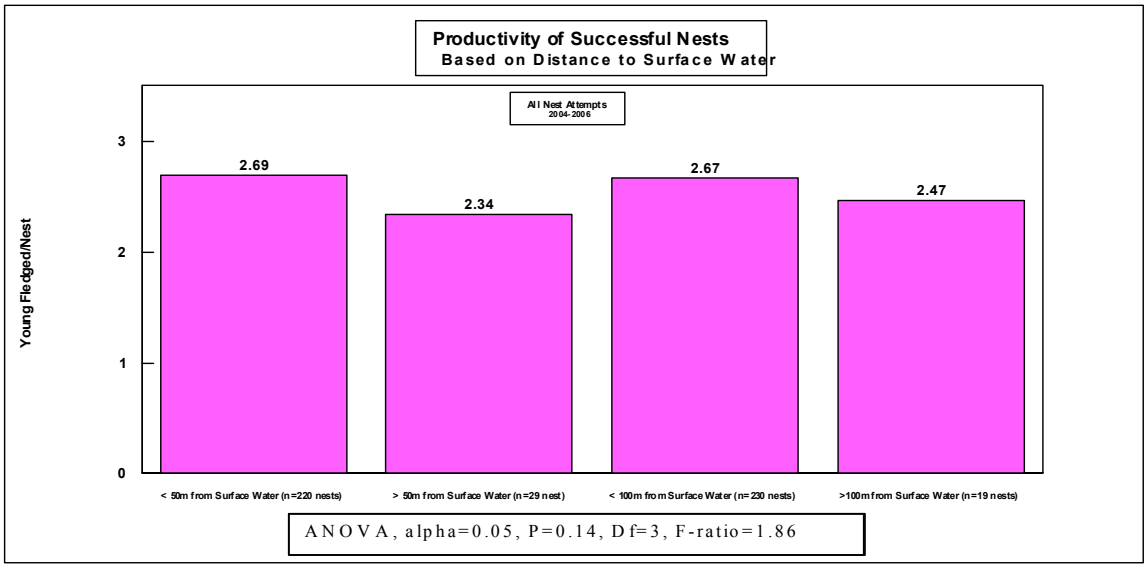
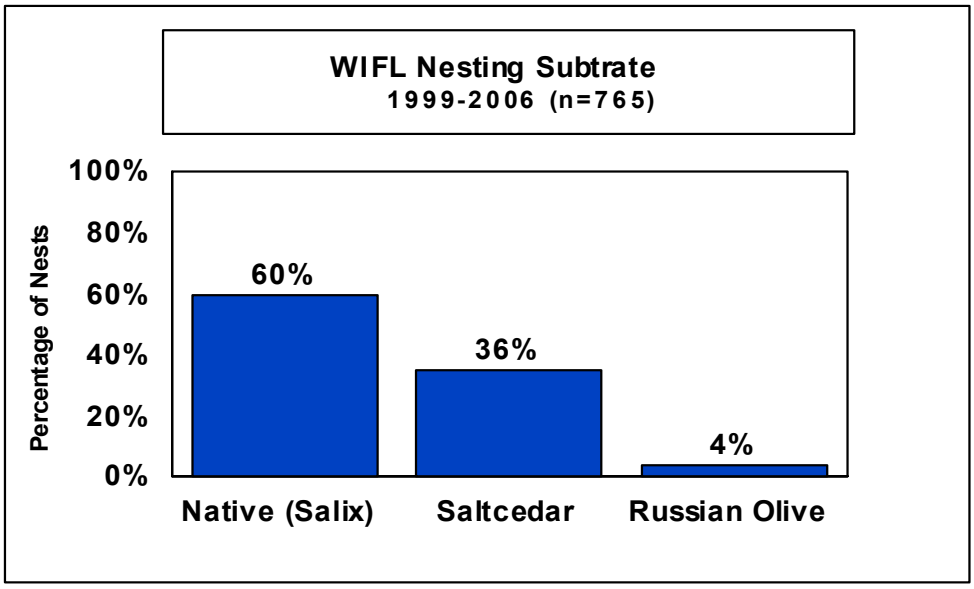

Nest Success vs. Nest Attempt vs. Hydrology
Based on Hydrology Immediately Under Nest
2004-2006
Percnt Successful Nests
100%
80%
60%
40%
20%
0%
1st Attempts
2-4 Attempts
50% (n=123)
57% (n=58)
82% (n=11)
100% (n=3)
58% (n=160)
46% (n=111)
59% (n=108)
41% (n=73)
Dry All Season
Saturated/Flooded then Dry
Saturated All Season
Flooded All Season
Chi-square w/Yates' Correction, alpha=0.05
DAS: P=0.45, Df=1, χ^2=0.57 SFD: P=1.00, Df=1, χ^2=0.00 SAS: P=0.08, Df=1, χ^2=3.06 FAS: P=0.02, Df=1, χ^2=5.05

