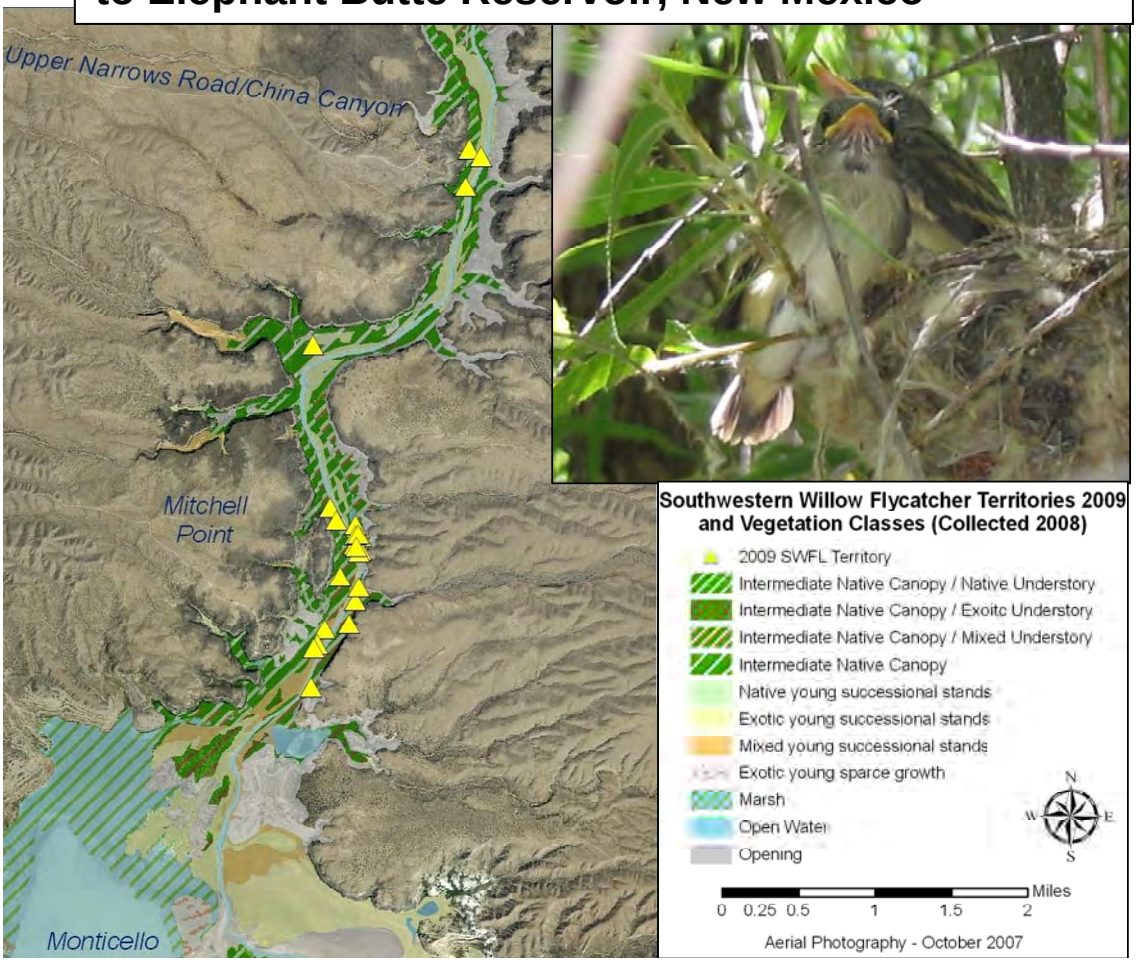
RECLAMATION

Managing Water in the West

2009 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
Technical Service Center
Fisheries and Wildlife Resources Group
Denver, Colorado

May 2010

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.

2009 Southwestern Willow Flycatcher Study Results

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 2009, the Bureau of Reclamation (Reclamation) conducted surveys and nest monitoring of the federally endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*; SWFL) in nine distinct reaches along approximately 200 kilometers of the Rio Grande in New Mexico between Velarde and Elephant Butte Reservoir. Surveys were performed to contribute to current baseline population data, monitor population trends, and determine the current distribution of SWFLs along the Middle Rio Grande and also to meet Reclamation's Endangered Species Act (ESA) compliance commitments. There were 629 resident SWFLs documented in 367 territories and forming 262 breeding pairs. As in previous years, the San Marcial reach of the river was by far the most productive containing 319 territories and 224 pairs.

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 294 nests and fledging 352 SWFL young. The Bosque del Apache reach was a distant second; 16 pairs within this reach produced 19 nests and fledged 28 SWFLs. Overall, nest success decreased slightly, while parasitism, predation and abandonment were similar to the past several years.

Other studies were initiated or continued in 2009. These include: (1) SWFL nesting hydrology study and (2) vegetation/habitat mapping. These studies are designed to provide further insight into potential threats to and habitat requirements of SWFL populations.

Survey Results

Endangered Species Collaborative Program Funded Survey	
Reach	**SWFL Territories**
Frijoles Canyon	1
Belen	3
Sevilleta NWR/La Joya SWA	18
San Acacia	1
Escondida	0
Bosque del Apache NWR	20
Tiffany	5
Reclamation Funded Survey	
Reach	**SWFL Territories**
Velarde	0
San Marcial	319

Recommendations

1. Continue annual surveying and nest monitoring within occupied and “critical habitat” reaches to determine reproduction, nest success, recruitment, distribution, and population trends of SWFLs within the 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 of the Upper and Middle Rio Grande 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 typically arrive at their Middle Rio Grande breeding sites by mid-May (the earliest detection in the Middle Rio Grande is May 6) and continue to arrive through early June. They depart for wintering areas in Mexico, Central America, and northern South America between late July and mid-August (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, the 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 conservation 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 portions of the San Marcial reach under a contract with the U.S. Army Corps of Engineers.

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

The 2009 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 14 and July 28, 2009. Nest searches and nest monitoring of SWFL nests were conducted in conjunction with survey efforts by USFWS-permitted biologists.

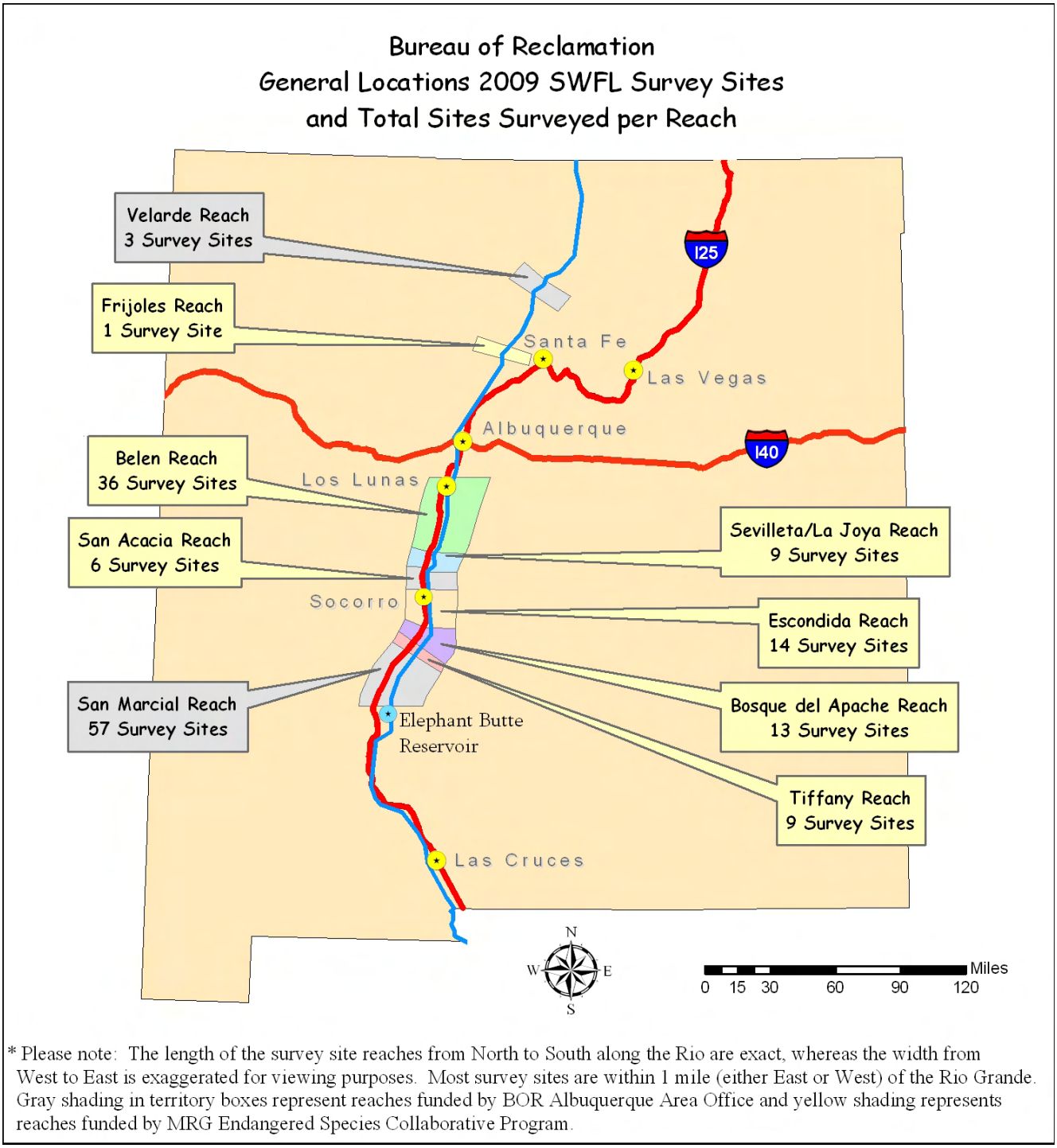


Figure 2. General locations of 2009 survey sites.

Goals and Objectives

Primary goals of the field studies performed in 2009 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 ESA compliance in specific action areas with five surveys.
- Monitor SWFL nests to determine productivity, parasitism and predation rates, population recruitment, and identify limiting factors.
- Determine relationships between SWFL nesting and hydrologic parameters.
- Assess habitat availability and utilization by breeding SWFLs.

Related Studies

In addition to the presence/absence surveys and nest monitoring conducted in 2009, the following related studies were either previously conducted or continued in 2009:

- Modified BBIRD Study (1999-2004) – An avian nest monitoring study, using a modified version of the Breeding Biology Research and Monitoring Database (BBIRD) protocol (Martin et al. 1997) was conducted. Potential BHCO host nests were monitored to determine the effectiveness of the 1997 through 2001 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 no increase in nest success was observed. 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 (1999 – 2008) - Point counts were conducted 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 conducted between 1997 and 2001. Point count data from 1999 to 2008 have shown a dramatic decline in BHCOs per point in the Sevilleta and Bosque del Apache reaches. BHCO abundance has increased within the San Marcial reach and declined slightly in the San Acacia reach. Similarly, host species abundance has increased markedly in the San Marcial reach while decreasing slightly in the other three reaches. Higher quality habitat in the San Marcial reach was likely attracting riparian-obligate host species which, in turn, may have attracted greater numbers of BHCOs. Methods and results

of this study can also be found as a component of *Riparian Obligate Nesting Success as Related to Cowbird Abundance and Vegetation Characteristics Along the Middle Rio Grande, New Mexico* (Moore 2006).

- Livestock Grazing Study (1997 – 2008) - A 12-year study to monitor and evaluate the impacts of livestock grazing on the establishment and development of riparian vegetation was concluded in 2008. 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 were collected biennially and processed. Results of this study are presented in *A Long-Term Assessment of Livestock Impacts on Riparian Vegetation: Elephant Butte Project Lands* (Ahlers et al. 2009).

- SWFL Habitat Suitability Modeling (1998 – Present) - Development of a SWFL habitat suitability model for GIS (geographic information systems) 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 Highway 60 and Elephant Butte Reservoir was classified using the Hink and Ohmart (1984) classification system. 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 Middle Rio Grande (MRG) Endangered Species 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.

  Most recently, aerial photographs were again taken during the summer and fall of 2007 and ground truthing was conducted during summer 2008. These data have been processed and are presented in *Southwestern Willow Flycatcher Habitat Suitability 2008: Highway 60 Downstream to Elephant Butte Reservoir, NM* (Ahlers et al. 2010).

- SWFL Nest Site Quantification (2004 – 2007) - 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 was used to increase overall knowledge of the nesting and general habitat requirements of the species. The resulting analysis of these data will help to provide guidelines for riparian restoration projects targeted for SWFL habitat. See *Vegetation Quantification of Southwestern Willow Flycatcher Nest Sites* (Moore 2007) for details of this study. In 2007, data were gathered at 11 non-nest sites within maturing habitat in both the delta of Elephant Butte Reservoir and adjacent to the Los Lunas Restoration Site. These data were compared to nest data to assess the suitability of these areas for nesting SWFLs. Results of this study are available in *An Assessment of Potential Southwestern Willow Flycatcher Habitat* (Moore 2009).

- Elephant Butte Photo Log (2005 – Present) In 2005, photostations were established adjacent to developing habitat in the delta of Elephant Butte Reservoir. Permanent photopoints are visited annually in August and photos are taken at predetermined bearings to document changes in riparian vegetation. Year-to-year comparisons of photos have documented considerable vegetation growth and development. Results of this study can be found in *Elephant Butte Reservoir Delta Photostations – 2005-2009* (Ahlers 2010).

- SWFL Hydrology Study (2004 – Present) - A hydrology monitoring study was initiated in 2004 to monitor the relationship of hydrology, habitat and breeding SWFLs. Nineteen "hydrostations" were placed in the high quality occupied habitat within the delta of Elephant Butte Reservoir and were monitored weekly during the SWFL breeding season. During the past several years, as habitat developed or degraded, several hydrostations were either added or moved to capture the hydrology within newly occupied habitat. This study is further explained and data are presented in the following sections

Methods

Study Area

Survey sites were selected based on environmental compliance needs related to Reclamation projects and a desire to monitor SWFL population trends within the Middle Rio Grande Basin. Sites consist of riparian habitat bounded by waterbodies, levees, or other physical features that are typically surveyed by one person in one day. The 2009 survey area encompassed selected sites along the Rio Grande in New Mexico between Velarde and Elephant Butte Reservoir. This stretch contained nine distinct survey reaches: Velarde, Frijoles Canyon, Belen, Sevilleta/La Joya, San Acacia, Escondida, Bosque del Apache, Tiffany, and San Marcial. Survey efforts varied among reaches and sites based on research needs, project compliance, and effort needed to ensure thorough coverage. Table 1 shows a summary of the survey effort within each reach.

Presence/Absence Surveys

All sites were surveyed using the repeated call-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. A minimum of three surveys were conducted at sites when only general research or study needs were required. A minimum of five surveys were conducted for all project related studies.

Table 1. Number of sites and surveys per reach – Middle Rio Grande 2009.

Survey reach	Total sites surveyed	Number of surveys
Velarde	3	3
Frijoles Canyon	1	3
Belen	36	3; 4 in sites SV-11 through SV-15
Sevilleta/La Joya[(1)]	10	5
San Acacia	6	5
Escondida	14	3
Bosque del Apache	14	3
Tiffany[(2)]	9	3
San Marcial[(3)]	58	5; 3 in sites EB-09 and EB-10 due to excessive flooding
Total	151	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 2009 because the entire site burned in May 2006.
(3) Pre-season reconnaissance in sites EB-15, 16 and 17 determined that habitat in these sites was unsuitable for breeding SWFLs, so no surveys were conducted.

The first survey conducted in late May increases the likelihood of detection, since males are more vocal when establishing territories than after nesting has begun. It was anticipated that migrant WIFLs (Willow Flycatchers that are not the *extimus* subspecies) 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 in project-related sites, were initiated in 2000 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 typically considered resident birds (i.e., SWFLs) for reporting purposes, however several were determined to be late migrants based on their behavior and not included as residents. Each site was surveyed as thoroughly as conditions would allow.

Nest Searches/Monitoring

Nest searches were conducted by a permitted biologist or by a technician under the direct supervision of a permitted biologist upon discovery of a breeding or suspected breeding SWFL pair. 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 as a result of disturbance. Nests with eggs/young were examined quickly using a mirror mounted on a telescopic pole, or a straight branch. Nesting chronology was then estimated following the initial search and examination. Subsequent visits were minimized and timed so at least one inspection would be made of both eggs and nestlings. Data resulting from these inspections 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 one 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 nest fails while a second brood occurs after a nest successfully fledges young. When possible, nests were monitored through completion. However, a few nests were not monitored to completion and had nestlings at least eight to ten days old at the last visit and were considered successful based on best biological opinion.

In 2002, the practice of addling or removing BHCO eggs from parasitized nests was initiated when necessary and possible. This activity was continued in 2009. SWFL eggs were never disturbed and time spent at the nest was minimized. Frequently, based on nesting chronology, it was determined that the BHCO egg did not have a chance to hatch. In these cases nests were monitored normally to minimize disturbance.

Hydrology Monitoring

In conjunction with SWFL nest monitoring, a hydrology monitoring study was implemented in 2004 and continued through 2009. Initially, nineteen "hydrostations" (custom-built staff gauges) were installed in proximity to the "core" SWFL population in the headwaters of Elephant Butte Reservoir (Figures 3 and 4). In 2008, four additional hydrostations (20, 22, 23, and 24) were installed in newly occupied habitat in 2008 and monitoring of two was discontinued due to loss of habitat quality. Hydrostations were placed in locations representative of the overall site's hydrology and were monitored during the SWFL breeding seasons from 2004 through 2009. Water depth was recorded on a weekly basis throughout the breeding season. These data were used to determine the relationship between flows in the Low Flow Conveyance Channel (LFCC) and depth of water within the "core" SWFL breeding areas of the Elephant Butte Reservoir delta. Useable data were gathered from 20 hydrostations in 2009.

During hydrostation data analysis, two different methods were utilized to determine the relationship of LFCC flows (at San Marcial) and water depth at occupied sites. The first method was to average the LFCC flows recorded immediately prior to and after drying of the site was recorded. For example: If surface water at a hydrostation was recorded when surface flows were 100 cfs, and the station was dry upon the next recording at 50 cfs, the average flow at which drying occurred would be approximately 75 cfs. The second method, used for sites that did not dry during data collection, utilized linear regression of water depth and LFCC flows over multiple years of data to estimate at what LFCC flows the site would no longer be flooded. Only regressions with a coefficient of determination (R^2) of ≥ 0.5 were used.

Hydrological data from the 2004 through 2009 breeding seasons were also compared to SWFL nest variables (success, productivity, predation, parasitism, and distance to water) to determine if any relationships exist between hydrology and nesting. For details of this hydrology monitoring study, see *A Review of Vegetation and Hydrologic Parameters Associated with the Southwestern Willow Flycatcher – 2002 to 2008: Elephant Butte Reservoir Delta* (Ahlers 2009).

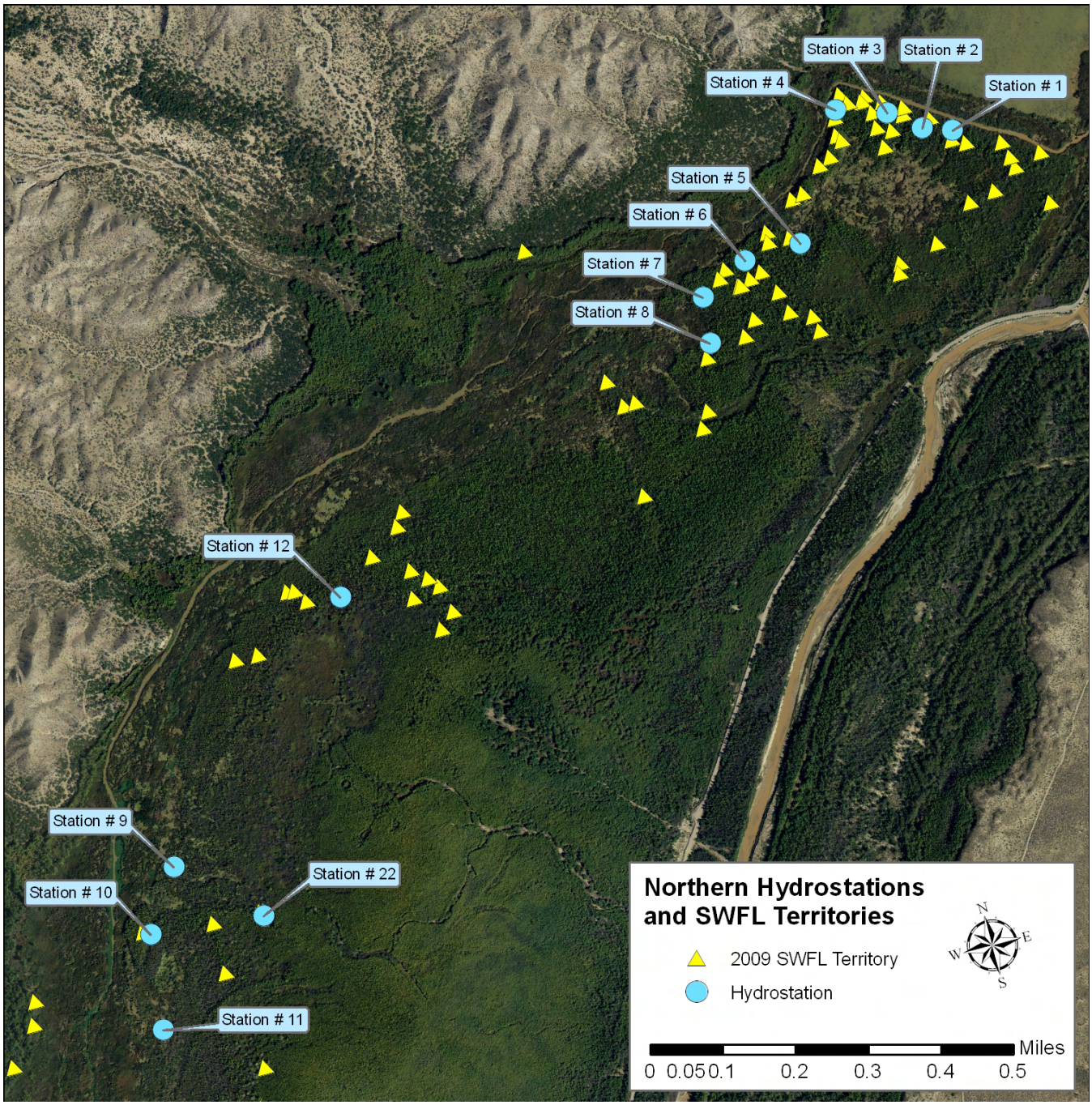


Figure 3. Northern hydrostations and locations of 2009 SWFL territories.

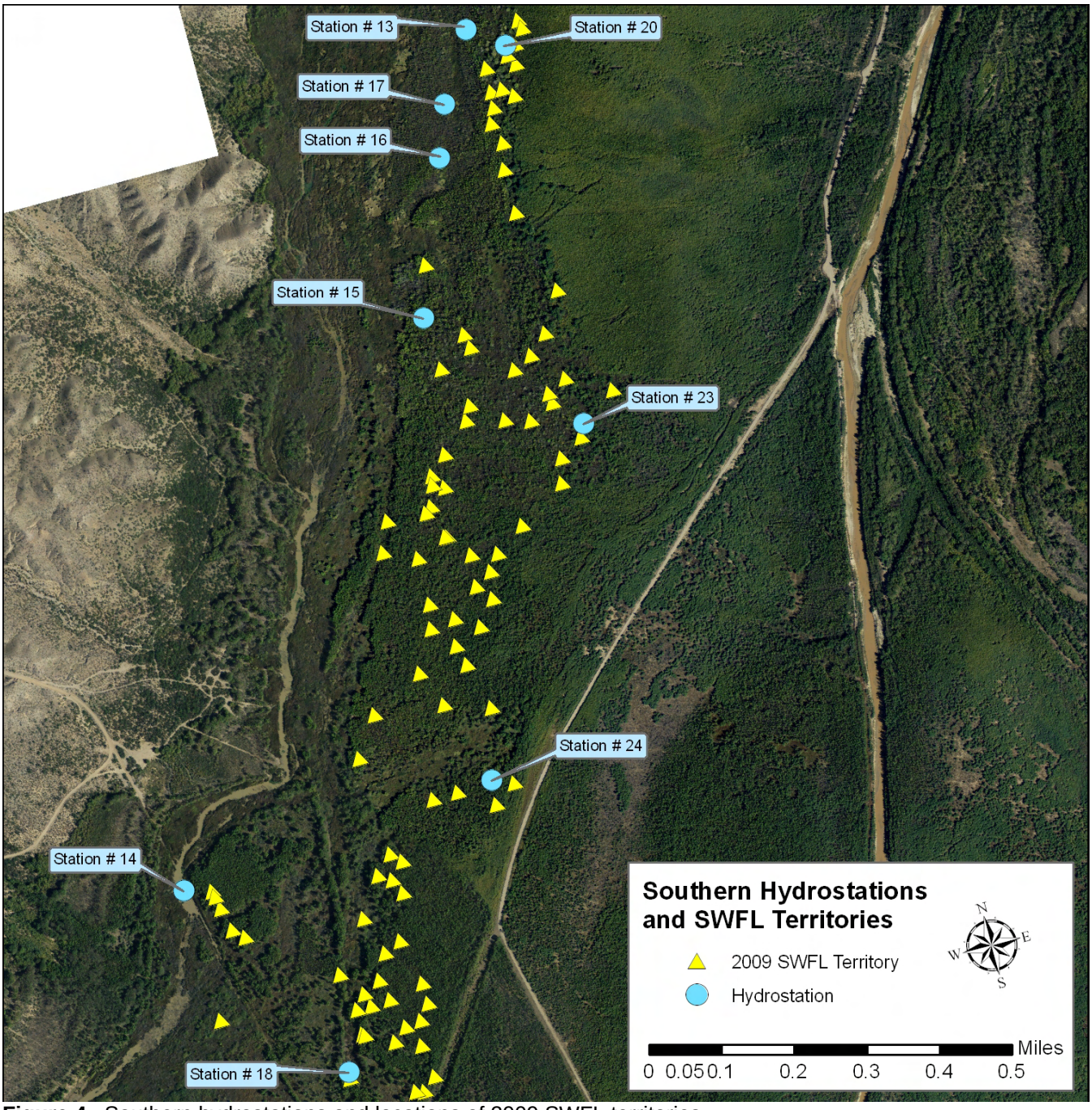


Figure 4. Southern hydrostations and locations of 2009 SWFL territories.

Results

Presence/Absence Surveys

During presence/absence surveys conducted from May 15 through July 24, 788 WIFLs were detected (526 males and 262 females). Based on detections prior to June 10 and/or the birds' lack of territorial behavior, 159 were believed to have been migrants (all of which were considered males due to singing, which explains the skewed sex ratio shown above). The remaining 629 birds comprised 262 pairs, 105 unpaired male territories which were considered resident SWFLs. Survey results within the Velarde, Frijoles Canyon, Belen, Sevilleta/La Joya, San Acacia, Escondida, Bosque del Apache, Tiffany, and San Marcial reaches are presented in Figures 5 through 13, respectively. A total of 367 SWFL territories were documented within the Middle Rio Grande study area during the 2009 season. SWFL detection results for 2009 are summarized in Table 2.

During the 2009 season, four or five surveys were completed in 77 sites, or 51 percent of the total sites surveyed. Within eight of these sites, 22 new SWFL territories were found during the fourth or fifth surveys (Table 3). A majority of these new territories, including those in sites DL-02, DL-06, LF-17a, and SV-07, were in densely occupied sites and were documented during nest/territory searches by experienced biologists. It is likely that these birds were originally undetected or mistaken for the other territorial SWFLs nearby. Sites EB-09 and EB-10 were not surveyed during the 2nd and 3rd survey periods due to extensive flooding. It is likely that the SWFLs documented within these sites would have been detected during these earlier surveys. Thus, only two SWFL territories - those from sites EB-13N and LF-12 - documented for the first time during 4th or 5th surveys were in habitat not already known to be occupied by territorial birds. This represents less than 0.01 percent of all SWFLs documented during 2009 surveys and is a testament to the effectiveness of the first three surveys. Presence/absence survey forms are presented in Appendix A. Occupied reaches and sites are detailed in the following sections (all site coordinates in UTM NAD 83 Datum, Zone 13 S).

The following section presents results by reach and site for all areas where SWFLs were found during the 2009 breeding season.

Frijoles Canyon

This reach was surveyed by Reclamation for the first time in 2008 and, for ease of data entry, consists of one site. It extends from the confluence of the Rio Grande and Frijoles Canyon downstream along the Rio Grande to the Cochiti Pueblo (approximately 9 km). The floodplain is constrained horizontally by a steep-walled canyon in many areas. However, side-canyons and sloughs at several locations within this site contain highly suitable SWFL habitat in the form of understory coyote willow (*Salix exigua*) with a Gooddings willow (*Salix gooddingii*) overstory. Many of these areas are positively impacted by beaver activity and contain water even during low river flows. Eleven migrant WIFLs were documented in this site in 2008. During surveys in 2009,

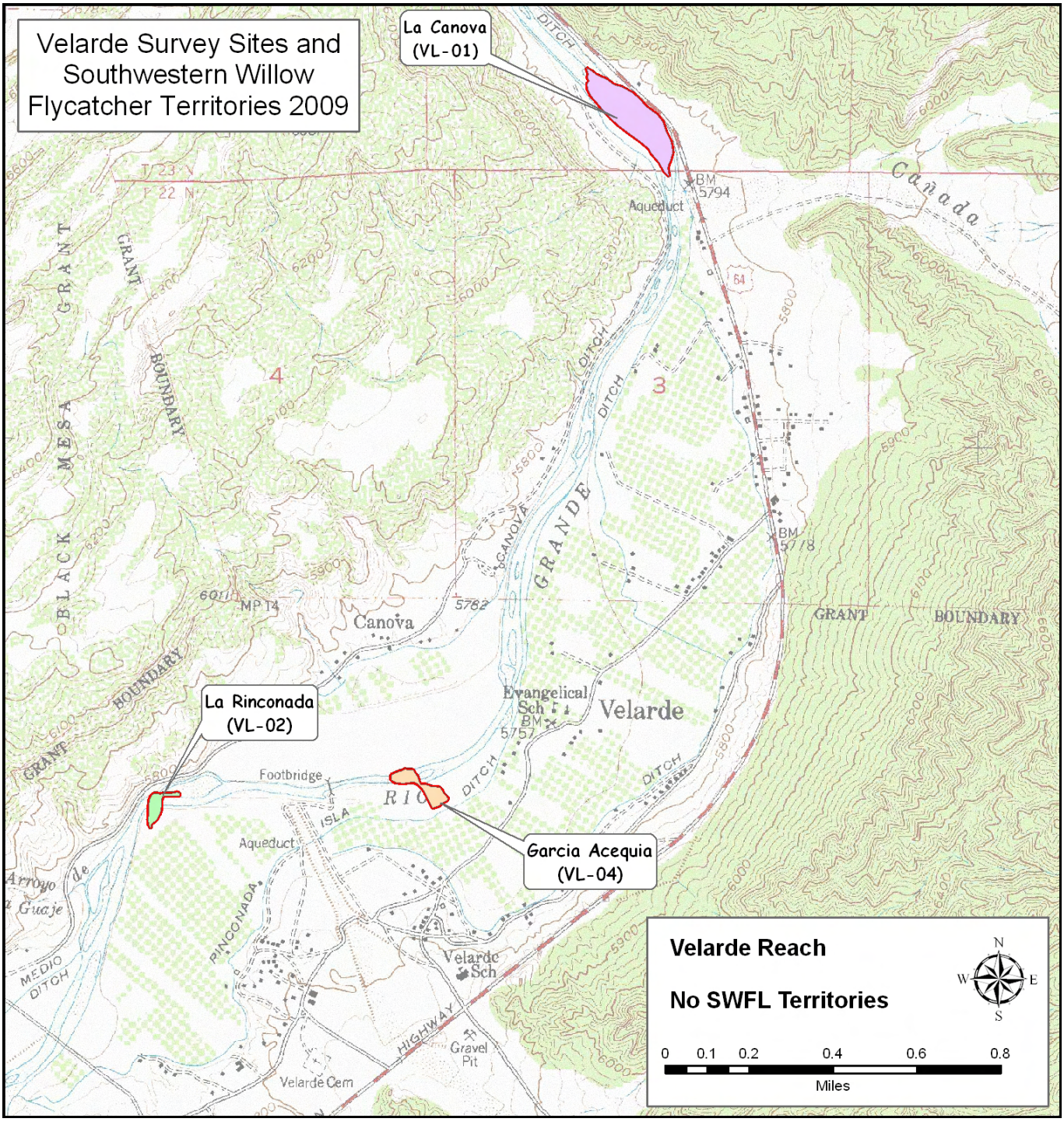


Figure 5. Overview of SWFL detections within the Velarde survey sites.

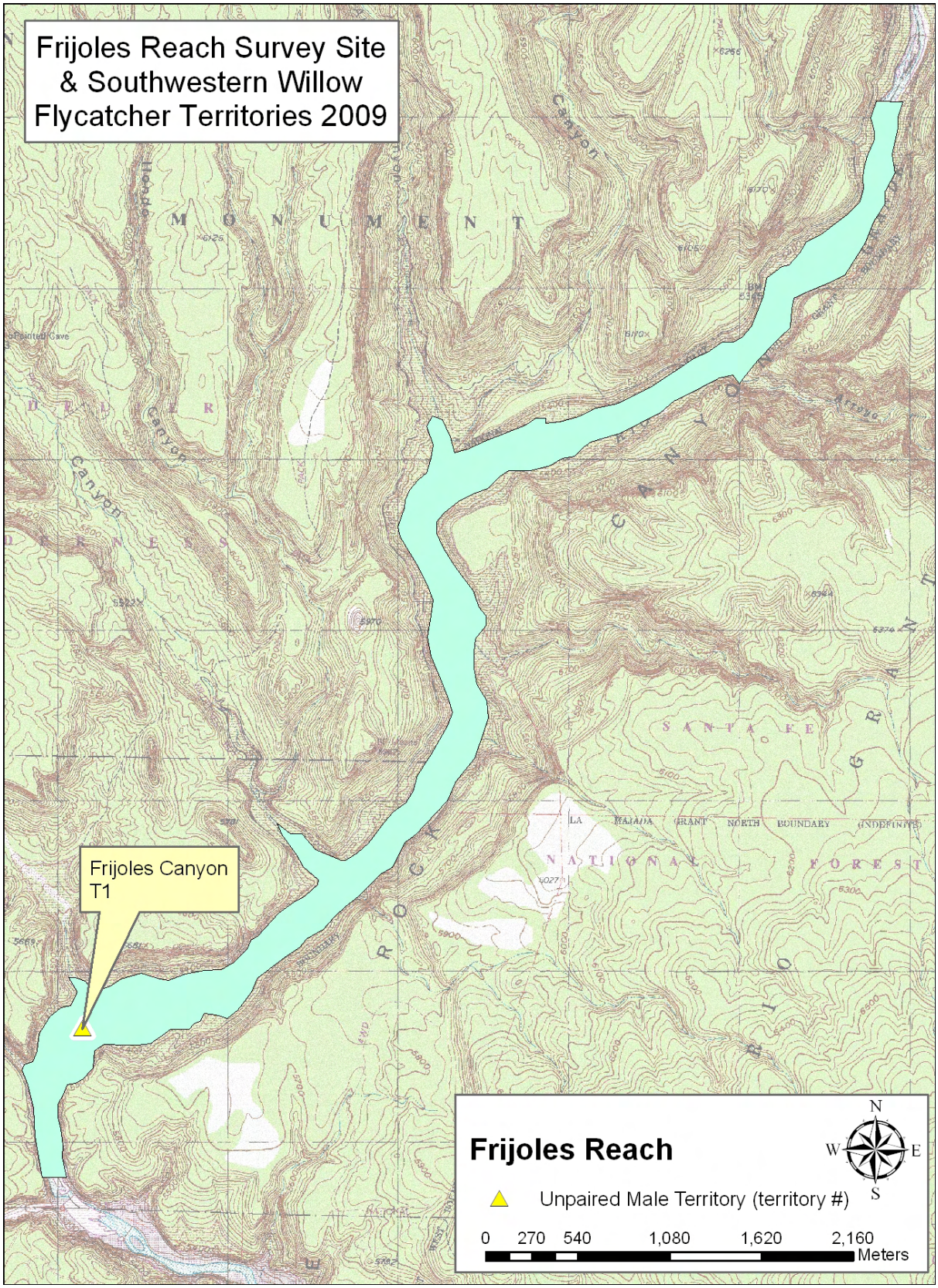


Figure 6. Overview of SWFL detections within the Frijoles survey site.