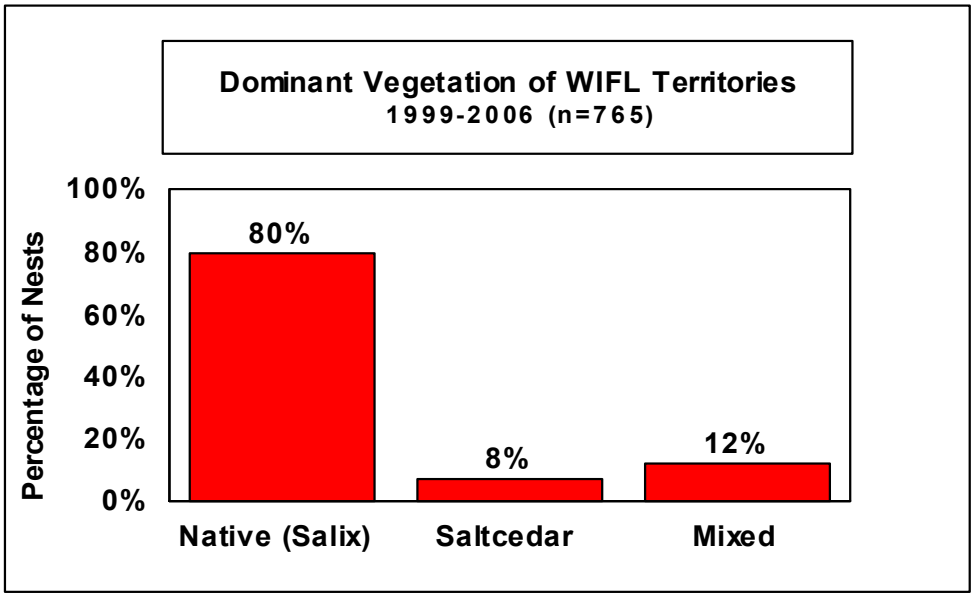

Percent Nest Success vs. Distance to Surface Water
Distance < or > 100 Meters
All Nesting Attempts
2004-2006
Percent Nest Success
100%
80%
60%
40%
20%
0%
53%
56%
< 100m From Surface Water (n=432)
> 100m From Surface Water (n=34)
Chi-square w/Yates' Correction, alpha=0.05, P=0.91, Df=1, χ^2=0.01

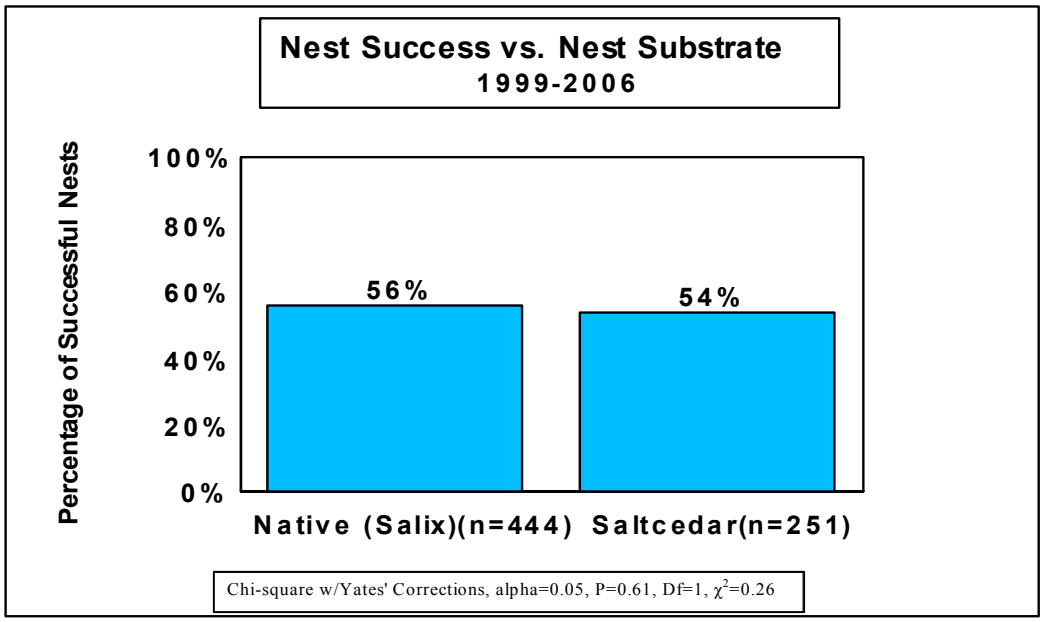

Percent Nest Success vs. Distance to Surface Water
Distance < or > 50 Meters
All Nesting Attempts
2004-2006
Percent Nest Success
100%
80%
60%
40%
20%
0%
54%
48%
< 50m From Surface Water (n=406)
> 50m From Surface Water (n=60)
Chi-square w/Yates' Correction, alpha=0.05, P=0.48, Df=1, χ^2=0.50

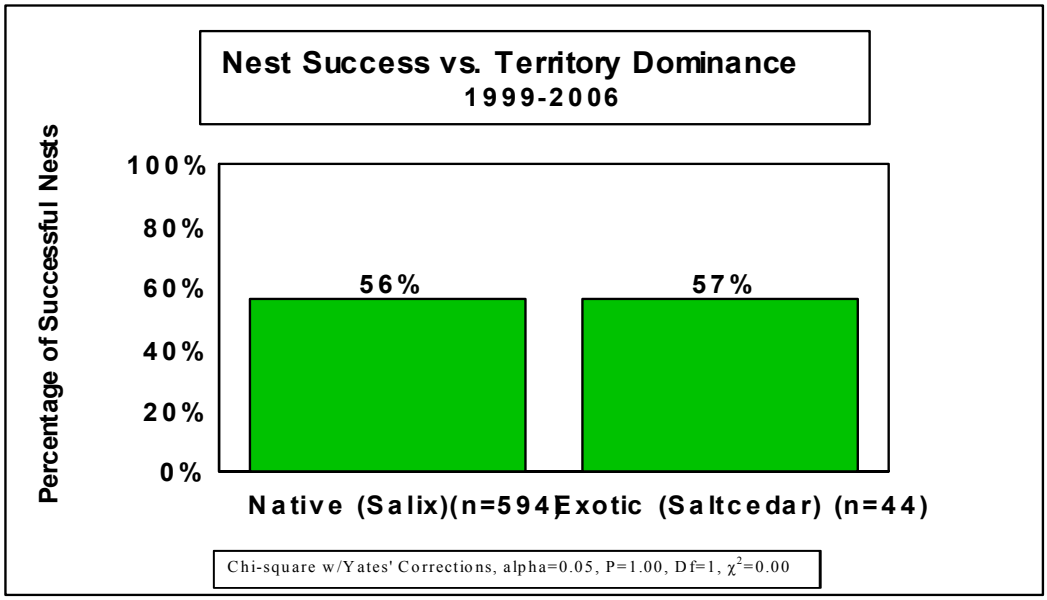

Productivity of Successful Nests
Based on Hydrology Immediately Under Nest
All Nesting Attempts 2004-2006
Young Fledged/Nest
3
2.5
2
1.5
1
0.5
0
2.51
2.67
2.74
2.80
Dry All Season (n=181 nests)
Saturated/Flooded then Dry (n=12 nests)
Saturated All Season (n=143 nests)
Flooded All Season (n=94 nests)
ANOVA, alpha=0.05, P=0.08, Df=3, F-ratio=2.34 (w/o SFD: P=0.04, Df=2, F-ratio=3.35)