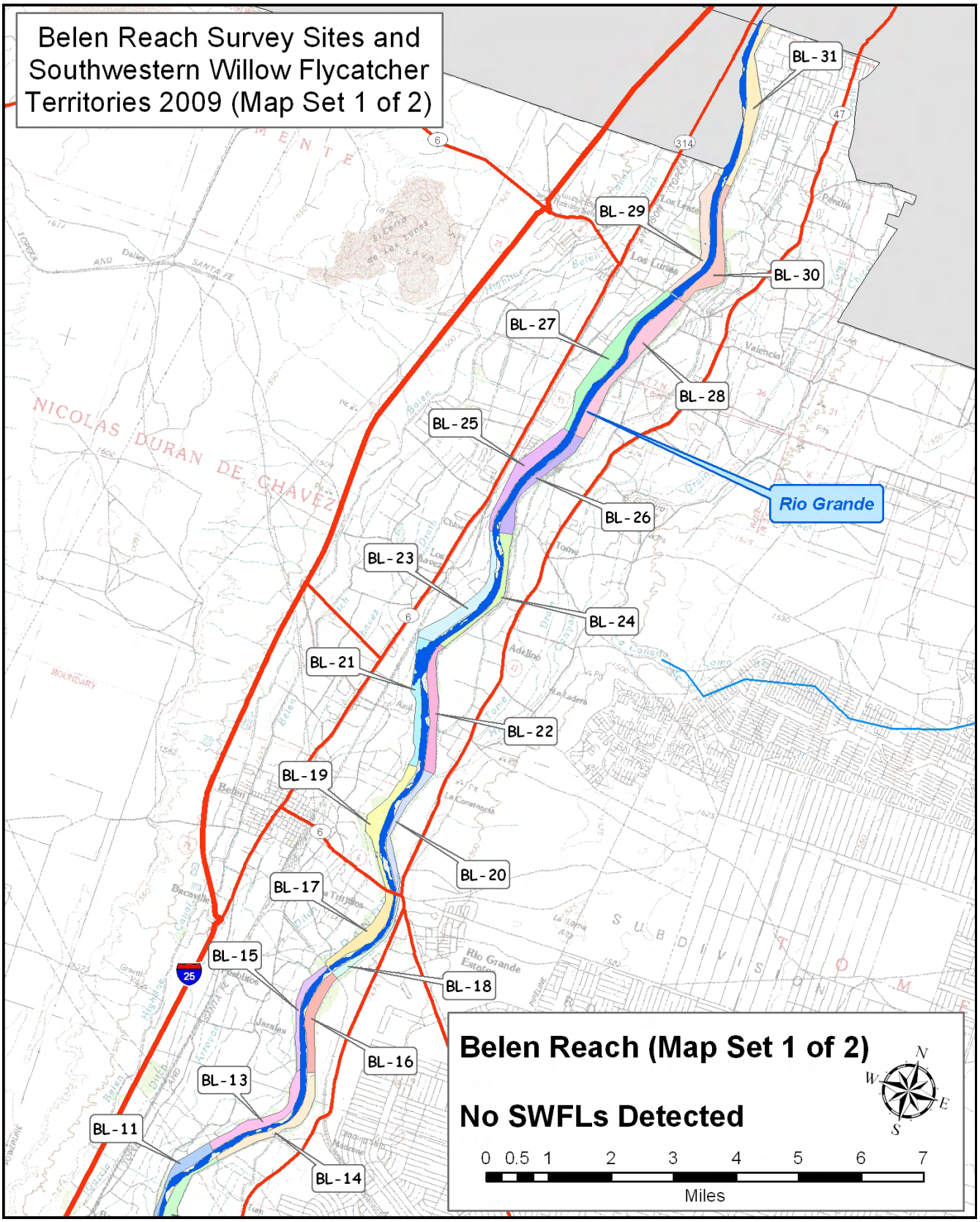


Figure 7a. Overview of SWFL survey sites and detections within the Belen Reach - Northern portion.

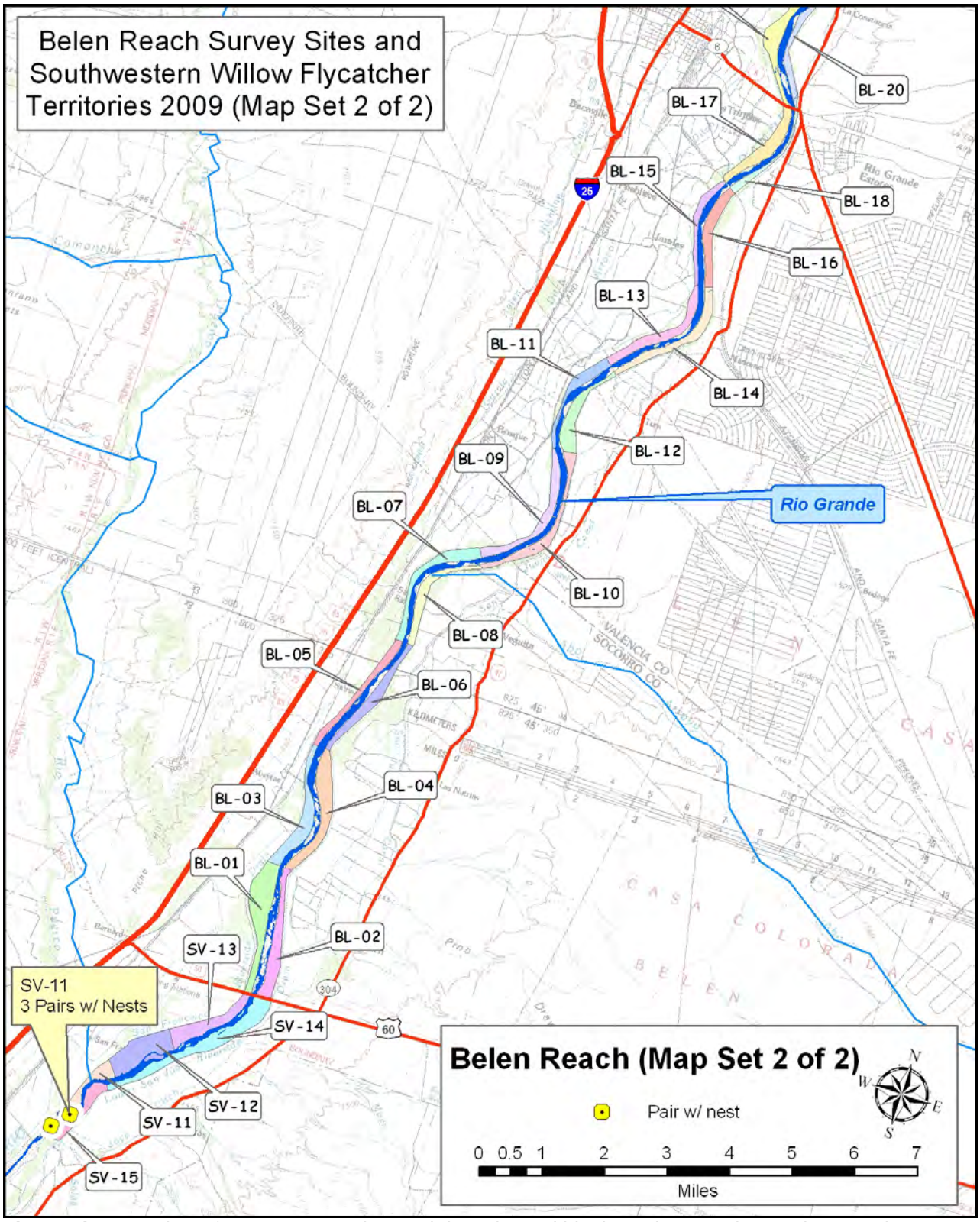


Figure 7b. Overview of SWFL survey sites and detections within the Belen Reach - southern portion.

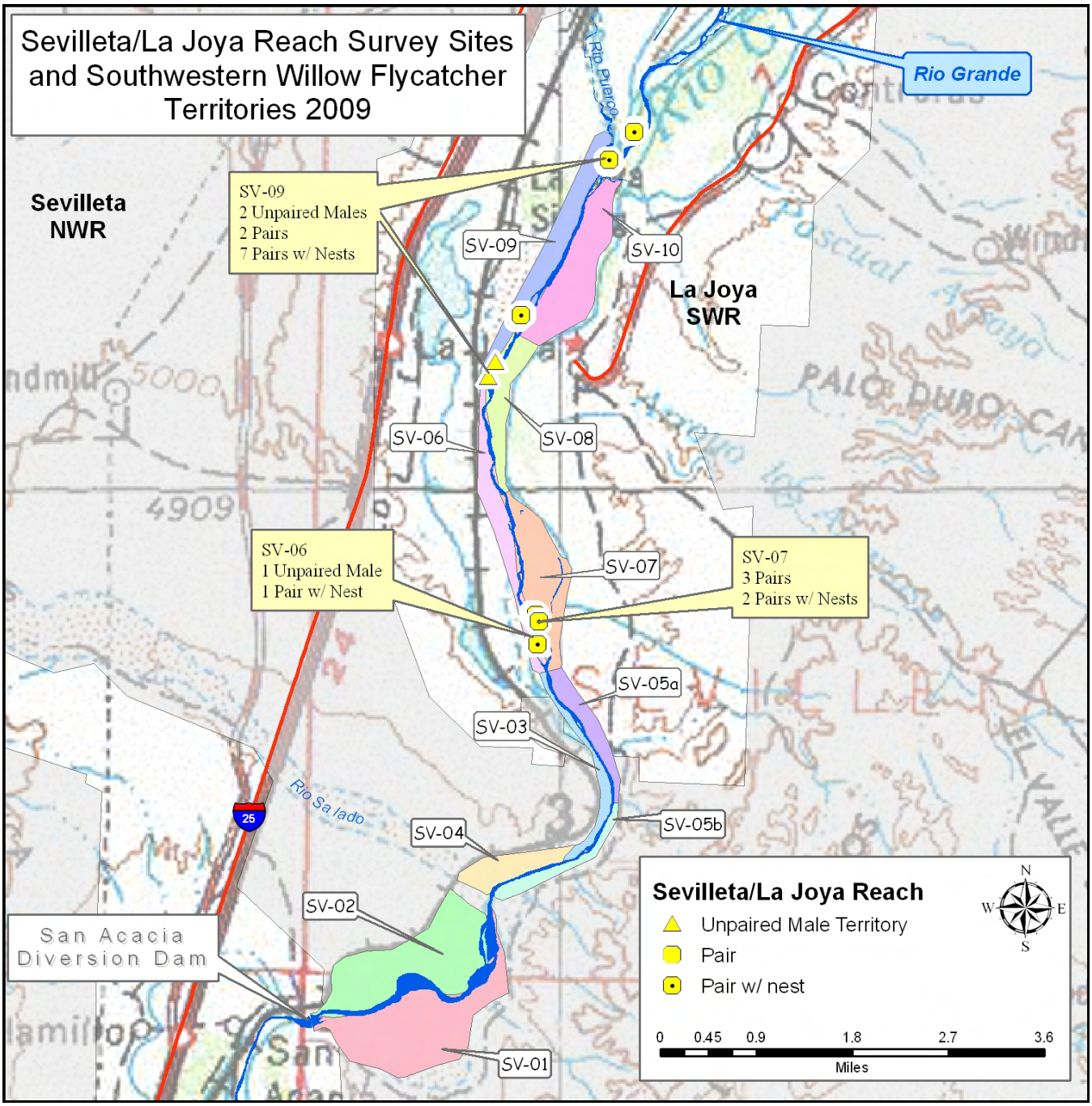


Figure 8. Overview of SWFL detections within the Sevilleta/La Joya survey sites.

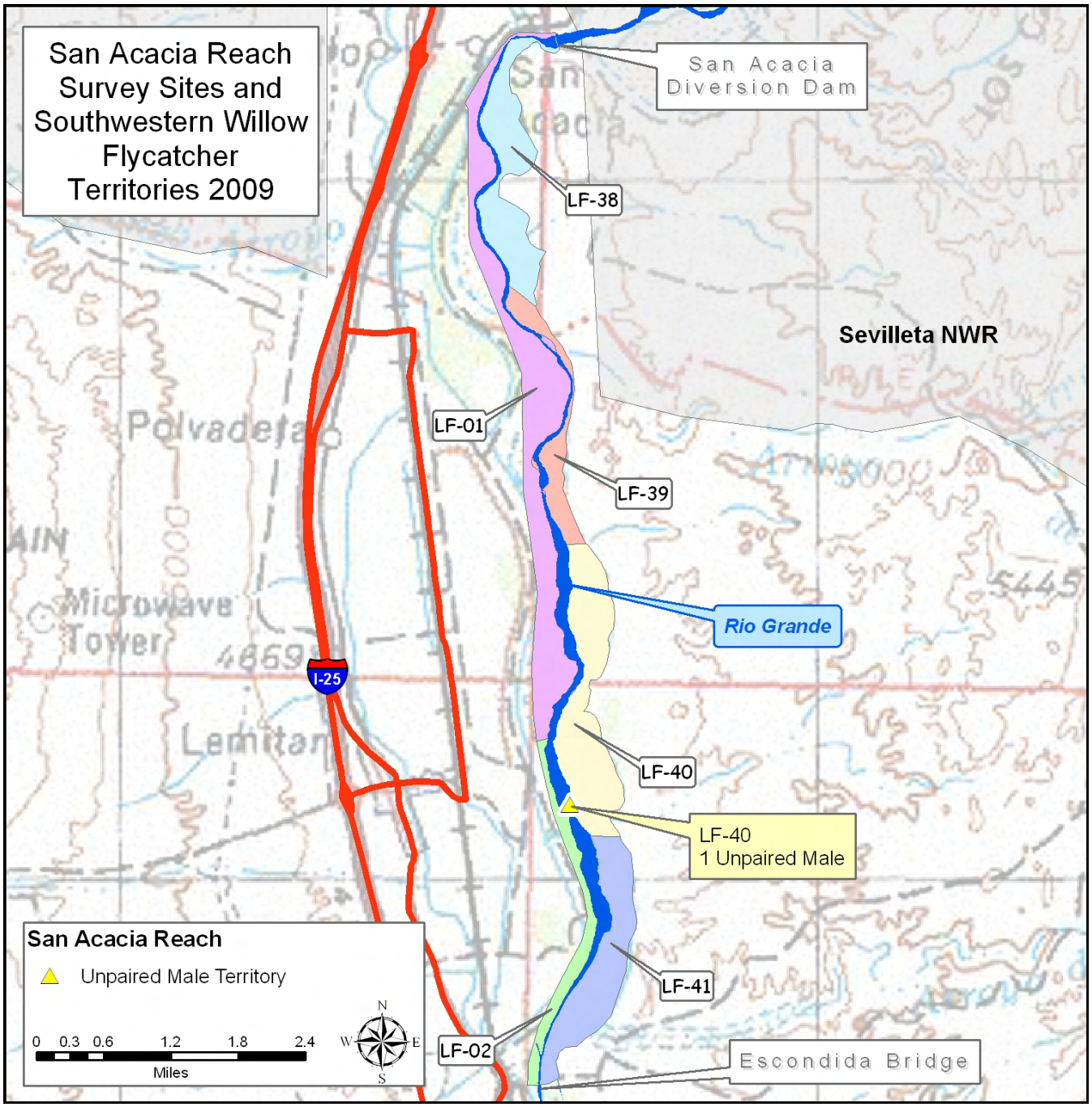


Figure 9. Overview of SWFL detections within the San Acacia survey sites.

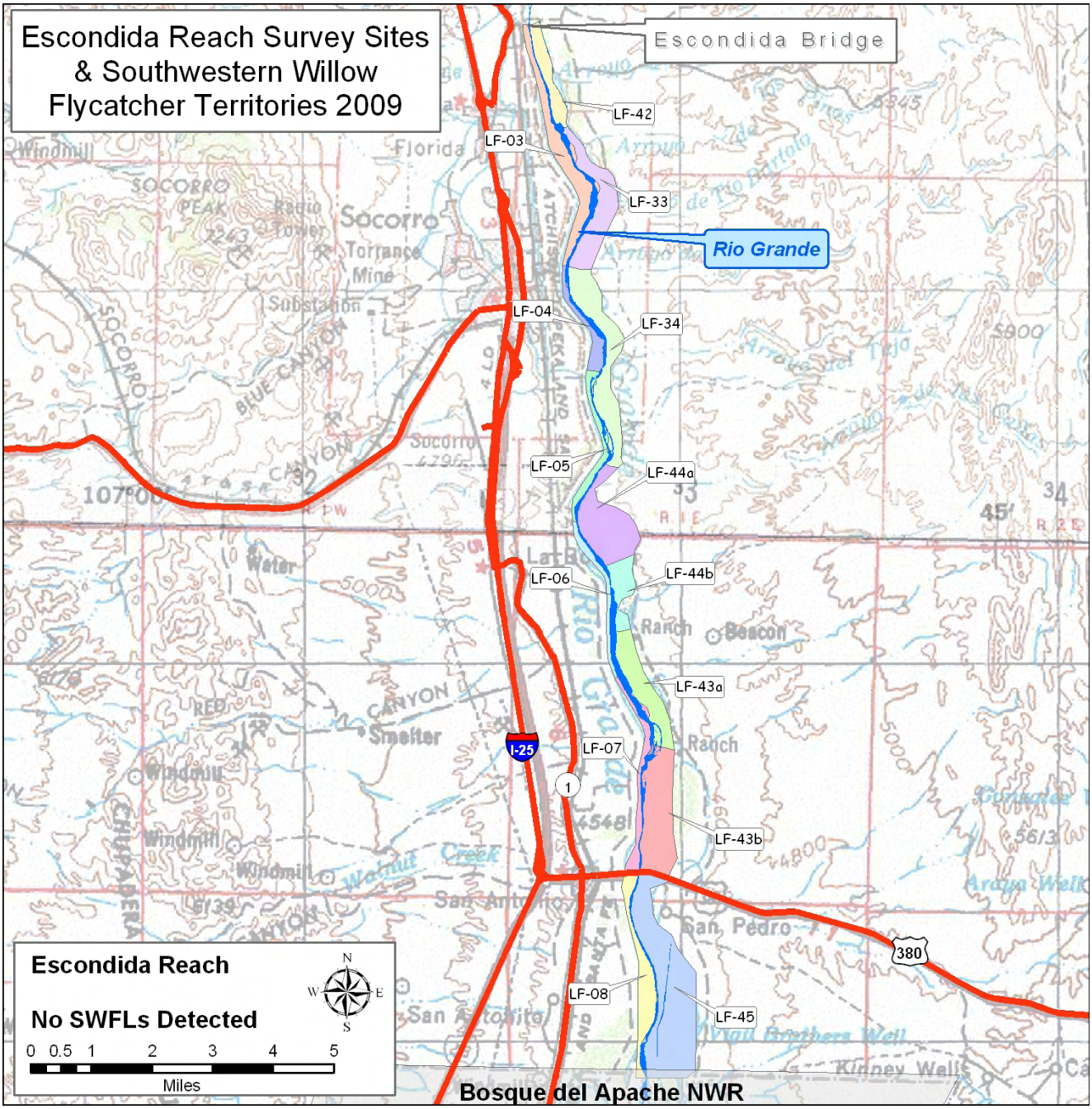


Figure 10. Overview of SWFL detections within the Escondida survey sites.