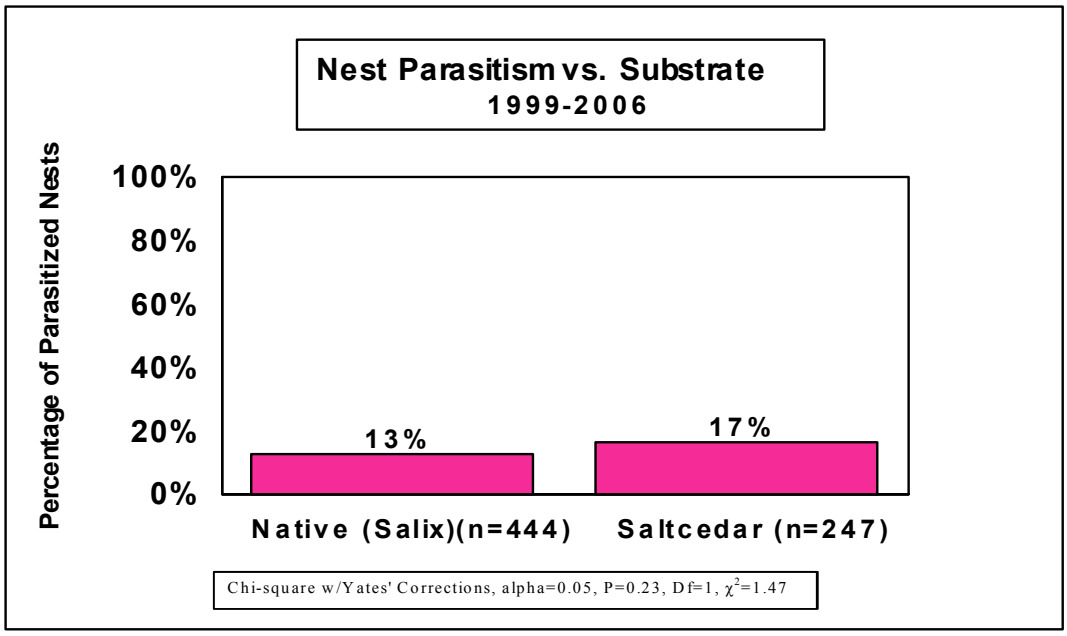

Productivity of Successful Nests
Based on Distance to Surface Water
All Nest Attempts
2004-2006
Young Fledged/Nest
3
2
1
0
2.69
2.34
2.67
2.47
< 50m from Surface Water (n=220 nests)
> 50m from Surface Water (n=29 nest)
< 100m from Surface Water (n=230 nests)
>100m from Surface Water (n=19 nests)
ANOVA, alpha=0.05, P=0.14, Df=3, F-ratio=1.86

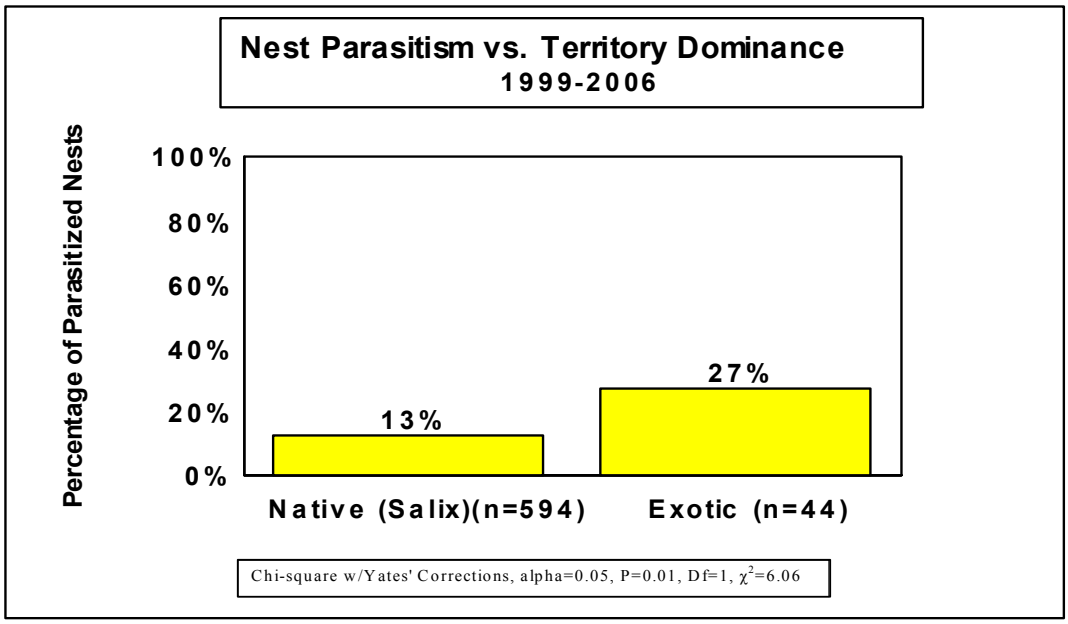

WIFL Nesting Subtrate
1999-2006 (n=765)
Percentage of Nests
100%
80%
60%
40%
20%
0%
60%
36%
4%
Native (Salix)
Saltcedar
Russian Olive


Dominant Vegetation of WIFL Territories
1999-2006 (n=765)
Percentage of Nests
100%
80%
60%
40%
20%
0%
80%
8%
12%
Native (Salix)
Saltcedar
Mixed


Nest Success vs. Nest Substrate
1999-2006
Percentage of Successful Nests
100%
80%
60%
40%
20%
0%
56%
54%
Native (Salix)(n=444)
Saltcedar(n=251)
Chi-square w/Yates' Corrections, alpha=0.05, P=0.61, Df=1, χ^2=0.26


Nest Success vs. Territory Dominance
1999-2006
Percentage of Successful Nests
100%
80%
60%
40%
20%
0%
56%
57%
Native (Salix)(n=594)
Exotic (Saltcedar) (n=44)
Chi-square w/Yates' Corrections, alpha=0.05, P=1.00, Df=1, χ^2=0.00

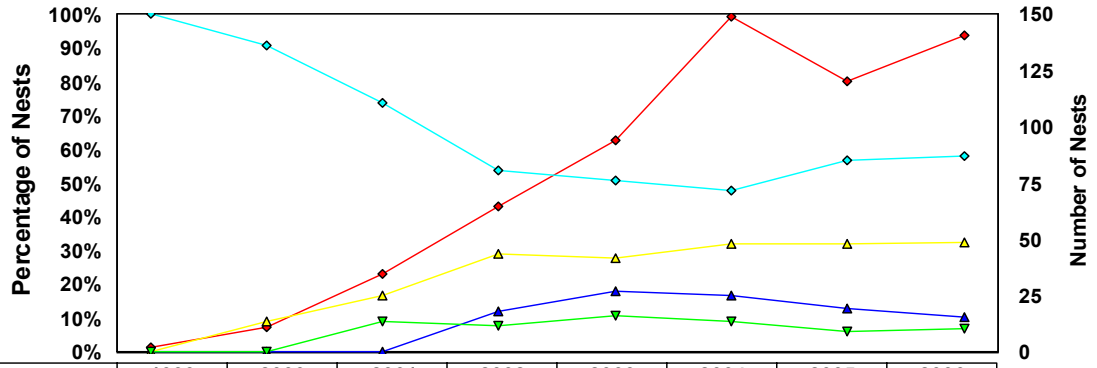

Nest Parasitism vs. Substrate
1999-2006
Percentage of Parasitized Nests
100%
80%
60%
40%
20%
0%
13%
17%
Native (Salix)(n=444)
Saltcedar (n=247)
Chi-square w/Yates' Corrections, alpha=0.05, P=0.23, Df=1, χ^2=1.47


Nest Parasitism vs. Territory Dominance
1999-2006
Percentage of Parasitized Nests
100%
80%
60%
40%
20%
0%
13%
27%
Native (Salix)(n=594)
Exotic (n=44)
Chi-square w/Yates' Corrections, alpha=0.05, P=0.01, Df=1, χ^2=6.06

SWFL Nest Monitoring Data Summary

Elephant Butte Reservoir Pool

Known Nest Outcomes 1999-2006

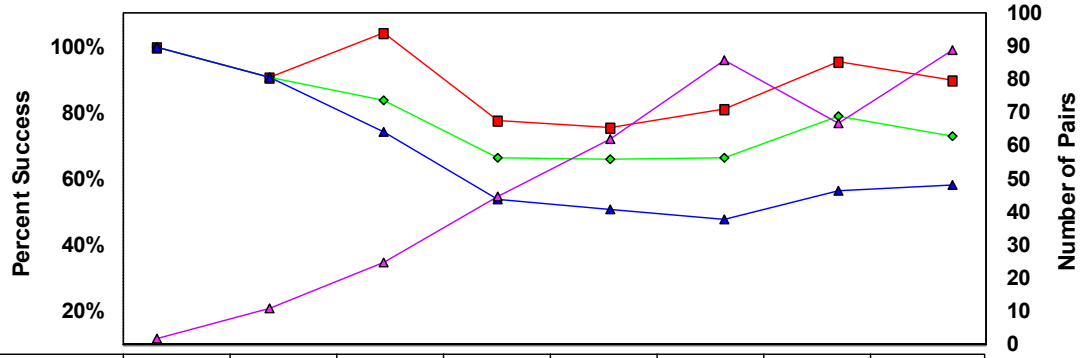


	1999	2000	2001	2002	2003	2004	2005	2006
Number of Nests	2	11	35	65	94	149	120	141
Parasitism	0%	0%	0%	12%	18%	17%	13%	11%
Predation	0%	9%	17%	29%	28%	32%	32%	33%
Abandonment	0%	0%	9%	8%	11%	9%	6%	7%
Nest Success	100%	91%	74%	54%	51%	48%	57%	58%