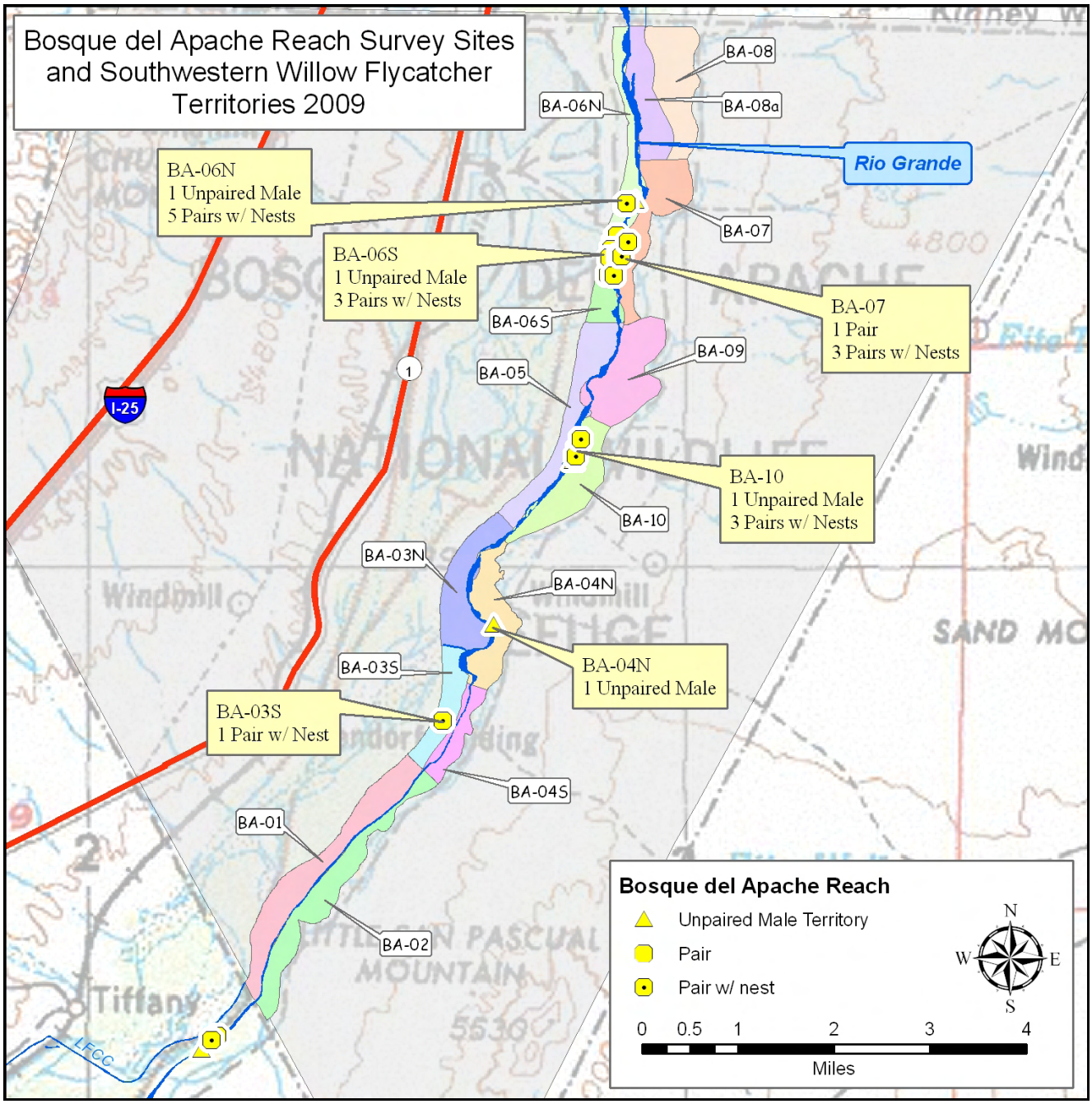


Figure 11. Overview of SWFL detections within the Bosque del Apache survey sites.

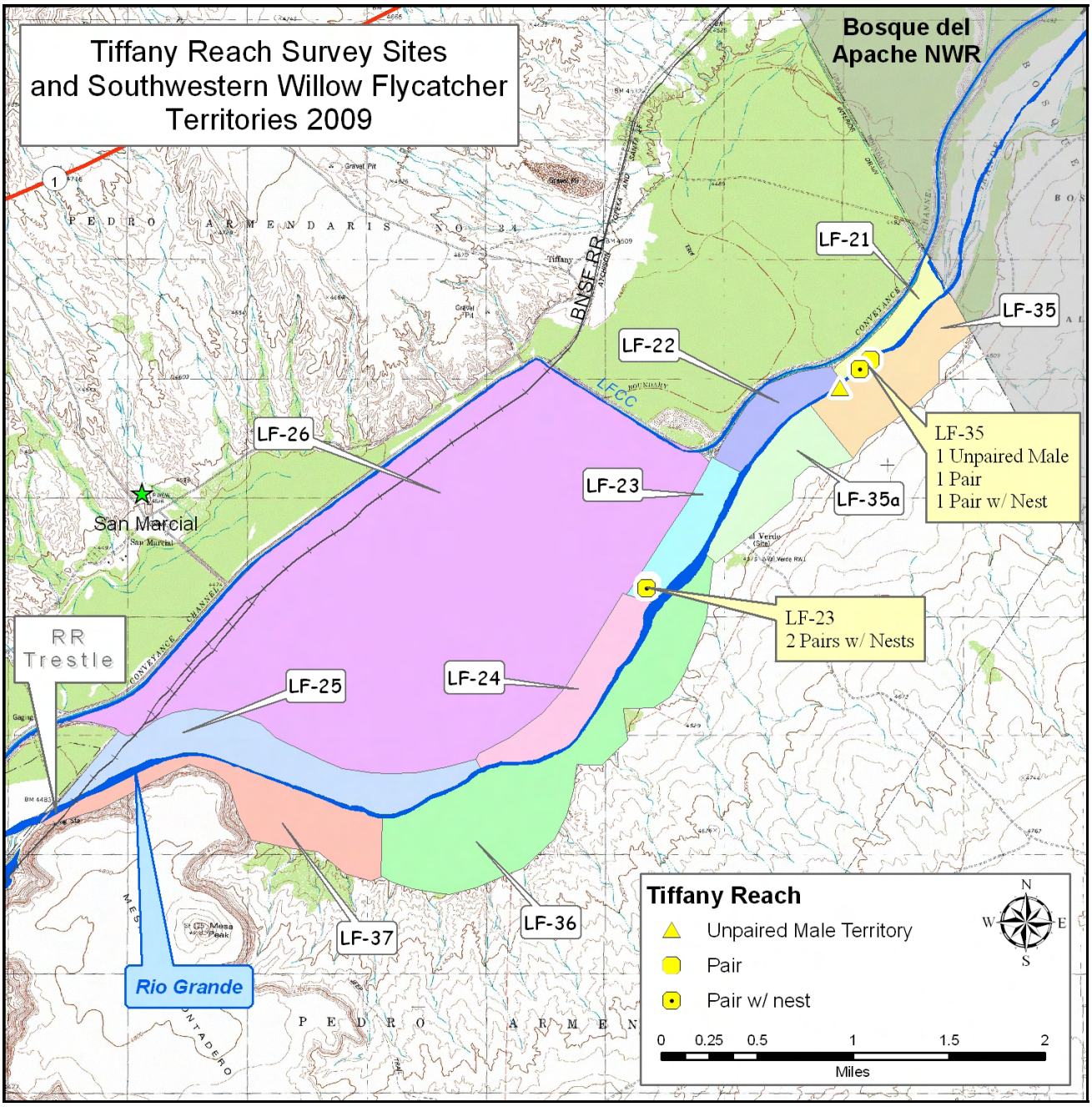


Figure 12. Overview of SWFL detections within the Tiffany survey sites.

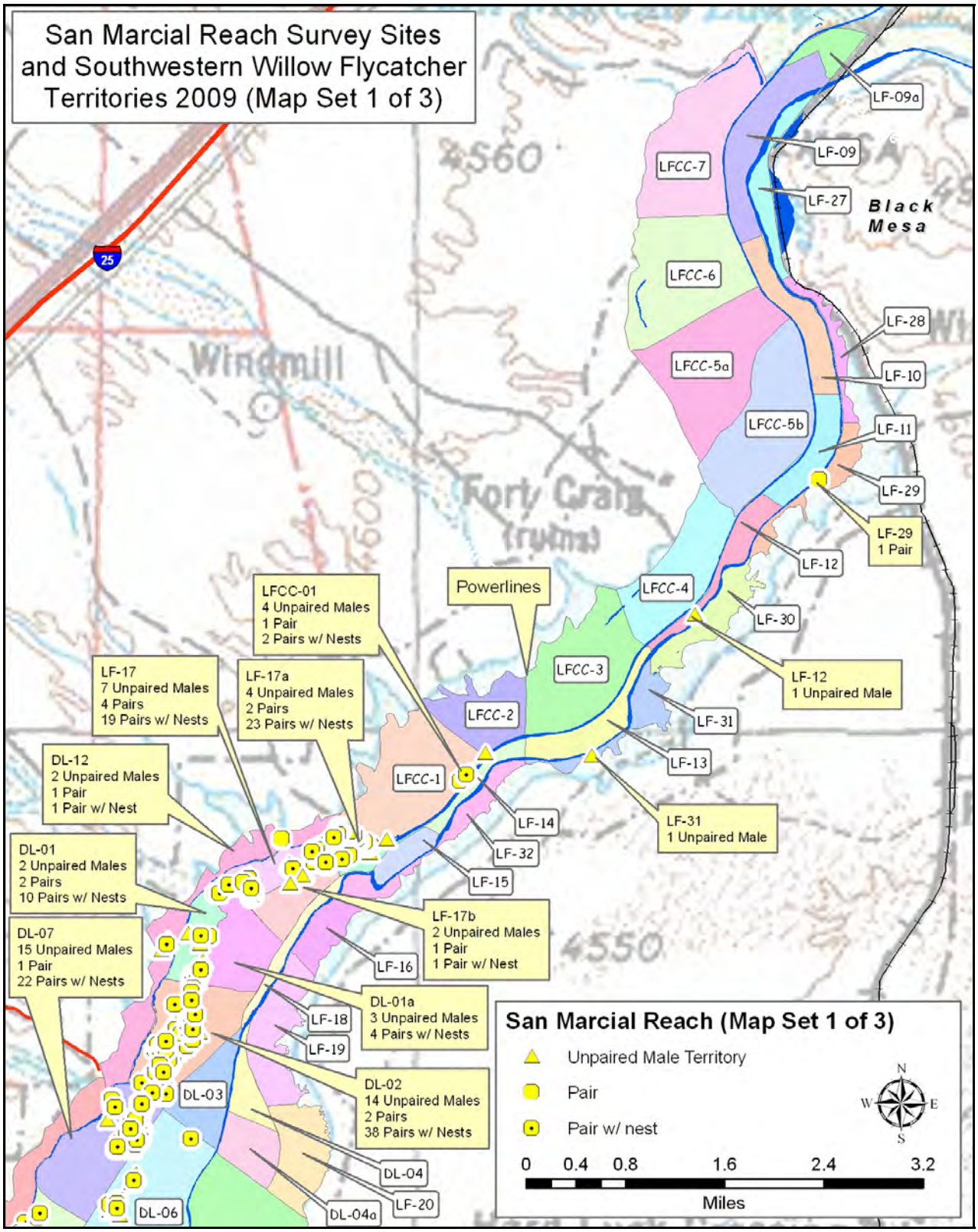


Figure 13a. Overview of and SWFL detections within the northern San Marcial survey sites.

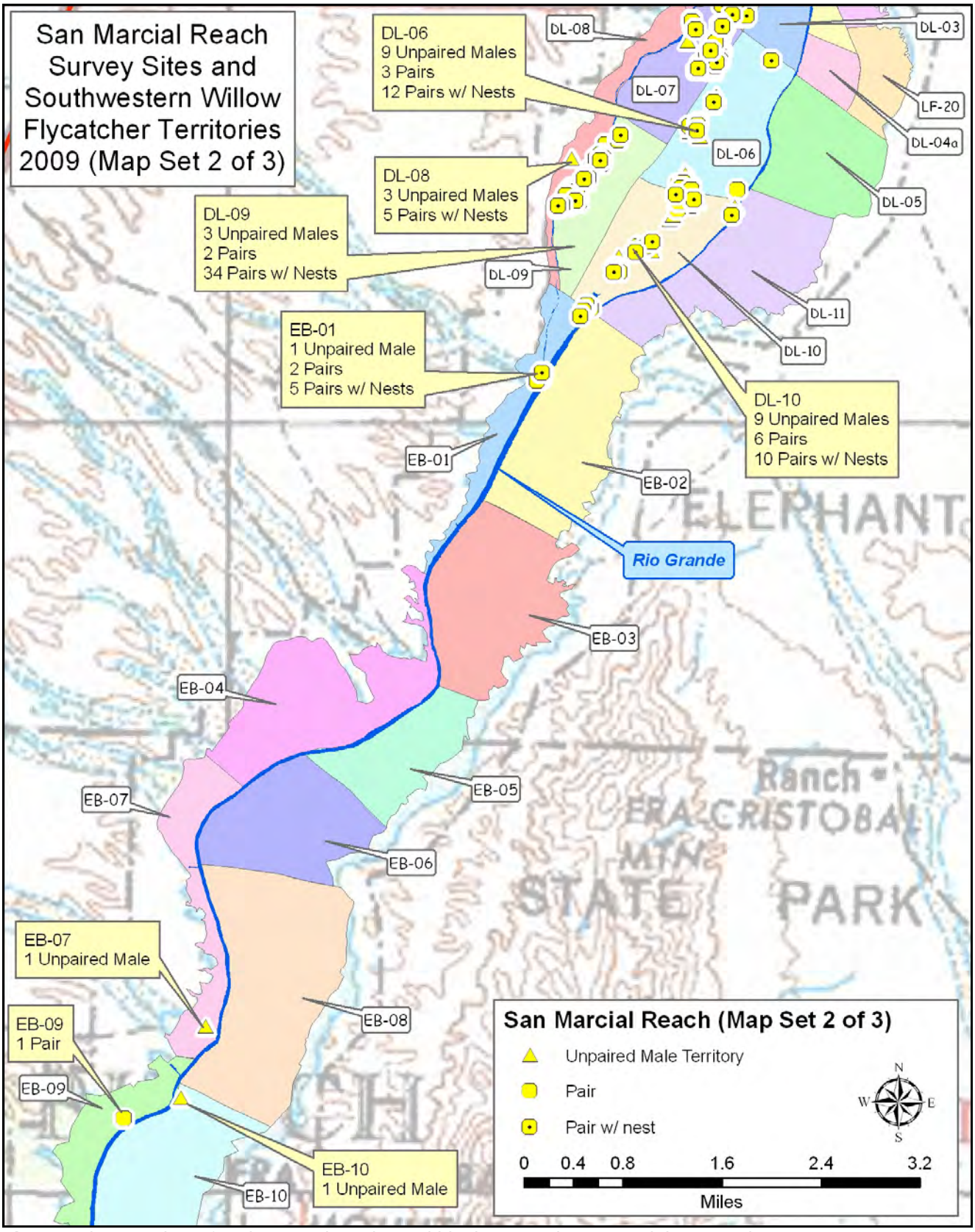


Figure 13b. Overview of and SWFL detections within the central San Marcial survey sites.

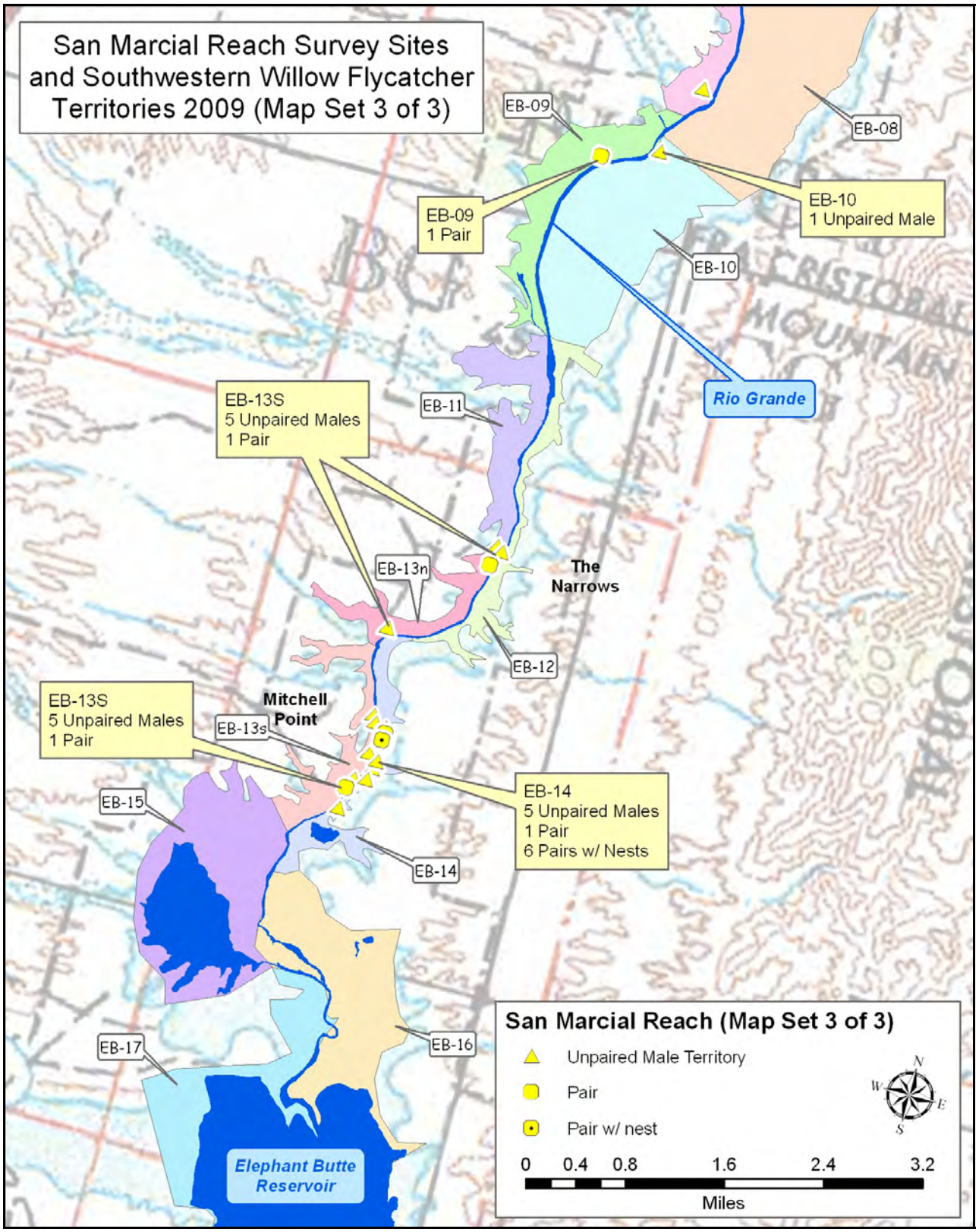


Figure 13c. Overview of and SWFL detections within the southern San Marcial survey sites.

Table 2. 2009 Willow Flycatcher survey detections within the Middle Rio Grande.

Site Name	WIFL's 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-01	1	0	0	0	N/A	N/A	Migrant
Velarde Reach [4] Summary	1	0	0	0	N/A	N/A	1 Migrant
Frijoles Canyon[5] Summary	5	0	1	1	N/A	N/A	4 migrants and 1 unpaired male
BL-01	2	0	0	0	N/A	N/A	2 migrants
BL-02	1	0	0	0	N/A	N/A	Migrant
BL-03	1	0	0	0	N/A	N/A	Migrant
BL-04	1	0	0	0	N/A	N/A	Migrant
BL-05	3	0	0	0	N/A	N/A	3 migrants
BL-08	1	0	0	0	N/A	N/A	Migrant
BL-09	3	0	0	0	N/A	N/A	3 migrants
BL-12	1	0	0	0	N/A	N/A	Migrant
BL-13	3	0	0	0	N/A	N/A	3 migrants
BL-14	5	0	0	0	N/A	N/A	4 migrants; 1 late migrant
BL-15	2	0	0	0	N/A	N/A	2 migrants
BL-18	3	0	0	0	N/A	N/A	1 migrant; 2 late migrants
BL-19	7	0	0	0	N/A	N/A	7 migrants
BL-21	3	0	0	0	N/A	N/A	3 migrants
BL-22	1	0	0	0	N/A	N/A	Migrant
BL-23	2	0	0	0	N/A	N/A	2 migrants
BL-25	2	0	0	0	N/A	N/A	2 migrant
BL-26	1	0	0	0	N/A	N/A	Migrant
BL-27	2	0	0	0	N/A	N/A	2 migrants
BL-28	1	0	0	0	N/A	N/A	Migrant
BL-29	3	0	0	0	N/A	N/A	1 migrant; 2 late migrants
SV-11	6	3	6	3	3	1 successful 1 failed 1 unknown	3 pairs w/ nests
SV-12	1	0	0	0	N/A	N/A	Migrant
SV-13	1	0	0	0	N/A	N/A	Migrant
SV-14	3	0	0	0	N/A	N/A	3 migrants
Belen Reach [6] Summary	59	3	6	3	3	1 successful 1 failed 1 unknown	48 migrants; 5 late migrants; 3 pairs w/ nests

[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 WIFL was considered to be a resident *Empidonax traillii extimus* if it was documented on or after June 10 and exhibited behavioral characteristics typical of a territorial WIFL 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] Velarde Reach = 3 select sites totaling approximately 0.5 km adjacent to the town of Velarde, NM.

[5] Frijoles Canyon Reach = From Cochiti Pueblo, upstream to the confluence with Frijoles Canyon

[6] Belen Reach = From south boundary of Pueblo of Isleta, downstream to confluence of Rio Puerco and Rio Grande.

Table 2 (cont'd). 2009 Willow Flycatcher survey detections within the Middle Rio Grande.

Site Name	WIFL's Observed	Est. Number of Pairs	Est. Number of *E.t. extimus*	Est. Number of Territories	Nest (s) Found	Nest Success	Comments
SV-01	1	0	0	0	N/A	N/A	Migrant
SV-02	4	0	0	0	N/A	N/A	4 migrants
SV-04	2	0	0	0	N/A	N/A	2 migrants
SV-05a/05b	3	0	0	0	N/A	N/A	3 migrants
SV-06	7	1	3	2	1	1 failed	4 migrants; 1 unpaired male; 1 pair w/ nest
SV-07	10	5	10	5	3	1 successful 2 failed	3 pairs; 2 pairs w/ nests
SV-09	22	9	20	11	10	4 successful 6 failed	2 migrants; 2 unpaired males; 2 pairs; 7 pairs w/ nests
Sevilleta/La Joya [7] Reach Summary	49	15	33	18	14	5 successful 9 failed	16 migrants; 3 unpaired males; 5 pairs; 10 pairs w/ nests
LF-01	8	0	0	0	N/A	N/A	6 migrants; 2 late migrants
LF-02	1	0	0	0	N/A	N/A	Migrant
LF-39	3	0	0	0	N/A	N/A	3 migrants
LF-40	3	0	1	1	N/A	N/A	2 migrants; 1 unpaired male
San Acacia Reach [8] Summary	15	0	1	1	N/A	N/A	14 migrants; 1 unpaired male
LF-03	8	0	0	0	N/A	N/A	8 migrants
LF-04	2	0	0	0	N/A	N/A	2 migrants
LF-33	3	0	0	0	N/A	N/A	3 migrants
LF-34	1	0	0	0	N/A	N/A	Migrant
LF-43b	2	0	0	0	N/A	N/A	2 late migrants
LF-44a	1	0	0	0	N/A	N/A	Migrant
LF-44b	1	0	0	0	N/A	N/A	Late-migrant
Escondida Reach [9] Summary	18	0	0	0	N/A	N/A	15 migrants; 3 late migrants
BA-01	1	0	0	0	N/A	N/A	Migrant
BA-02	3	0	0	0	N/A	N/A	1 migrant; 2 late migrants
BA-03S	3	1	2	1	1	1 successful	1 migrant, 1 pair w/ nest
BA-04N	1	0	1	1	N/A	N/A	1 unpaired male
BA-04S	1	0	0	0	N/A	N/A	Migrant
BA-06N	12	5	11	6	6	4 successful 2 failed	1 migrant; 1 unpaired male; 5 pairs w/ nests
BA-06S	7	3	7	4	5	3 successful 1 failed 1 unknown	1 unpaired male; 3 pairs w/ nests
BA-07	15	4	8	4	4	1 successful 3 failed	7 migrants; 1 pair; 3 pairs w/ nests
BA-08/08a	1	0	0	0	N/A	N/A	Migrant
BA-10	7	3	7	4	3	2 successful 1 failed	1 unpaired male; 3 pairs w/ nests
Bosque del Apache Reach[10] Summary	51	16	36	20	19	11 successful 7 failed 1 unknown	13 migrants; 2 late migrants; 4 unpaired males; 1 pair; 15 pairs w/nests

[7] Sevilleta/La Joya Reach = From confluence of Rio Puerco and Rio Grande, downstream to San Acacia Diversion Dam
[8] San Acacia Reach = From San Acacia Diversion Dam, downstream to Escondida Bridge
[9] Escondida Reach = From Escondida Bridge, downstream to north boundary of Bosque del Apache NWR
[10] Bosque del Apache (BDA) Reach = From N boundary of BDA NWR, downstream to S boundary of BDA NWR.

Table 2 (cont'd). 2009 Willow Flycatcher survey detections within the Middle Rio Grande.

Site Name	WIFL's Observed	Est. Number of Pairs	Est. Number of *E.t. extimus*	Est. Number of Territories	Nest (s) Found	Nest Success	Comments
LF-23	4	2	4	2	2	1 successful 1 failed	2 pairs w/ nests
LF-25	1	0	0	0	N/A	N/A	Migrant
LF-35	5	2	5	3	1	1 failed	1 unpaired male; 1 pair; 1 pair w/ nest
Tiffany Reach [11] Summary	10	4	9	5	3	1 successful 2 failed	1 migrant; 1 unpaired male; 1 pair; 3 pairs w/ nests
LF-10	1	0	0	0	N/A	N/A	Migrant
LF-12	2	0	1	1	N/A	N/A	1 migrant; 1 unpaired male
LF-13	3	0	0	0	N/A	N/A	3 migrants
LF-17	53	23	53	30	30	15 successful 14 failed 1 unknown	7 unpaired males; 4 pairs; 19 pairs w/nests
LF-17a	54	25	54	29	39	14 successful 24 failed 1 unknown	4 unpaired males; 2 pairs; 23 pairs w/ nests
LF-17b	6	2	6	4	1	1 successful	2 unpaired males; 1 pair; 1 pair w/ nest
LF-28	4	0	0	0	N/A	N/A	4 migrants
LF-29	7	1	2	1	None	N/A	5 migrants; 1 pair
LF-31	2	0	1	1	N/A	N/A	1 migrant; 1 Unpaired male
LFCC-01	10	3	10	7	3	1 successful 2 failed	4 unpaired males; 1 pair; 2 pairs w/nests
LFCC-03	1	0	0	0	N/A	N/A	Migrant
LFCC-05a	1	0	0	0	N/A	N/A	Migrant
DL-01a	13	4	11	7	7	3 successful 4 failed	2 migrants; 3 unpaired males; 4 pairs w/nests
DL-01	26	12	26	14	14	6 successful 8 failed	2 unpaired males; 2 pairs; 10 pairs w/ nests
DL-02	95	40	94	54	60	17 successful 36 failed 7 unknown	1 migrant; 14 unpaired males; 2 pairs; 38 pairs w/ nests
DL-03	1	0	0	0	N/A	N/A	Late migrant
DL-06	43	15	39	24	16	11 successful 5 failed	4 migrants; 9 unpaired males; 3 pairs; 12 pairs w/nests
DL-07	62	23	61	38	41	20 successful 18 failed 3 unknown	1 migrant; 15 unpaired males; 1 pair; 22 pairs w/ nests
DL-08	13	5	13	8	8	6 successful 2 failed	3 unpaired males; 5 pairs w/ nests
LFCC-03	1	0	0	0	N/A	N/A	Migrant
LFCC-05a	1	0	0	0	N/A	N/A	Migrant
DL-01a	13	4	11	7	7	3 successful 4 failed	2 migrants; 3 unpaired males; 4 pairs w/nests
DL-01	26	12	26	14	14	6 successful 8 failed	2 unpaired males; 2 pairs; 10 pairs w/ nests
DL-02	95	40	94	54	60	17 successful 36 failed 7 unknown	1 migrant; 14 unpaired males; 2 pairs; 38 pairs w/ nests
DL-03	1	0	0	0	N/A	N/A	Late migrant

[11] Tiffany Reach = From south boundary of Bosque del Apache NWR, downstream to railroad trestle.

Table 2 (cont'd). 2009 Willow Flycatcher survey detections within the Middle Rio Grande.

Site Name	WIFL's Observed	Est. Number of Pairs	Est. Number of *E.t. extimus*	Est. Number of Territories	Nest (s) Found	Nest Success	Comments
DL-06	43	15	39	24	16	11 successful 5 failed	4 migrants; 9 unpaired males; 3 pairs; 12 pairs w/nests
DL-07	62	23	61	38	41	20 successful 18 failed 3 unknown	1 migrant; 15 unpaired males; 1 pair; 22 pairs w/ nests
DL-08	13	5	13	8	8	6 successful 2 failed	3 unpaired males; 5 pairs w/ nests
DL-09	76	36	75	39	48	27 successful 19 failed 2 unknown	1 migrant; 3 unpaired males; 2 pairs; 34 pairs w/nests
DL-10	41	16	41	25	11	4 successful 7 failed	9 unpaired males; 6 pairs; 10 pairs w/ nests
DL-12	7	2	6	4	1	1 unknown	1 migrant; 2 unpaired males; 1 pair; 1 pair w/ nest
EB-01	16	7	15	8	6	3 successful 2 failed 1 unknown	1 migrant; 1 unpaired male; 2 pairs; 5 pairs w/ nests
EB-07	1	0	1	1	N/A	N/A	1 unpaired male
EB-09	2	1	2	1	None	N/A	1 pair
EB-10	1	0	1	1	N/A	N/A	1 unpaired male
EB-12	5	0	0	0	N/A	N/A	5 migrants
EB-13N	5	1	5	4	None	N/A	3 unpaired males; 1 pair
EB-13S	7	1	7	6	1	1 failed	5 unpaired males; 1 pair
EB-14	21	7	19	12	8	1 successful 2 failed 5 unknown	2 migrants; 5 unpaired males; 1 pair; 6 pairs w/ nests
EB-15	1	0	0	0	N/A	N/A	Migrant
San Marcial Reach [12] Summary	580	224	543	319	294	129 successful 144 failed 21 unknown	36 migrants; 1 late migrant; 95 unpaired males; 32 pairs; 192 pairs w/ nests
2009 TOTALS	**788**	**262**	**629**	**367**	**333**	**147 Succesful 163 Failed 23 Unknown**	**148 Migrants [13] 11 Late Migrants [14] 105 Unpaired Males [15] 39 Pairs [16] 223 Pairs w/nests [17]**

[12] San Marcial Reach = From railroad trestle, downstream through the narrows to Elephant Butte Reservoir Pool (Monticello Bay)

[13] Migrant – any WIFL detected only during the period prior to June 10th, and where breeding was neither confirmed nor suspected.

[14] Late migrant – any WIFL detected between June 10th and July 1 that failed to exhibit behavioral characteristics typical of a territorial male.

[15] Unpaired Male – a resident SWFL that was documented on or after June 10th and exhibited behavioral characteristics typical of a territorial flycatcher, however breeding was neither suspected nor confirmed

[16] Pair – a SWFL territory where breeding was confirmed or behavioral evidence strongly suggested that pairing had occurred

[17] Pair w/ nest – a SWFL territory where breeding was confirmed by the discovery of an active nest.

Table 3. SWFLs and territories documented for the first time during 4th or 5th surveys during 2009.

Survey Site	New SWFLs	New Territories
DL-02	17 (5 pairs, 7 males)	12
DL-06	4 (1 pair, 2 males)	3
EB-09	2 (1 pair)	1
EB-10	1 (1 male)	1
EB-13N	1 (1 male)	1
LF-12	1 (1 male)	1
LF-17a	6 (3 pairs)	3
SV-07	1 (1 female)	0

five WIFLs were documented; four were migrants and one lone male occupied a large territory and was documented during the 2nd and 3rd survey periods (Table 2).

Belen Reach

This reach extends from the southern boundary of the Pueblo of Isleta to the confluence of the Rio Puerco and Rio Grande and encompasses riparian habitat within the active floodplain. It contains 36 sites which were surveyed three times (with the exception of SV-11 through SV-15, which were surveyed four times to ensure thorough coverage). The majority of habitat in this reach consists of a mix of cottonwood (*Populus deltoides*) gallery, with sparse saltcedar (*Tamarix* sp.), Russian olive (*Eleagnus angustifolia*) and/or coyote willow understory. The river in this reach is relatively degraded and banks are often incised or undercut. Most sites are bounded by the Rio Grande on one side and an extensive levee system on the other. Suitable SWFL habitat in this reach is patchy and consists primarily of developing stands of willows and Russian olive on lower terraces and recently established river bars. During 2009, 59 WIFLs were recorded in this reach. However, 48 were determined to be migrants, five were late migrants recorded after June 10, and six formed three pairs and nested in site SV-11 (Table 2).

> **Site SV-11** is on the La Joya State Waterfowl Area north of the Rio Puerco (3806837 N 331875 E to 3805122 N 330783 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 (*Baccharis salicifolia)* 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. Three nesting pairs were documented in this site.

Sevilleta/La Joya Reach

This reach extends from the confluence of the Rio Grande and Rio Puerco downstream to San Acacia Diversion Dam; encompassing the riparian habitat within the active floodplain. Lands within this reach are managed by the New Mexico Department of Game and Fish (La Joya State Waterfowl Area) and U.S. Fish and Wildlife Service (Sevilleta National Wildlife Refuge). Of the eleven sites in this reach, ten were surveyed five times (SV-08 was omitted due to landowner issues). Habitat within this reach ranges from highly suitable SWFL habitat composed of coyote willow and Russian olive along the banks of the river to overstory cottonwood gallery and sparse, decadent saltcedar. Overbank flooding does occur during high flow events, particularly on the lower terraces. The river channel within this reach is not degraded due to San Acacia Diversion Dam which backs-up water, allowing the portion immediately upstream of the dam to aggrade. A total of 49 WIFLs were

detected in this reach during 2009 surveys; 16 were determined to be migrants, 3 were unpaired male territories, and 30 formed 15 breeding pairs (Table 2).

Site SV-06 is located on the La Joya State Waterfowl Area on the west side of the Rio Grande (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. Overstory cottonwood galleries are also present. Territory numbers in this site have fluctuated greatly since 2007. This site is perhaps one of the most difficult to survey within the study area due to the dense Russian olive habitat. During 2009 surveys, one unpaired SWFL male and one breeding pair were documented within this site.

Site SV-07, located on the east side of the river approximately 7 km north of the San Acacia Diversion Dam (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. This site is also perhaps one of the most difficult to survey within the study area due to the dense Russian olive habitat. Ten SWFLs, forming five pairs, were documented in this site during 2009 surveys.

Site SV-09 is approximately 8 km south of Highway 60 on the west side of the river immediately downstream of the Rio Grande/Rio Puerco confluence (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 flooding in certain areas. Several high flow channels in the northern end of the site are also flooded during high flow events. A total of 22 WIFLs were documented in this site during 2009 surveys. Six pairs were located in the coyote willow and Russian olive dominated habitat near the confluence with the Rio Puerco. Three pairs were located in similar habitat in the middle of the site and two lone males were located at the southern end of the site.

San Acacia Reach

This reach extends downstream from San Acacia Diversion Dam to the Escondida Bridge and encompasses approximately 16 km of riparian corridor. Six sites within this reach were each surveyed five times. The active floodplain within this reach is relatively narrow and is constrained by levees along the LFCC to the west and the uplands to the east. Habitat within this reach is varied and consists of a mixture of gallery cottonwood, saltcedar of various ages and structures, and coyote willow and Russian olive along the river. The highly degraded river channel has reduced overbank flooding and limited significant understory growth in many areas of this reach. However, several river bars in this reach have produced habitat that appears suitable to WIFLs and, in 2008 and 2009, territorial SWFL males occupied this reach for the first time since surveys began in 1996. Fourteen WIFL migrants were also detected (Table 2).

Site LF-40 is 4.2 km long site on the east side of the Rio Grande approximately 8.5 km south of the San Acacia Diversion Dam on the west side of the river (3784915N 326338E to 3780743N 326482E). Habitat within this site is highly variable and ranges from mature

cottonwood and Russian olive with a variety of understory vegetation to younger stands of cottonwood, Russian olive and coyote willow closer to the river. Very little overbank flooding occurs within the site. During the past several years, lower terraces along the river have become established with younger stands of dense coyote willow, saltcedar, Russian olive and cottonwood. The SWFL documented in 2009 occupied this habitat adjacent to the river.

Bosque del Apache Reach

This reach encompasses riparian habitat within the active floodplain of the Bosque del Apache NWR. Fourteen sites were each surveyed three times during 2009. Habitat varies widely from decadent, dense saltcedar to large, mature cottonwood galleries to dense patches of coyote willow and Russian olive. This reach of the river is highly aggraded and subject to frequent overbank flooding during high spring and summer flows. This reach, during 2009, became the second most highly occupied reach in the study area. Fifty-one WIFLs, including 15 migrants, four unpaired males, and 16 SWFL pairs, were detected in this reach (Table 2).