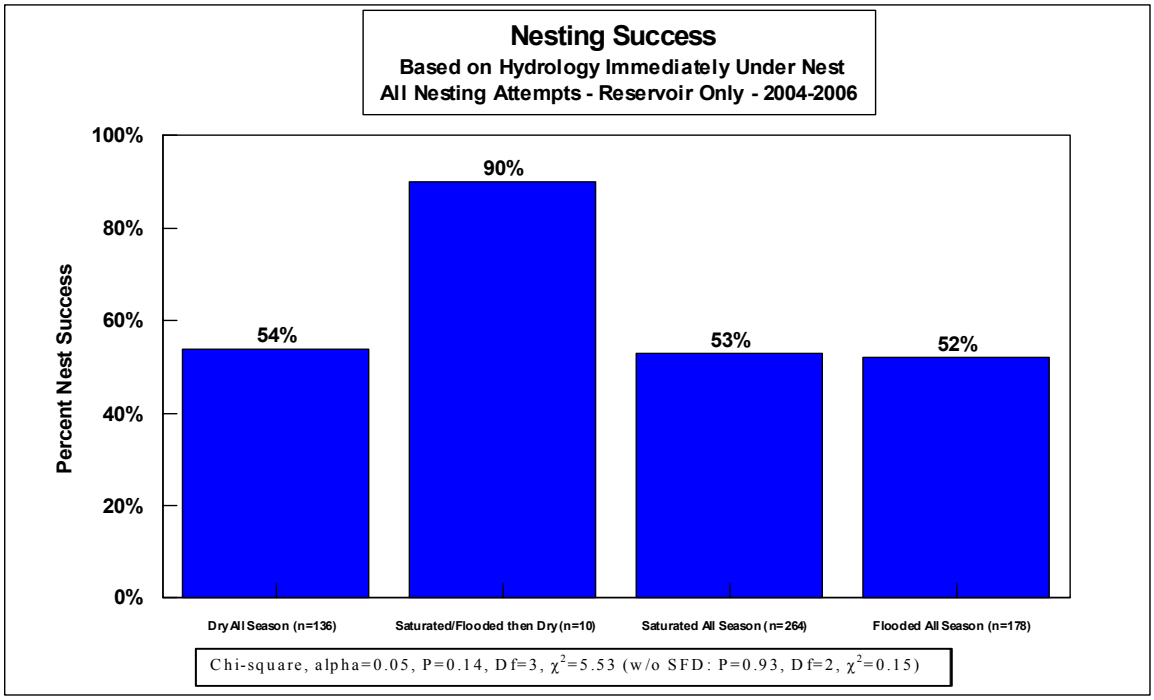
Nest Success vs. Pair Success

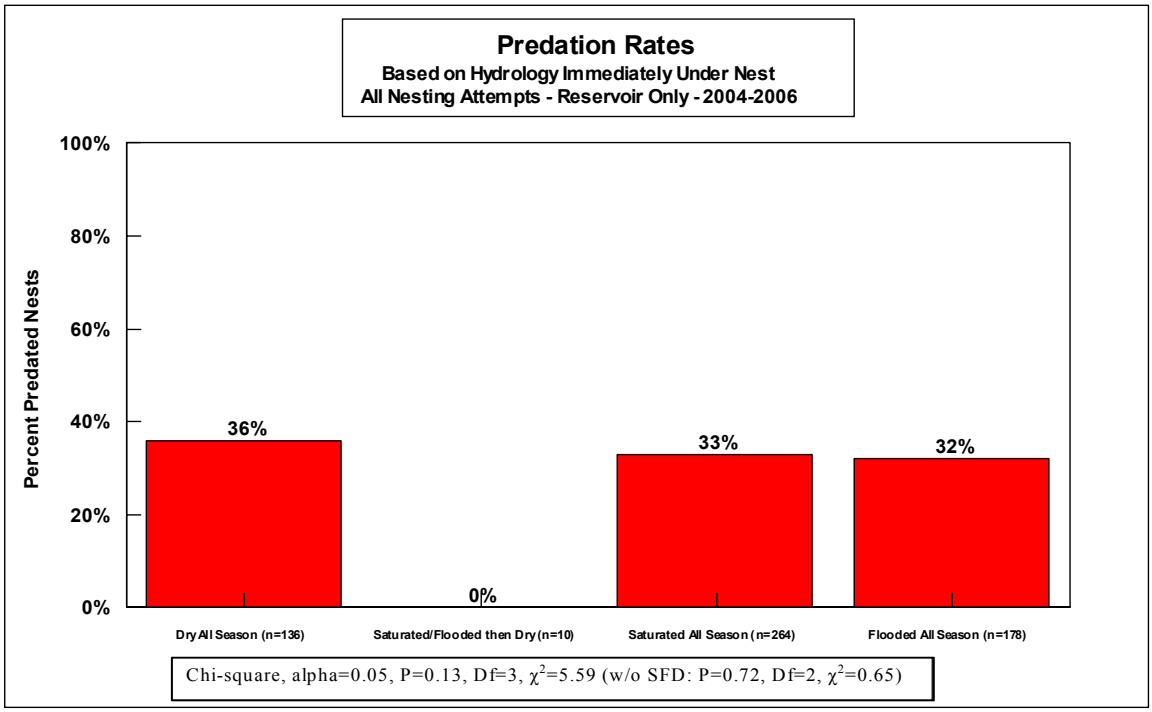
Elephant Butte Reservoir Pool

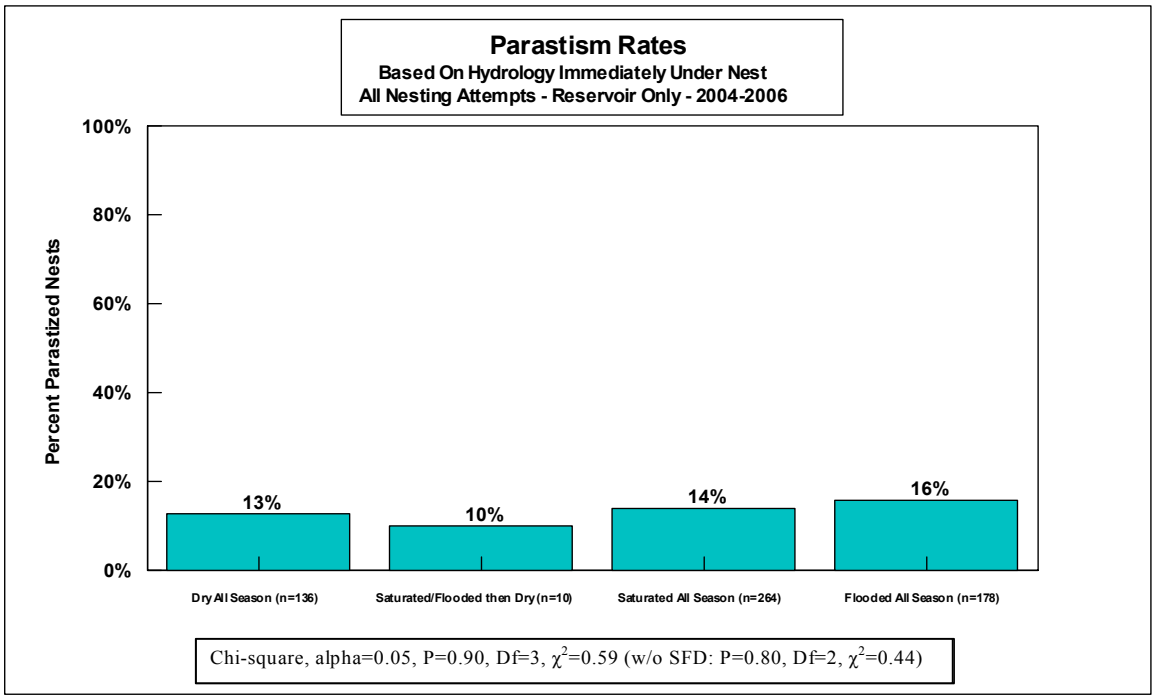
1999-2006

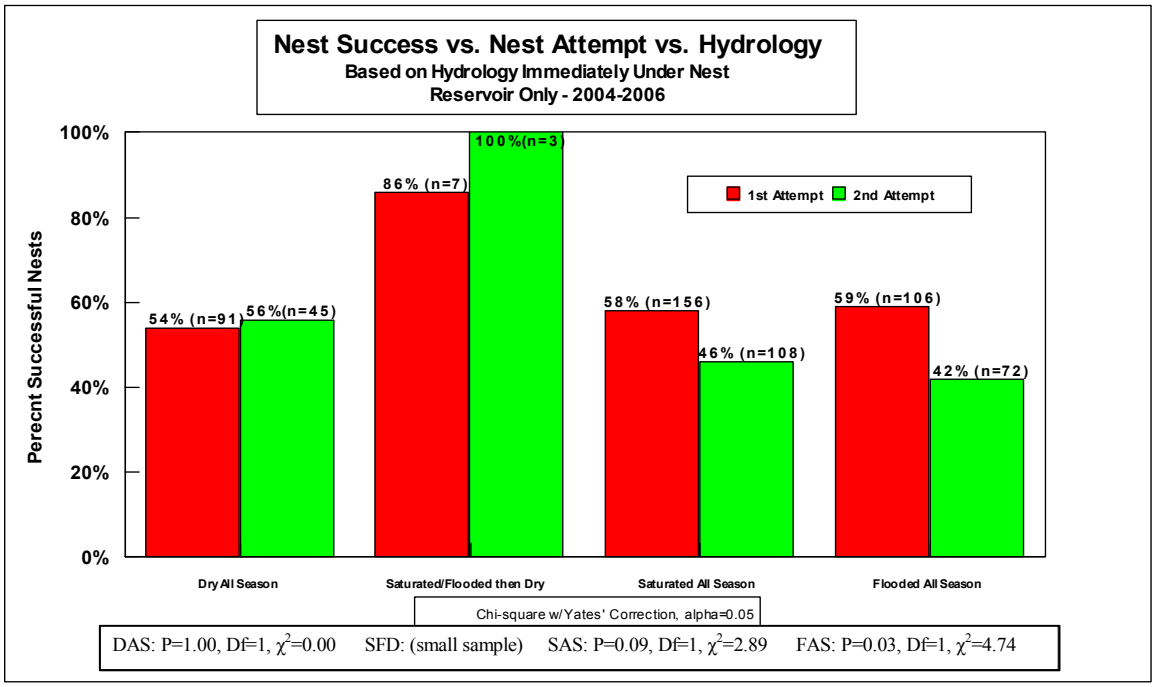


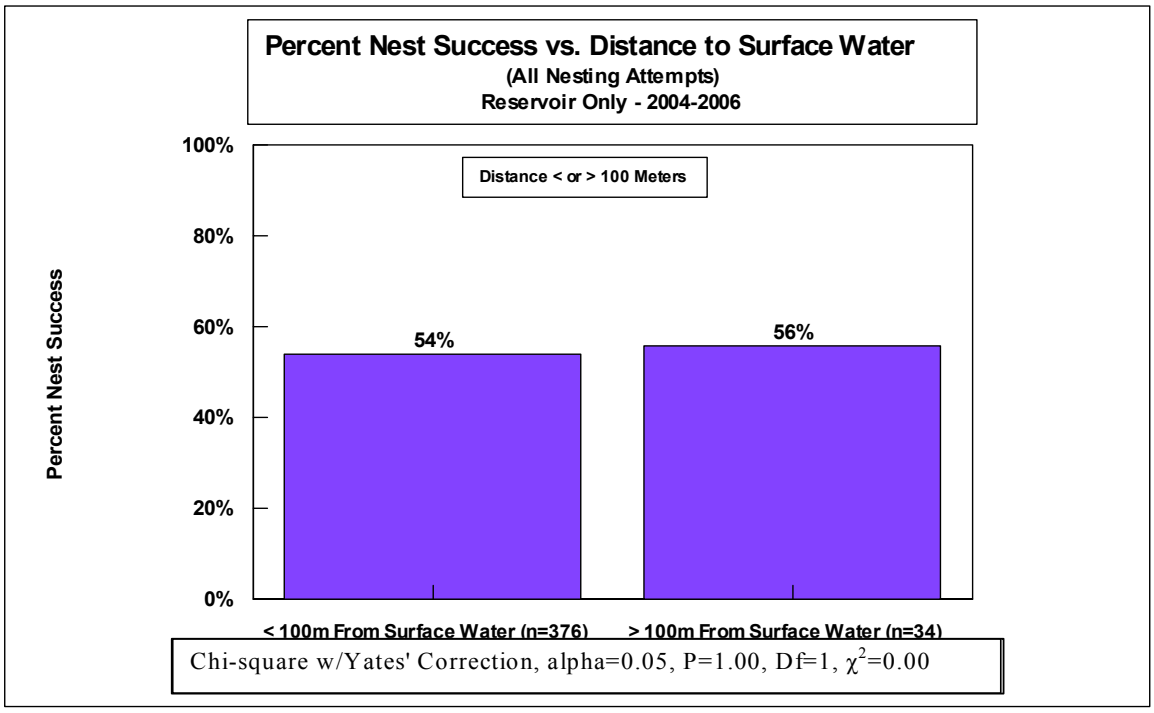
	1999	2000	2001	2002	2003	2004	2005	2006
Pr Success (Pop)	100%	91%	104%	78%	76%	81%	96%	90%
Pr Success (Ind)	100%	91%	84%	67%	66%	66%	79%	73%
Nest Success	100%	91%	74%	54%	51%	48%	57%	58%
Number of Pairs	2	11	25	45	62	86	67	89