Site BA-03S is located on the Bosque del Apache NWR approximately 5 km north of the southern refuge boundary and encompasses the Bosque Channel Widening Project (3738796 N 326371 E to 3736814 N 325648 E). As part of this project, exotic vegetation was removed and a high flow channel installed through the middle of this site. The remaining native habitat has expanded and now occupies a large portion of this site, particularly adjacent to the river. Habitat on the levee side of the site consists of dense mature saltcedar interspersed with occasional cottonwoods, *Baccharis*, and coyote willow. This site is regularly flooded during spring and summer high flow events. One SWFL pair nested within the Channel Widening Project boundary.

Site BA-04N is upstream and across the river from site BA-03S in the Bosque del Apache NWR (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 and native willows. These riverbars contain the best SWFL habitat within this site. The site is relatively dry with the exception of low lying areas and high flow channels that receive overbank flooding during high river flows. One unpaired male SWFL was documented on a lower terrace adjacent to the river during 2009 surveys.

Site BA-06N is immediately south of the northern Bosque del Apache NWR boundary on the west side of the Rio Grande (3749294 N 328913 E to 3745590 N 328829 E). This site is relatively narrow, particularly on the northern end, and habitat consists of a mix of native and exotic vegetation. Saltcedar dominates much of the site away from the river. Nearer to the river, patches of young coyote willow, Baccharis, cottonwood and Russian olive have developed. This habitat was flooded during 2009 due to the formation of a sediment plug adjacent to the site. This flooded habitat became occupied by breeding SWFLs; one unpaired male territory and five breeding pairs were documented during 2009.

Site BA-06S is a relatively short (1.3 km) site that is approximately 4 km south of the northern Bosque del Apache boundary on the west side of the river (3745590 N 328829 E to 3744316 N 328879 E). Habitat consists primarily of decadent saltcedar with sparse

cottonwood canopy along the levee, sparse mid-age saltcedar in the interior and young cottonwood, Russian olive and coyote willow in the southern portion of the site along the river. This site was periodically flooded during the 2009 survey season and several SWFLs were documented; one unpaired male and three nesting pairs occupied young to mid-aged stands of mixed native and exotic vegetation adjacent to the river.

Site BA-07 is approximately 3 km south of the northern Bosque del Apache boundary on the east side of the river (3747044 N 329380 E to 3744284 N 328986 E). The site was flooded during early parts of the 2009 survey season, preventing thorough surveys during the first survey period, but dried out as the summer progressed. Habitat varies from marsh in the northeastern portion of the site to young cottonwood, coyote willow, saltcedar and Russian olive adjacent to the river. Four pairs of SWFLs were located during 2009 surveys.

Site BA-10 contained breeding SWFLs in 2009 for the first time since Reclamation began surveying this site. It is a 2.5 km long site on the east side of the river approximately 7.5 km south of the northern refuge boundary (3742787 N 328318 E to 3740664 N 327026 E). Habitat, particularly away from the river, is dominated by sparse saltcedar. Lower terraces adjacent to the river flood occasionally and have become vegetated with various age classes of Russian olive, saltcedar, coyote willow and cottonwood. Three nesting SWFL pairs and one unpaired male occupied a multi-storied habitat patch dominated by saltcedar and cottonwood.

Tiffany Reach

The Tiffany Reach extends from the southern boundary of the Bosque del Apache to the north boundary of Elephant Butte Project Lands (i.e. San Marcial railroad trestle) and encompasses riparian habitat within the active floodplain of the Rio Grande. It includes nine sites which were surveyed three times (a 10th site, LF-26, burned during 2006 and wasn't surveyed). Vegetation in this reach consists primarily of various age classes of saltcedar with occasional patches of native willows and cottonwoods, particularly near the river. A large open-water marsh also exists at the foot of Black Mesa, upstream from the railroad trestle. Portions of this reach routinely receive overbank flooding. A sediment plug in 2005 increased flooding near the southern end of this reach. A total of 10 WIFLs, including one migrant, one unpaired male SWFL and four SWFL pairs, were observed in this reach in 2009 (Table 2).

Site LF-23 is approximately 3 km south of the southern Bosque del Apache NWR boundary on the west side of the river (3731409 N 321097 E to 3730314 N 320381 E). It is dominated by monotypic saltcedar on the western side of the site and cottonwood/tree willow with saltcedar and coyote willow understory adjacent to the river. Two nesting SWFL pairs were documented during 2009 surveys.

Site LF-35 is immediately south of the southern Bosque del Apache boundary on the east side of the Rio Grande (3732924 N 322831 E to 3731979 N 321672 E). The site is approximately 1.5 km in length and a berm/ditch runs the length of the site and breaks the habitat into two main types. On the east side, away from the river, habitat is almost exclusively young to mid-aged saltcedar. An emergent marsh forms during wetter years. On the river side of the berm, habitat is composed of a mix of mid-aged to mature coyote willow,

cottonwood, Goodding's willow and Russian olive with occasional sparse saltcedar understory. Five SWFLs were documented in this site in 2009 consisting of one unpaired male and two SWFL pairs.

San Marcial Reach

This reach is the longest of the survey reaches (45 km) and contains the most survey sites and SWFL territories. The length of this reach has more than tripled since 1995 when surveys began. The gradual recession of Elephant Butte Reservoir during the late 1990's, exposed an additional 32 km of survey area. The reach extends from the north boundary of Elephant Butte Project Lands (i.e. San Marcial railroad trestle) downstream through the delta of Elephant Butte Reservoir. It encompasses 56 sites, both inside and outside the active floodplain, that were surveyed five times each (with the exception of two sites that were excessively flooded during survey periods 2 and 3). Habitat consists of some of the best native SWFL habitat within the subspecies' range. Vast expanses of native Goodding's willow and coyote willow habitat formed in the conservation pool of Elephant Butte Reservoir as the reservoir receded during the late 1990's and early 2000's. Formerly occupied habitat also exists outside the reservoir pool, however, this habitat has degraded during the past several years and much of the native vegetative component has died off. The degraded portion of the river channel provides very little overbank flooding in this reach. However, surface water is provided to the sites on the western side of the reservoir pool by the LFCC outfall and seepage from the adjacent uplands. During 2009 surveys, 580 WIFLs, including 37 migrants, 95 unpaired male SWFL territories, and 224 SWFL pairs, were detected in this reach. The number of SWFL territories within the San Marcial Reach increased dramatically since 1995 and is currently the largest population within its range (Table 2).

Site LF-12 is a narrow site situated between the LFCC and the Rio Grande approximately 7 km downstream of the San Marcial railroad trestle (3723102 N 314765 E to 3721226 N 313069 E). Several years ago, habitat within this site was of very high quality for nesting SWFLs; Goodding's willow, coyote willow and cottonwood were the dominant tree species and overbank flooding occurred regularly. However, channel degradation in 2005 lowered the water table and frequency of flooding and the vegetation has declined greatly. Currently, much of the site is dominated by dead or dying willows and cottonwoods with a dense understory of saltcedar. Narrow strips of coyote willow occur near the riverbank. It is in this coyote willow habitat that one unpaired male SWFL territory was documented in 2009.

Site LF-17 is located in the northern end of the conservation pool of Elephant Butte Reservoir, and south of the LFCC outfall (3718796 N 308899 E to 3718303 N 307471 E). This site was split in two (LF-17 and LF-17b) in 2004 to allow a greater focus on 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 2009 survey season. Habitat is very high quality with mature Goodding's willow dominant and occasional coyote willow, saltcedar, and cottonwoods mixed in. Habitat within the originally occupied northern portion of the site is 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. Habitat within the southern end of the site is a younger age-class and should maintain its suitability longer. Seven unpaired male SWFL territories and 23 pairs were documented during 2009 surveys.

Site LF-17a is located immediately north of LF-17 adjacent to the LFCC outfall (3719016 N 309039 E to 3718308 N 309016 E). Quality habitat adjacent to the LFCC is a mixture of native willow habitat interspersed by high-flow channels filled with cattails (*Typha* sp.). Over the past several years, habitat has expanded so that these cattail-filled high-flow channels have nearly filled in with native willows. A large patch of cattails is still present in the middle of the site and a mixture of saltcedar, young cottonwood and Goodding's willow occurs in the southeastern portion of the site. This site, due to its proximity to the LFCC, was flooded during much of the 2009 survey season. However, sediment deposition has been heavy in this site during the past several years and higher flows in the LFCC are now necessary for overbank flooding. Formal surveys were not conducted within this site. Instead, 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. Twenty-five SWFL pairs and four unpaired male SWFL territories were documented in this site in 2009.

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 (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 dense saltcedar, cattail marsh or cottonwood/willow community. Small patches of moderately-suitable SWFL habitat occur throughout the site with the best being a patch of young cottonwood, saltcedar and coyote willow adjacent to the LFCC. It is in this patch that three SWFL pairs and four unpaired males were documented during 2009 surveys.

Site DL-01a was initially included in Site DL-01, but was split to allow formal surveys to be conducted, while only focused nest/territory searches are conducted in DL-01 to minimize disturbance. The site is in the northern end of the Elephant Butte Reservoir conservation pool approximately 2 km south of the LFCC outfall (3717453 N 308282 E to 3716809 N 307932 E). The majority of habitat in this site is mid-aged saltcedar. Small patches of Goodding's willow, coyote willow and cattails are present on the western edge adjacent to DL-01, where hydrology is condusive. On the eastern edge of the site, there is a large swath of coyote willow, cottonwood, Goodding's willow and saltcedar. Most of the native vegetation has died out due to a lack of groundwater and/or changing soil chemistry. Two migrants, three unpaired males and four pairs were documented in this site in 2009.

Site DL-01 is immediately south of LF-17 in the conservation pool of Elephant Butte Reservoir (3718303 N 307471 E to 3716976 N 306739 E). This site has been one of the most heavily occupied SWFL sites in the Middle Rio Grande for the past three 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 the site. Instead, experienced 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 stands interspersed with occasional saltcedar shrubs. Large, dense patches of cattails extend the length of the site on the western edge. This site also receives regular flooding caused by the breach in the LFCC. Suitable habitat in this site reached a peak around 2005 or 2006, and has begun slowly declining in quality due to prolonged flooding, encroachment of cattails, and over-maturity. Two unpaired male SWFL territories and 12 pairs were documented in this site in 2009.

Site DL-02 is immediately south of DL-01 in the Elephant Butte Reservoir conservation pool (3716809 N 307932 E to 3715299 N 306713 E). Habitat within most of the site is very similar to DL-01, with large stands of mid-aged Goodding's willow and coyote willow, sparse saltcedar understory, and large expanses of cattails. This portion of the site is regularly flooded. The northeastern side of the site, where groundwater is deeper, is dominated by various age classes of saltcedar. This site contained the most SWFL territories of any site in our study area in 2009. SWFLs are concentrated in the high quality native habitat occurring in the middle and western side of the site along the LFCC. Fourteen unpaired SWFL males and 40 pairs were documented in this site in 2009.

Site DL-06 is immediately south of Site DL-02 on the west side of the Rio Grande in the Elephant Butte Reservoir conservation pool (3714748 N 307408 E to 3713090 N 306690 E). High quality SWFL habitat is dominated by coyote willow and Goodding's willow, interspersed by smaller patches of saltcedar and cattail marsh. Much of the site is dry, due its disconnection from the active river channel and distance from the LFCC outfall. However, areas in the southwestern portion of the site receive flooding during high flows in the LFCC. SWFLs occupied these areas in 2009; nine unpaired SWFL males and 15 pairs were documented.

Site DL-07 is located directly south of DL-02 on the east side of the LFCC outfall (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 northern 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. Fifteen unpaired SWFL male territories and 23 SWFL pairs were detected during 2009 surveys.

Site DL-08 is located on the west side of the LFCC outfall south of Dryland Road (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, Goodding's willow, coyote willow and seep willow. Several patches of high quality SWFL habitat exist adjacent to the LFCC outfall and portions of the site are regularly flooded. Territories within this site were

immediately adjacent to the LFCC outfall in mid-age stands of native willows and saltcedar. Three unpaired male SWFL territories and five SWFL pairs were documented.

Site DL-09, located directly south of DL-07 and north of the LFCC outfall/Rio Grande confluence (3713826 N 305732 E to 3711830 N 304474 E), contains habitat that is very similar to DL-07. A large cattail marsh occupies the southern half of the site. Several large patches of high quality Goodding's willow habitat, with sparse saltcedar and coyote willow in the understory, exist along the western side of the site. Much of the site was either flooded or saturated throughout the survey season. Three unpaired male SWFL territories and 36 SWFL pairs were detected in this site during 2009 surveys, making this the second most heavily occupied survey site in the study area.

Site DL-10 is located directly north of the LFCC outfall/Rio Grande confluence and bordered by the Rio Grande on the east (3713090 N 306690 E to 3711593 N 304811 E). Several large swaths of high quality SWFL habitat occur adjacent to the high flow channel running down the center of the site. This habitat consists of Goodding's willow and coyote willow stands interspersed by large swaths of cattail marsh and weedy habitat. The southern half of the site is almost exclusively cattail marsh. Most of this site has been flooded in the past, as evidenced by deep cracks in the soil, but, with the exception of high flow channels, the northern portion rarely contains standing water currently. Nine unpaired male SWFLs and 16 pairs were located in this site in 2009.

Site DL-12 is located immediately west of the densely occupied sites of LF-17, DL-01, and DL-02. The site is narrow and is bounded by the LFCC primary water course along the east and the uplands on the west (3719016 N 309039 E to 3715506 N 306009 E). Areas adjacent the LFCC are flooded during the breeding season. Habitat is comprised of narrow patches of cottonwood, Gooding's willow, and coyote willow. A large cattail marsh separates this site from the occupied sites to the east. SWFLs were first detected within this site in 2009 when two unpaired males and two pairs were recorded.

Site EB-01 is a long, narrow site that runs from the confluence of the LFCC outfall and the Rio Grande to just upstream of Nogal Canyon on the west side of the river (3712009N 304210E to 3708220N 302630E). A majority of this site is cattail marsh. However, strips of relatively suitable SWFL habitat exist adjacent to uplands and the river. This site is regularly flooded both by groundwater and the LFCC outfall. One unpaired male SWFL, and seven pairs were located in this site in 2009.

Site EB-07 runs along the west side of the floodplain approximately 3.5 km upstream of "The Narrows" (3705885N 299727E to 3701965N 299342E). It is a relatively narrow site bounded by uplands to the west and the Rio Grande to the east. Habitat within the site varies from cattail marsh and shrubby *Baccharis* and saltcedar to native patches of coyote and Goodding's willow. Much of the site was flooded during 2009 surveys. One unpaired male SWFL territory was documented in the southern end of the site amidst young Goodding's willow and cattails.

Site EB-09 is located within the pool of Elephant Butte Reservoir immediately upstream of "The Narrows" (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.). The levee to the east of this site was breached during the 2008 and 2009 breeding seasons, allowing water to flow through the site. Flooding within this site improved habitat, but also made surveying difficult during early survey periods. Surveys 2 and 3 were not conducted for safety reasons. One SWFL pair was documented in this site in 2009.

Site EB-10 is immediately upstream of "The Narrows" on the east side of the Rio Grande (3701618 N 299386 E to 3698740 N 298618). Habitat varies widely from sparse, young saltcedar and *Baccharis* to cattail marsh to high quality SWFL habitat in the form of young Goodding's willow. Similar to EB-09, the levee to the west of this site has breached during the past several years allowing river water to enter the site. While this benefits habitat, it makes much of the site inaccessible during periods of high river flows. Surveys 2 and 3 were not conducted for safety reasons. One unpaired male territory was located in this site during 2009.

Site EB-13N is in the middle of "The Narrows" of Elephant Butte Reservoir on the west side of the Rio Grande pilot channel (3695927 N 298637 E to 3694261 N 297523 E). High quality SWFL habitat has developed rapidly in this site due to ample groundwater provided by both the river and seepage from the adjacent uplands. Vegetation within the site consists of Goodding's willow patches of varying ages interspersed with young saltcedar and marsh habitat. During 2009, reservoir levels reached this site and much of the site was flooded throughout the survey season. Three unpaired male SWFLs and one pair were documented.

EB-13S is a narrow, linear site in the southern end of "The Narrows" of Elephant Butte Reservoir (3694261 N 297523 E to 3691076 N 296957 E). Habitat diversity within this site is high. Vegetation ranges from dense young saltcedar to mid-aged patches of Goodding's willow, coyote willow and seep willow to cattail marsh. Large side canyons contain high quality Goodding's willow habitat. Portions of this site are regularly flooded or contain saturated soils due to seepage from the uplands. In 2009, rising reservoir levels flooded most of this site. Five unpaired male SWFLs and one pair were documented during 2009 surveys.

Site EB-14 is across the pilot channel from EB-13S in the southern end of "The Narrows" (3694502 N 297938 E to 3691076 N 296957 E). Habitat is very similar to that found in the EB-13 sites. High quality SWFL habitat in the form of young Goodding's willow is interspersed with young saltcedar, cottonwood, and marsh habitat. This site was flooding by rising reservoir water during much of the 2009 survey season, making access difficult. Five unpaired male SWFLs, and seven pairs were found in this site during 2009.

Nest Searches/Monitoring

In 2009, a total of 333 nests were monitored within the Middle Rio Grande Basin. Of these, 147 nests were successful, while 163 failed, and the outcome of 23 nests was unknown. An estimated

400 SWFLs fledged during the 2009 breeding season. The nests of 223 pairs were found. However, 39 additional pairs were also observed and, although nesting was suspected these nests were not discovered. Successful nests include those which supported chicks at least 9 days old on the last nest visit. Every effort was made to monitor nests until nestlings were at least 10 days old. However, several nests that were not monitored into the late nestling stage were considered to have likely fledged young and were thus included in the successful nest count. Eight nests that were monitored for eight days or less were considered successful based on nesting chronology, post-fledging appearance of the nest and timing of renesting.

The following is a reach-by-reach and site-by-site summary of the SWFL nest monitoring efforts of 2009. It is important to note that the number of nests found per site or reach should not be used as a direct measure of breeding activity. Although every reasonable effort was made to locate the nests of breeding pairs, the availability of qualified personnel and logistics limited the extent of nest searching in some areas. The number of territories found within each reach or site should be used in lieu of nests. See Appendix B for detailed nest site and nest monitoring data forms.

Belen reach

SWFL breeding habitat is limited in this reach and the highest quality habitat consists primarily of developing coyote willow and/or Russian olive on lower terraces and river bars. Nesting SWFLs were first documented in this reach in 2005 when one pair produced two nests in SV-11. No nesting was documented in 2006 until one pair again produced two nests in 2007 in site SV-11. During 2008, one pair in SV-11 produced one nest that successfully fledged three SWFLs. In 2009, again within site SV-11, a total of three pairs produced three nests; one nest fledged a single SWFL, another was predated, and the outcome of the third was unknown. SV-11 is the most southern downstream site within the Belen reach.

Sevilleta/La Joya reach

Unlike the native plant-dominated habitats which support most other SWFL territories in the Middle Rio Grande valley, this reach is dominated by exotic species (saltcedar and Russian olive). Since the discovery of breeding SWFLs in this reach in 1999, SWFL nest numbers increased from 3 in 1999 to a high of 21 in 2004 (Table 4). Since then, nest numbers declined to a low of six in 2007 and then rebounded to 14 in 2009. Nest searching effort in this reach was reduced in 2007 and 2008 due to the abundance of nesting pairs in the San Marcial reach. Thus, pair and territory numbers should be used in place of nests to determine recent population trends in this reach. The greatest number of territories found within this reach over the past 11 years was in 2008 when a relatively disproportionate number of unpaired males comprised 13 of the total 31 territories. In 2009, a total of 18 SWFL territories were detected, however only three of these were unpaired males while 15 territories were pairs. These pairs constructed 14 nests, of which four were renests. Five nests were successful and fledged approximately 14 young. The remaining nine nests failed; five failed due to parasitism and four were predated. The following is a site-by-site breakdown of all SWFL nesting in the Sevilleta/La Joya reach during 2009:

> **SV-06** – Only two territories were found within this site: one pair and one unpaired male. The pair produced a single nest which failed due to BHCO parasitism.

Table 4. Summary of SWFL nest monitoring (1999-2009) – Sevilleta/La Joya reach

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)
1999	4	4	3	0	0	1 (33%)*	0	2 (67%)	5	2.5
2000	8	5	6	2 (33%)*	0	2 (33%)*	0	3 (50%)	6	2.0
2001	11	10	9	4 (50%)*	1 (13%)	0	1	6 (75%)	12	2.0
2002	13	10	13**	4 (31%)*	6 (46%)*	0	0	8 (62%)	16	2.0
2003	17	9	12**	1 (9%)*	3 (27%)*	4 (36%)*	1	4 (36%)	10	2.5
2004	19	18	21**	5 (36%)*	7 (50%)*	0	7	7 (50%)	14	2.0
2005	17	10	10	0	1 (25%)*	2 (50%)*	6	1 (25%)	3	3.0
2006	21	15	18**	4 (25%)*	6 (38%)*	1 (6%)*	2	8 (50%)	20	2.5
2007	14	8	6	2 (33%)*	2 (33%)*	0	0	4 (67%)	11	2.8
2008	31	18	13**	4 (36%)*	3 (27%)*	4 (36%)*	2	4 (36%)	9	2.3
2009	18	15	14**	5 (36%)*	5 (36%)*	0	0	5 (36%)	14	2.8
Total	173	125	125	31 (29%)	34 (32%)	14 (13%)	19	52 (49%)	120	2.3

Note: Unknown nest outcomes were not included in nest variable calculation (i.e. parasitism, predation, abandonment, or nest success).
* Some nests were parasitized, predated, and/or abandoned.
** Some pairs re-nested after failed attempt or attempted a second, third, or fourth brood.

SV-07 – Five SWFL pairs established territories within the SV-07 site in 2009. Only three nests from these pairs were discovered: one successfully fledged a single young, another failed due to BHCO parasitism, and the remaining nest was predated.

SV-09 – Eleven SWFL territories were found in 2009: nine pairs and two unpaired males. A total of 10 nests were monitored, of which 4 were successful [fledging 13 young]. Of the six failed nests: three were parasitized by BHCOs and three were predated.

Bosque del Apache reach

The number of SWFL territories and associated nesting in this reach has been very sporadic over the past eight breeding seasons. From 2002 through 2008, a total of 12 pairs and seven nests were found: then in 2009 alone, 16 pairs and 19 nests were discovered (Table 5). The dramatic increase is likely due in large part to the extent of overbank flooding and the development of suitable habitat within isolated patches of this reach. Nest success in 2009 was 61% (n=18), which was much higher than nest success within the San Marcial Reach (47%, n=273). Only two nests (9%) from 2002 – 2009 have been parasitized, while seven nests (30%) have been predated.

BA-03S – Although SWFL territories had been previously recorded within this site, 2009 was the first year nesting was recorded. A single pair, with one confirmed attempt successfully fledged young.

Table 5. Summary of SWFL nest monitoring (2002-2009) – Bosque del Apache NWR

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)
2002	3	0	0	0	0	0	0	0	0	0
2003	3	1	1	0	0	0	0	1 (100%)	1	1.0
2004	1	1	2**	1 (50%)*	1 (50%)*	0	0	1 (50%)	3	3.0
2005	0	0	0	0	0	0	0	0	0	0
2006	4	1	1	0	1(100%)	0	0	0	0	0
2007	7	6	1	0	0	0	1	0	0	0
2008	5	3	2	0	0	0	2	0	0	0
2009	20	16	19**	1 (6%)	5 (28%)	1 (6%)	1	11 (61%)	28	2.3
Total	43	28	26	2 (9%)	7 (30%)	1 (4%)	3	13 (57%)	32	2.3

Note: Unknown nest outcomes were not included in nest variable calculation (i.e. parasitism, predation, abandonment, or nest success).
* Some nests were parasitized, predated, and/or abandoned.
** Some pairs re-nested after failed attempt or attempted a second, third, or fourth brood.

BA-06N – Like site BA-03S, SWFL territories had been previously recorded within this site, however nesting was never confirmed. In 2009, the first year nesting was recorded, six nests were found; four of these were successful and two failed. One nest failed due to predation and the other was abandoned.

BA-06S – Although a single nest was found within this site in 2008, the outcome was unknown. Until 2009, the 2008 nest was the only one documented in this site. In 2009, five nests were found; three were successful, one was predated, and the outcome of the other was unknown.

BA-07 – Nesting was confirmed in this site during the 2007 and 2008 breeding seasons, however the outcomes were unknown. In 2009, four nests were discovered; one was successful and the remaining three failed. One nest failed due to parasitism and the other two were predated.

BA-10 – Prior to 2009, neither territories nor nesting had been confirmed in this site. In 2009, three nests were discovered; two were successful and the other was abandoned.

Tiffany reach

With the exception of 2004, when 11 nests were documented, the relative number of SWFL nests within this reach has been limited over the past several years. Nest numbers totaled four, one and three in 2005, 2006 and 2007, respectively. During the 2008 breeding season no nesting was documented in this reach, although several territories were confirmed. In 2009, five territories of

which four were comprised of pairs, produced three nests. Only one of these nests was successful; fledging a single young. The remaining two nests were both predated. The following is a brief site summary of these three nests.

LF-23 – Two pairs each produced a single nest within this site. The first pair's nest was predated after hatching, while the second pair was able to successfully fledge a single young.

LF-35 – Only one nest was found in association with the pair at this site. However, the nest that was found was possibly a renest. This nest was predated shortly after two eggs were laid.

San Marcial reach

A total of 224 pairs and 294 nests (including renests and second broods) were documented within this reach in 2009. All but three pairs and three nests occurred within the Elephant Butte Reservoir conservation pool. Nesting activity was confirmed for 192 pairs, while nests for the remaining 32 pairs were more than likely, simply not found. Fledging of SWFL young occurred in 129 of the 273 nests with known outcomes, for an overall nest success rate of 47% (Table 6). The majority of nest failures could be attributed to nest predation which occurred at 90 nests (33%); brood parasitism of 37 nests (14%) also attributed to nest failure. Although nest abandonment often occurs following predation or brood parasitism, abandonment alone as a cause of nest failure occurred at only 26 nests (10%). Nest success or failure of 21 nests was unknown. Approximately 356 fledglings were produced from the 129 successful nests within this reach. Over 1350 nests have been found and monitored within this reach since 1996 (Table 6).

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 2009 SWFL breeding season.

DL-01– SWFL pair and nest numbers in this site have remained relatively steady for the past four years after peaking at a high of 27 pairs and 47 nests in 2004. In 2009, 12 pairs and 14 nests were documented. Six nests successfully fledged young and the remaining eight failed for a 43% nest success.

DL-01a – Although the number of territories and associated nesting is declining within DL-01, the same numbers are increasing within DL01a. The first SWFLs were documented in 2007 when four territories and a single nest were discovered. In 2009, seven territories - four of which were pairs – produced seven nests. Three nests were successful (43 percent success) and four failed. Overall habitat quality has improved within DL-01a over the past few years, primarily due to increased flooding along the western edge of the site.

DL-02 – This site has experienced a steady increase in pair and nest numbers and continues to be the most highly occupied site within the study area. During the 2009 season, a total of 40 pairs were documented and 60 nests were discovered. Of these 60 nests, seven of the outcomes were unknown; 17 were successful, for a nest success rate of 32 percent; and 36 failed.

Table 6. Summary of SWFL nest monitoring in the San Marcial reach (1996-2009).

Year	# Territories	# Pairs (% of total territories)	# Nests found	# Nests parasitized (%)	# Nests predated (%)	# Nests abandoned (%)	Unknown success	# Successful nests (%)	Estimated total # chicks fledged	Estimated productivity (# chicks per successful nest)
1996	13	1 (8%)	1	0	0	1 (100%)	---	0	0	---
1997	10	3 (30%)	2	0	0	0	0	2 (100%)	4	2.0
1998	11	4 (36%)	2	0	0	0	0	2 (100%)	7	3.5
1999	12	5 (42%)	5	1 (20%)*	1 (20%)*	1 (20%)*	0	4 (80%)	10	2.5
2000	23	20 (87%)	19	2 (12%)*	1 (6%)	2 (12%)*	2	14 (82%)	29	2.1
2001	25	25 (100%)	36**	0	7 (19%)	2 (6%)	0	27 (75%)	79	2.9
2002	60	50 (83%)	66**	11 (17%)*	19 (29%)*	6 (9%)*	0	36 (55%)	≥86	2.4
2003	82	67 (82%)	96**	17 (18%)*	31 (33%)*	13 (14%)*	3	48 (52%)	≥126	2.6
2004	113	92 (81%)	153**	25 (17%)*	48 (32%)*	15 (10%)*	4	71 (48%)	187	2.6
2005	107	77 (72%)	127**	16 (13%)*	37 (31%)*	7 (6%)*	7	68 (57%)	≥197	2.9
2006	142	117 (82%)	148**	15 (10%)*	47 (33%)*	11 (8%)	4	83 (58%)	≥213	2.6
2007	197	153 (78%)	220**	29 (14%)*	40 (19%)*	31 (15%)	10	117 (56%)	320	2.7
2008	235	168 (71%)	186**	5 (3%)*	56 (34%)*	16 (10%)	23	87 (53%)	209	2.4
2009	319	224 (70%)	294**	37 (14%)*	90 (33%)*	26 (10%)	21	129 (47%)	356	2.8
Total	1352	1006 (74%)	1355 **	158 (12%)	377 (29%)	131 (10%)	74	688 (54%)	1823	2.6

Note: Unknown nest outcomes were not included in nest variable calculation (i.e. parasitism, predation, abandonment, or nest success).

* Some nests were parasitized, predated, and/or abandoned.

** Some pairs re-nested after failed attempt or attempted a second, third, or fourth brood.

DL-06 – This site has also experienced a large increase in both pairs and nests during the past four years. It has gone from being unoccupied in 2005; to containing 15 pairs and 16 nests in 2009. Nesting was confirmed for 12 of the 15 pairs. Of the 16 nests, 11 were successful for a 69 percent success; and five failed.

DL-07 – Pair numbers in this site have increased from seven in 2005 to 23 in 2009. In 2009, nesting was confirmed for 22 pairs, and 41 nests were discovered. Of these 41 nests, the outcome of three was unknown; 20 were successful (53 percent nest success); and 18 failed.

DL-08 – Five pairs, which produced eight nests were documented in this site in 2009. The number of breeding SWFLs in this site has remained somewhat constant over the past four years, ranging from six to ten territories. Of the eight documented nests in 2009, six were successful (75 percent nest success) and two failed.

DL-09 – The number of breeding pairs within this site dramatically increased in 2009. In 2008, 14 pairs and 11 nests were documented: in 2009 the number of breeding pairs more than double and the number of nests quadrupled within this site. A total of 36 pairs and 48 nests were found in 2009. Of these nests, the outcome of two nests was unknown, 19 failed and 27 were successful (59 percent nest success). This site is second only to DL-02 in the number of SWFL nest found within the study area.

DL-10 – Similar to DL-09, this site has also experienced a significant increase in breeding SWFLs over the past two years. Nesting SWFLs were documented for the first time in this site in 2008, when five pairs and six nests were documented. In 2009, the number of breeding pairs more than tripled to 16 pairs, and the number of nests nearly doubled to 11. Of these 11 nests only four were successful (36 percent success) and seven failed.

DL-12 – Breeding SWFLs were first documented within this site in 2009 when two pairs and one nest was discovered. Unfortunately, the outcome of the nest was unknown.

EB-01 – Like DL-12, breeding SWFLs were first documented within this site in 2009; seven pairs and six nests were discovered. The outcome of one nest was unknown, two failed, and three were successful.

EB-09 – Although a pair of SWFLs has been documented within this site over the past three years, no nests have been found. Survey and nest searching access within this site has been severely limited by flooding during the past two field seasons.

EB-10 – For the first time, a pair of SWFLs was documented within this site in 2009. However, no nest was found.

EB-13S – For each of the past two years, one SWFL pair and one nest have been documented within this site. Both nests failed. Although the number of breeding SWFLs has been limited over the past couple years, the overall number of territories has increased from three in 2008, to six in 2009.

EB-14 – Breeding SWFLs were first documented within this site it 2008, when four pairs and three nests were found. In 2009, the number of breeding SWFLs increased to seven pairs, and eight nests were found. Unfortunately, due to limited access the outcomes of five nests were unknown. Only one nest was confirmed as successful, and two nests failed.

LF-17 – In 2009, 23 pairs and 30 nests were found within this site, which represents a slight increase compared to 2007, or 2008 when 19 pairs were confirmed. Of the 30 nests found in this site during the 2009 season, the outcome of one nest was unknown; 14 nests failed; and 15 were successful (52 percent nest success).

LF-17a – The suitable SWFL habitat within this site is the most densely populated habitat found within the entire study area. The average SWFL territory within LF-17a was approximately 0.11 ha (.27 acres) in size. In 2009, 25 pairs and 39 nests were documented, which is quite consistent with those found in 2007, and 2008. Of the 39 nests found in 2009,

the outcome of one nest was unknown, 24 failed and 14 were successful which equates to a 37 percent nest success. Nest success in 2009 plummeted compared to the 62 percent nest success documented in both 2007 and 2008. Nest predation accounted for 17 of the nest failures, while brood parasitism resulted in only two failures. The remaining five nest failures were attributed to abandonment.

LF-17b – This site was originally a portion of LF-17a. LF-17b was established as a survey site in 2009, and became occupied by two SWFL pairs the same year. Only one nest was found; which was successful.

LF-29 – Although no nesting was documented, a pair of SWFLs did occupy the LF-29 site during the 2009 breeding season. This was the first year that SWFL pairs were detected within this site.

LFCC-01 - Nesting was documented in this site for the first time in 2006. In 2009, three SWFL pairs and three nests were documented within this site. Two of the SWFL nests failed and the other was successful. This is the only site within the San Marcial reach that is not within the current reservoir pool, although historically it was part of the reservoir pool.

Hydrology Monitoring

Data from all 23 hydrostations were analyzed during 2009 and some provided more conclusive results than others. Fourteen were recorded as either dry or saturated soil on at least one date during the six seasons of data collection and most of these instances occurred during the lower flow years of 2004 and 2006. These 14, as shown in Figure 14, dried out at different LFCC flows based on their location relative to the LFCC outfall and other hydrologic characteristics of each site. All but three were flooded when LFCC flows were at least 200 cfs and six of 14 were flooded when flows were at least 100 cfs. Over the duration of the study, as explained below, the average flow at which hydrostations 1 through 4 were recorded dry increased greatly.

Nine hydrostations were continually flooded during the study (8, 10, 11, 14, 17, 20, 21, 22, and 23), even with minimal flows in the LFCC. Regression analysis of LFCC flow rates and water depth at each hydrostation also indicate the persistence of flooding during low LFCC flows. Minimal LFCC flows for the study period were between 10 and 30 cfs, recorded during late July 2004 and between May and early June of 2006. A high water table is more likely responsible for flooding these sites than water from the LFCC. A prolonged period of low or absent LFCC flows, sufficient to lower the water table, would be necessary to remove floodwaters from these sites.