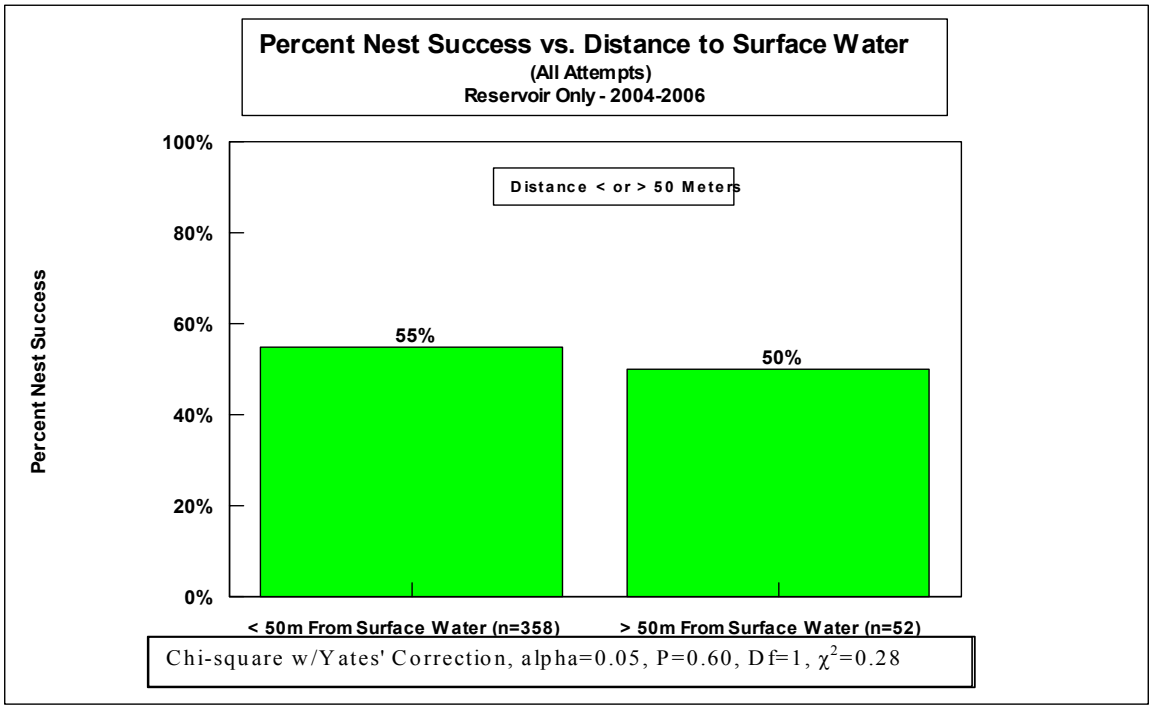

Nesting Success
Based on Hydrology Immediately Under Nest
All Nesting Attempts - Reservoir Only - 2004-2006
Percent Nest Success
100%
80%
60%
40%
20%
0%
54%
90%
53%
52%
Dry All Season (n=136)
Saturated/Flooded then Dry (n=10)
Saturated All Season (n=264)
Flooded All Season (n=178)
Chi-square, alpha=0.05, P=0.14, Df=3, χ^2=5.53 (w/o SFD: P=0.93, Df=2, χ^2=0.15)

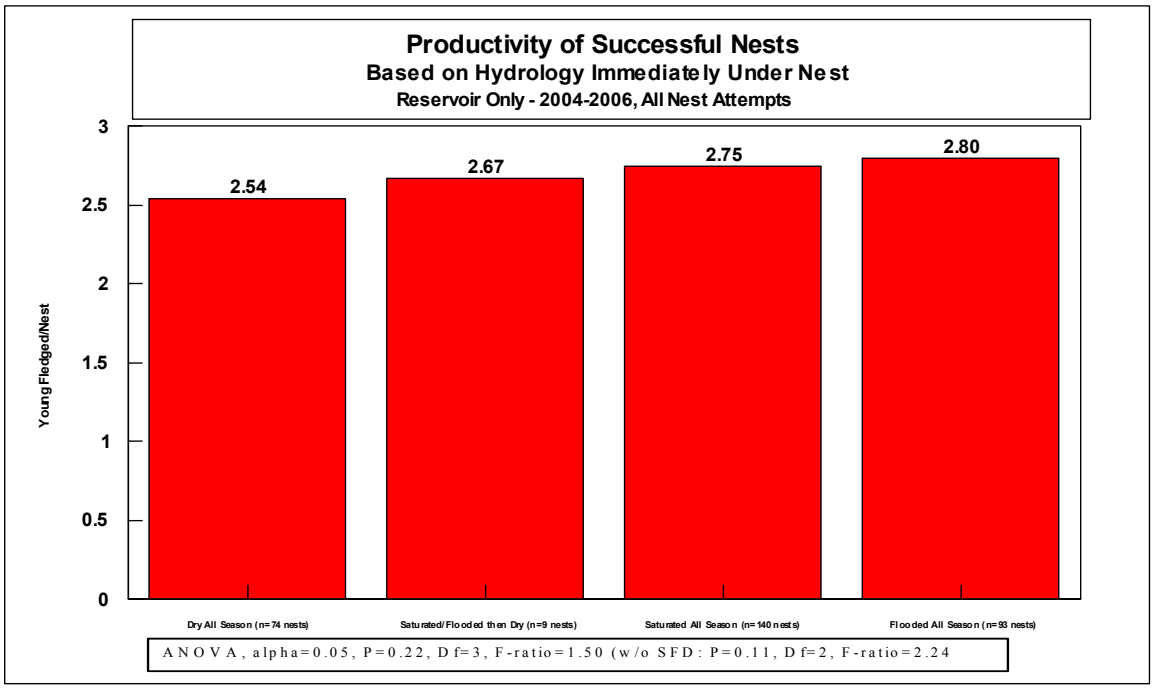

Predation Rates
Based on Hydrology Immediately Under Nest
All Nesting Attempts - Reservoir Only - 2004-2006
Percent Predated Nests
100%
80%
60%
40%
20%
0%
36%
0%
33%
32%
Dry All Season (n=136)
Saturated/Flooded then Dry (n=10)
Saturated All Season (n=264)
Flooded All Season (n=178)
Chi-square, alpha=0.05, P=0.13, Df=3, χ^2=5.59 (w/o SFD: P=0.72, Df=2, χ^2=0.65)

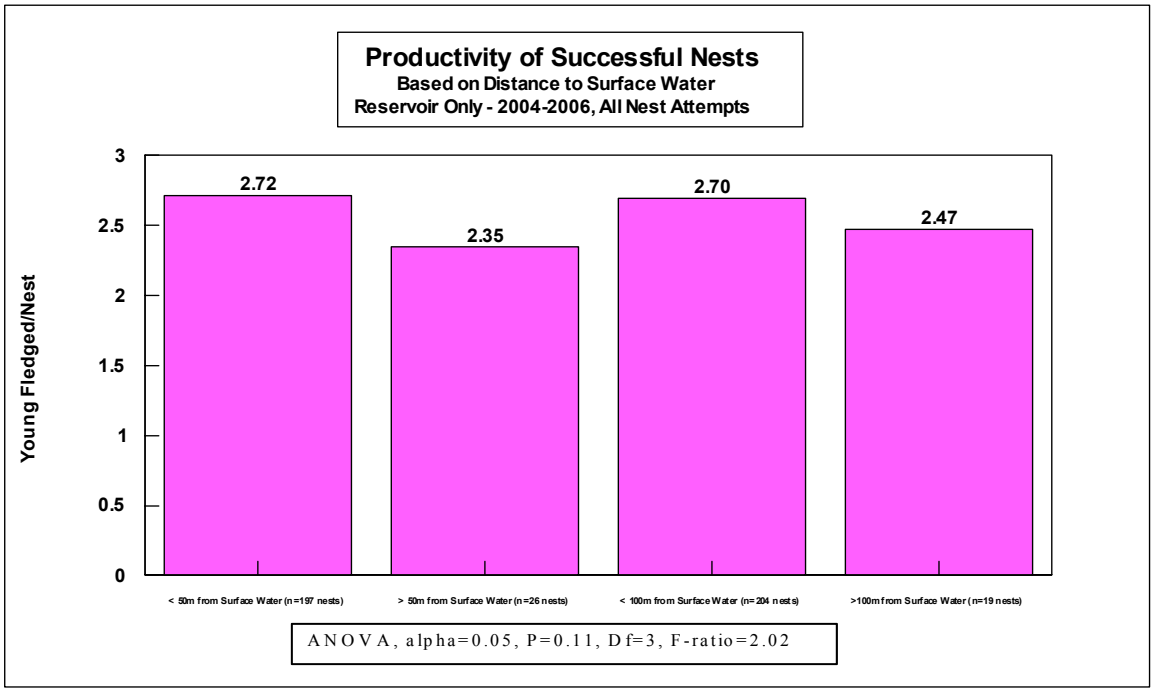

Parastism Rates
Based On Hydrology Immediately Under Nest
All Nesting Attempts - Reservoir Only - 2004-2006
Percent Parastized Nests
100%
80%
60%
40%
20%
0%
13%
10%
14%
16%
Dry All Season (n=136)
Saturated/Flooded then Dry (n=10)
Saturated All Season (n=264)
Flooded All Season (n=178)
Chi-square, alpha=0.05, P=0.90, Df=3, χ^2=0.59 (w/o SFD: P=0.80, Df=2, χ^2=0.44)


Nest Success vs. Nest Attempt vs. Hydrology
Based on Hydrology Immediately Under Nest
Reservoir Only - 2004-2006
Perecnt Successful Nests
100%
80%
60%
40%
20%
0%
1st Attempt
2nd Attempt
54% (n=91)
56%(n=45)
86% (n=7)
100%(n=3)
58% (n=156)
46% (n=108)
59% (n=106)
42% (n=72)
Dry All Season
Saturated/Flooded then Dry
Saturated All Season
Flooded All Season
Chi-square w/Yates' Correction, alpha=0.05
DAS: P=1.00, Df=1, χ^2=0.00 SFD: (small sample) SAS: P=0.09, Df=1, χ^2=2.89 FAS: P=0.03, Df=1, χ^2=4.74


Percent Nest Success vs. Distance to Surface Water
(All Nesting Attempts)
Reservoir Only - 2004-2006
Distance < or > 100 Meters
Percent Nest Success
100%
80%
60%
40%
20%
0%
54%
56%
< 100m From Surface Water (n=376)
> 100m From Surface Water (n=34)
Chi-square w/Yates' Correction, alpha=0.05, P=1.00, Df=1, χ^2=0.00


Percent Nest Success vs. Distance to Surface Water
(All Attempts)
Reservoir Only - 2004-2006
Distance < or > 50 Meters
Percent Nest Success
100%
80%
60%
40%
20%
0%
55%
50%
< 50m From Surface Water (n=358)
> 50m From Surface Water (n=52)
Chi-square w/Yates' Correction, alpha=0.05, P=0.60, Df=1, χ^2=0.28


Productivity of Successful Nests
Based on Hydrology Immediately Under Nest
Reservoir Only - 2004-2006, All Nest Attempts
Young Fledged/Nest
3
2.5
2
1.5
1
0.5
0
2.54
2.67
2.75
2.80
Dry All Season (n=74 nests)
Saturated/Flooded then Dry (n=9 nests)
Saturated All Season (n=140 nests)
Flooded All Season (n=93 nests)
ANOVA, alpha=0.05, P=0.22, Df=3, F-ratio=1.50 (w/o SFD: P=0.11, Df=2, F-ratio=2.24


Productivity of Successful Nests
Based on Distance to Surface Water
Reservoir Only - 2004-2006, All Nest Attempts
Young Fledged/Nest
3
2.5
2
1.5
1
0.5
0
2.72
2.35
2.70
2.47
< 50m from Surface Water (n=197 nests)
> 50m from Surface Water (n=26 nests)
< 100m from Surface Water (n=204 nests)
>100m from Surface Water (n=19 nests)
ANOVA, alpha=0.05, P=0.11, Df=3, F-ratio=2.02