One interesting observation was made concerning hydrostations 1 through 4. During the past six years, LFCC flows required for flooding of these sites have varied significantly. Flooding flows for stations 1, 3 and 4 gradually increased between 2004 and 2009 (Figure 15) with a dramatic increase noted between 2007 and 2009 at hydrostation 2. These changes are due to the fact that these stations are located in the northern end of the conservation pool of Elephant Butte Reservoir and immediately adjacent to the LFCC outfall. Water from the LFCC outfall impacts these stations first, both depositing (aggrading) and removing (degrading) sediment. Water slows as it passes through

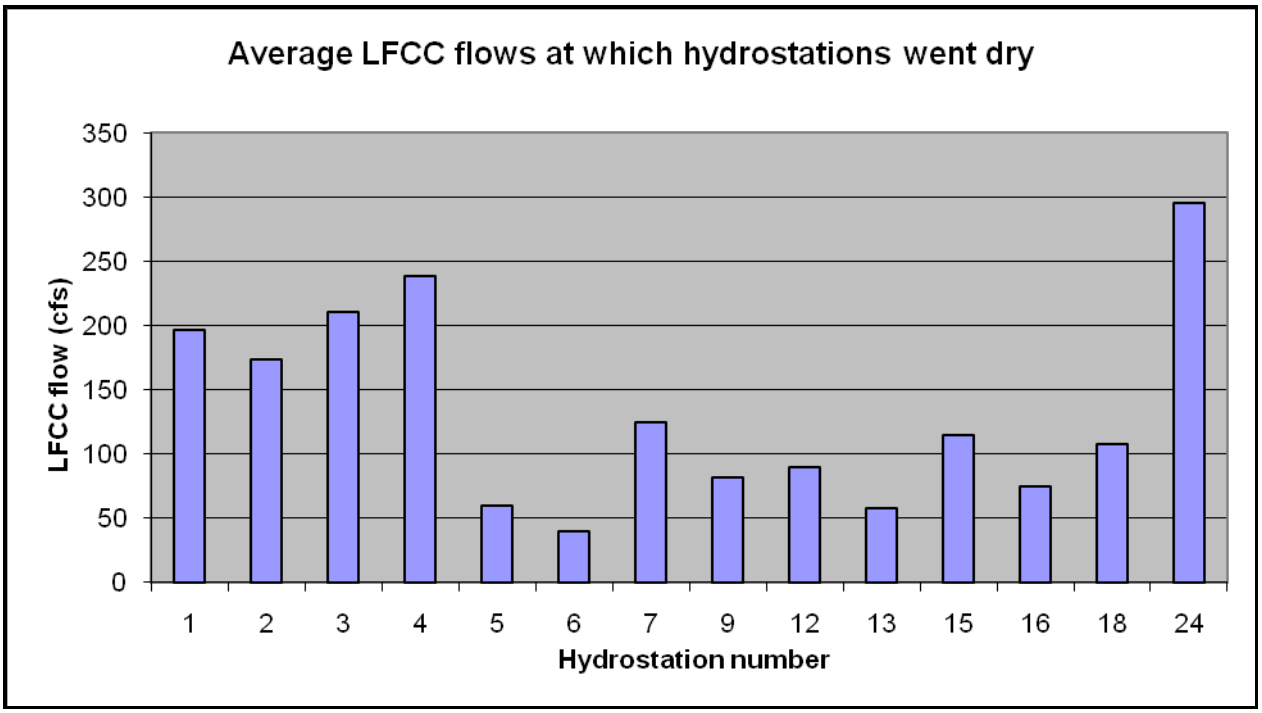
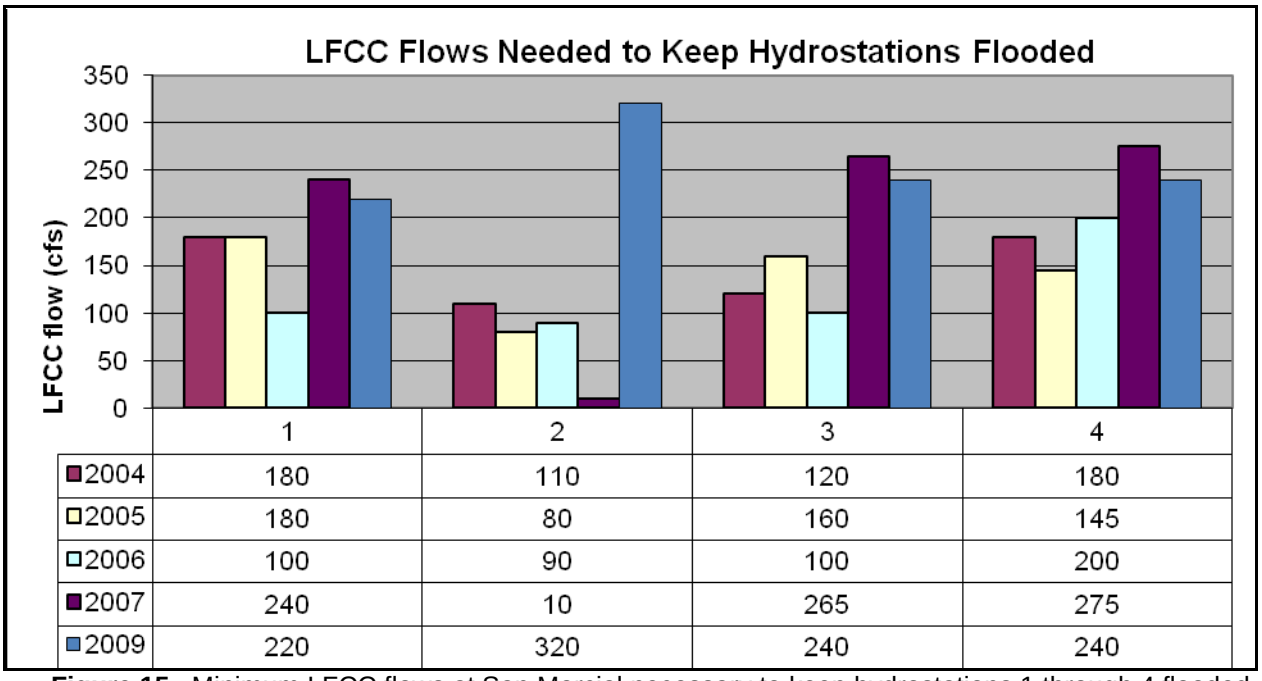


Figure 14. Average flows at which hydrostations went dry (nine did not dry during the study period).



	1	2	3	4
2004	180	110	120	180
2005	180	80	160	145
2006	100	90	100	200
2007	240	10	265	275
2009	220	320	240	240

Figure 15. Minimum LFCC flows at San Marcial necessary to keep hydrostations 1 through 4 flooded during 2004 through 2009. Note overall increasing trends for all stations. Insufficient data gathered for analysis during 2008.

flooded vegetation and much of the suspended sediment drops out. Thus, floodwater depths and flows required for flooding have been more stable for the southern (downstream) stations.

Hydrology data were compared to SWFL nest variables (i.e., success, productivity, predation, and BHCO parasitism). Over the entire study area between 2004 and 2009, 96.6 percent of nests (n = 1172) were within 100 m (328 feet) of surface water and 93.5 percent were within 50 m (164 feet) of surface water. Nesting success, productivity, predation and cowbird parasitism rates were statistically similar for both nests within and outside 50 m from water and nests within and outside 100 m from water (Table 7). Although sample sizes differed greatly, productivity of successful nests was greater, although not statistically significant, for nests both within 50 m and 100 m of water than for those outside of 50 m. Four classes were used to analyze nesting variables based on hydrology immediately under each nest: dry all cycle, saturated/flooded then dry, saturated all cycle and flooded all cycle (a subset of saturated all cycle). [A "Cycle" refers to a nesting attempt from initiation to either failure or fledging.] Of all nests monitored between 2004 and 2009 (n = 1172), 23.0 percent were dry all season, 2.3 percent were saturated or flooded then dry, 74.7 percent were saturated all season, and 46.6 percent were flooded all season. Due to the small sample size, nests that were saturated/flooded then dry were not considered in statistical analyses. Nest success and predation were statistically similar for all three classes. Cowbird parasitism was significantly greater for nests that were dry all season than for those that were saturated or flooded all season (Chi-square test, $\alpha = 0.05$, P = 0.02, Df = 2, $\chi^2 = 7.41$). Also, when compared to the other two classes independently, successful nests that were above dry soil all season produced significantly fewer fledglings than nests that were either above saturated soil all season or above floodwater all season (a subset of saturated all season) (ANOVA, $\alpha = 0.05$, P = 0.01, Df = 2, F-ratio = 4.25). See the Habitat and Nesting Variable Analysis Attachment and Ahlers (2009) for graphical representations of hydrology and nest variable comparisons.

Table 7. Statistical results of hydrology comparisons.

	Hydrological Classification		
	Distance from Water		**Hydrology Under Nest[1]**
Nesting variable	**≥ or < 50 m**	**≥ or < 100 m**	
Success	Same	Same	Same
Predation	Same	Same	Same
Cowbird parasitism	Same	Same	DAC> SAC, FAC
Productivity	Same	Same	DAC < SAC, FAC

[1] DAC = Dry all Cycle; SAC = Saturated all Cycle; FAC = Flooded all Cycle

Discussion

This section presents and discusses various aspects of SWFL study results since 1995, including those from 2009.

Presence/Absence Surveys

Overview of Middle Rio Grande Surveys

As shown in Figure 16, the number of SWFL territories within Reclamation survey sites has dramatically increased since 1999. The vast majority of these territories (86%) have been found within the exposed portion of Elephant Butte Reservoir. Suitable SWFL habitat developed within the exposed reservoir pool in conjunction with the receding reservoir from the late-1990s to 2005. Other smaller patches of suitable habitat also developed within various reaches of the study area. Typically, these other patches were on low lying terraces immediately adjacent to the Rio Grande that were subject to overbank flooding during high flow periods. Conversely, with rare exception, SWFL habitat within Elephant Butte Reservoir that developed was established and maintained by flows from the Low Flow Conveyance Channel or seeps from the adjacent uplands – not the Rio Grande channel.

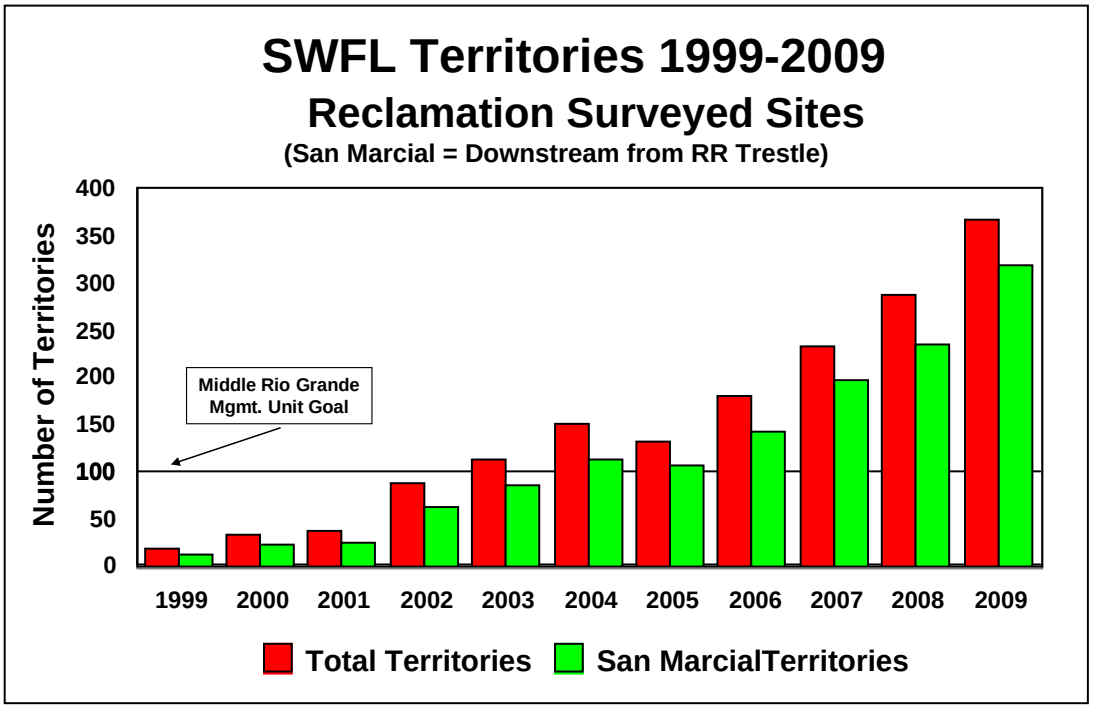


Figure 16. Overview of SWFL territories within the Middle Rio Grande - 1999-2009.

The SWFL recovery plan (USFWS 2002) established a recovery goal of 100 territories for the Middle Rio Grande Management Unit, which is one of six Management Units within the larger Rio Grande Recovery Unit. This goal was achieved in 2003, and has been exceeded every year since. In 2009, 367 SWFL territories were documented within Reclamation surveyed sites along the Middle Rio Grande. The remaining portion of this section discusses the number, trends, and distribution of SWFL territories within each of the respective reaches since surveys were initiated.

Velarde reach

The number of SWFL territories in this survey reach has declined from a high of six in 1995 to one or zero between 2001 and 2009 (Table 8). No territorial SWFLs have been documented within the three surveyed Velarde sites since 2006. The habitat quality within the La Canova, La Rinconada, and Garcia Acequia sites has not visually declined, and may actually have improved in recent years. It is likely that limiting factors, such as predation and brood parasitism, are acting in concert with the restricted extent of available habitat to affect this local population which appears 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 Ohkay Owingeh. Current trends seem to indicate that this small population in the Velarde reach has become unsustainable.

Table 8. Reach summary of SWFL territories/pairs in lands within the active floodplain of the Rio Grande surveyed by Reclamation between 1995 and 2009.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
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	0	0	0
Frijoles	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	1 T 0 P	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	10 T 1 P	4 T 1 P	3 T 3 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 15 P	14 T 8 P	31 T 18 P	18 T 14 P
San Acacia	n/s	0	0	0	0	0	0	0	0	0	0	0	0	2 T 0 P	1 T 0 P
Escondida	n/s	n/s	0	0	0	0	0	4 T 0 P	0	0	0	1 T 0 P	0	1 T 0 P	0
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	7 T 6 P	5 T 3 P	20T 16 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	4 T 3 P	8 T 3 P	5 T 4 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	197 T 153 P	235 T 168 P	319 T 224 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	232 T 171 P	287 T 193 P	369 T 264 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.

Any restoration plans for this reach should be carefully considered. Suitable habitat does exist within this reach, and several sites were once occupied with breeding SWFLs. However, only one SWFL nest was ever confirmed as successful. Therefore, creation of additional habitat within this reach would likely be unoccupied, and if it did become occupied with breeding SWFLs it would likely serve as a population sink based on historic data from this area.

Frijoles reach

This reach was first surveyed by Reclamation during 2008 and one late migrant (located on June 16th and considered a territory) was documented. In 2009, a lone male was detected on both the June 13th survey and the July 3rd survey at the same location. Unfortunately, pairing could not be confirmed and the territory was designated as that of an unpaired SWFL male (Table 8). Habitat within this reach is somewhat patchy, although several large patches of high quality habitat do exist. The quality and extent of suitable SWFL habitat within this reach is second only to that found within the Elephant Butte Reservoir portion of the San Marcial reach. This reach is utilized by migrating WIFLs and is likely to become occupied by breeding SWFLs in the near future.

Belen reach

This reach was first surveyed in 2002 and one SWFL territory was detected. Since then, a small number of unpaired male territories have been documented in various sites within this reach (Table 8). However, the few breeding pairs that have been found were all within a single site (SV-11) immediately upstream of the confluence of the Rio Puerco and Rio Grande. In 2009, three territories comprising three pairs were found within the SV-11 site. These were the only SWFLs documented within the Belen reach during the 2009 season.

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 territories were documented in 2008 and 2009. This reach receives very little overbank flooding, with the exception of a few low lying areas. Small patches of habitat continue to improve in quality, particularly in areas where restoration projects have been initiated 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, the population in this reach has the potential for growth in the near future.

Sevilleta/La Joya reach

SWFLs in the Sevilleta/La Joya reach were first documented in 1999 while conducting routine avian point counts. Limited surveys were conducted and four territories all comprised of pairs were confirmed. It is impossible to know how many SWFLs may have occupied the site prior to 1999, and comprehensive surveys were not initiated throughout the reach until 2000. However, since 2000 the number of territories and pairs increased through 2004 (Table 8). Since then, territory numbers have remained relatively constant. In 2009, 18 territories comprised of 15 pairs and three unpaired males occupied habitat within the SV-06, SV-07, and SV-09 survey sites.

Large patches of habitat in these sites have become increasingly suitable for breeding SWFLs during the past six or seven years. Conversely, the large SWFL population (10 territories) that once

occupied site SV-03 dwindled to zero territories in 2009. Several large saltcedar trees within the occupied portion of SV-03 were blown down during the winter of 2006-2007, altering the density and structure of habitat and reducing its suitability for breeding SWFLs. There is still ample suitable habitat within this reach for additional SWFLs to occupy.

Population expansion within this reach is also of significant interest due to the type of habitat present. A mixed vegetative community in the form of saltcedar, Russian olive and coyote willow dominates the majority of occupied sites in this reach, particularly sites SV-03, 06 and 07. Overbank flooding in this reach is limited but flooding or saturated soils are present near much of the occupied habitat. The proximity to water, density and vertical stratification of vegetation and scattered patches of native habitat seem to make certain sites more 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. High river flows during the past three years have resulted in some overbank flooding that has promoted reestablishment of native vegetation along lower terraces and river bars. In 2008, two SWFL territories within this reach were discovered, which were the first ones found since surveys began in 1996 (Table 8). In 2009, a single unpaired male was found on June 13th and again on June 23rd at the same location. Pairing was not confirmed and the territory was designated as that of an unpaired male. Due to the limited habitat within this reach it is unlikely that a substantial number of SWFL territories will become established anytime in the near future.

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.

This reach of the river seldom receives any overbank flooding and several patches of native vegetation are dying or becoming more decadent. A small number of resident SWFLs have been documented in this reach since 2002, most of which have been late migrants that were considered residents due to dates of detection (Table 8). In 2009, no SWFL territories were discovered within this reach. Considering the limited extent of suitable habitat in this reach, it is unlikely that a substantial population of resident SWFLs will occupy this reach in the near future.

Bosque del Apache reach

SWFL territories within the active floodplain of the Bosque del Apache NWR were few in number and broadly distributed throughout the reach during the 2002-2008 period. The number of SWFL territories during this seven year period ranged from zero to seven. However, in 2009 the number of SWFL territories dramatically increased to 20 territories comprised of 16 pairs and four unpaired males (Table 8). As predicted in last year's report, "Flooding in 2007 and 2008 will likely promote development of higher quality SWFL habitat and it will be interesting to see if larger populations develop in this reach", the attractiveness of habitat did improve due to overbank flooding and the SWFLs responded accordingly. Due to relatively high nesting success (greater than 60 percent) and

the presence of flooded suitable habitat, it is likely that the number of SWFL territories within this reach will increase during the 2010 breeding season.

Tiffany reach

In 2004 a comprehensive survey of this reach was conducted for the first time since 1996 and 16 territories were documented. Since then, the population has fluctuated between three and nine territories. 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. Possibly, the availability of higher quality habitat elsewhere on the Middle Rio Grande may have caused some birds to relocate. In 2009, five territories comprising four pairs and one unpaired male were documented. Although this reach once supported the largest known breeding population of SWFLs within the Middle Rio Grande in a patch referred to as the "Condo Site" by NMNHP (1994), it currently appears that this reach is incapable of sustaining a large SWFL population.

San Marcial reach

SWFL surveys have been conducted in this reach since 1995 (Table 8). Since then, the number of SWFL territories and available habitat within the San Marcial reach has significantly increased (Figure 17). Since 2000, a majority of these territories have occurred in the conservation pool of Elephant Butte Reservoir. As reservoir levels decreased during the late-1990s and early-2000s, vast expanses of primarily native habitat developed on the western side of the floodplain. This habitat consists of dense Goodding's and coyote willow of various age classes and is provided with water by the LFCC outfall. SWFLs first occupied suitable habitat in the uppermost reaches of the reservoir (sites LF-17 and LF-17a) and expanded downstream as habitat became suitable. During this same period, channel degradation and lower flows within the Rio Grande caused habitat upstream of the reservoir pool in the San Marcial reach to decline in quality. Due to these factors, the vast majority of SWFL territories within this reach, and the study area as a whole, are found within the reservoir pool.

In 2009, 319 SWFL territories were found within the San Marcial reach. Pairs were confirmed at 224 territories and the remaining 95 territories were classified as unpaired males. Habitat modeling conducted during summer and fall of 2008 indicates that habitat is not a limiting factor to this population (Reclamation 2009). It is likely that, in the absence of some stochastic event, this

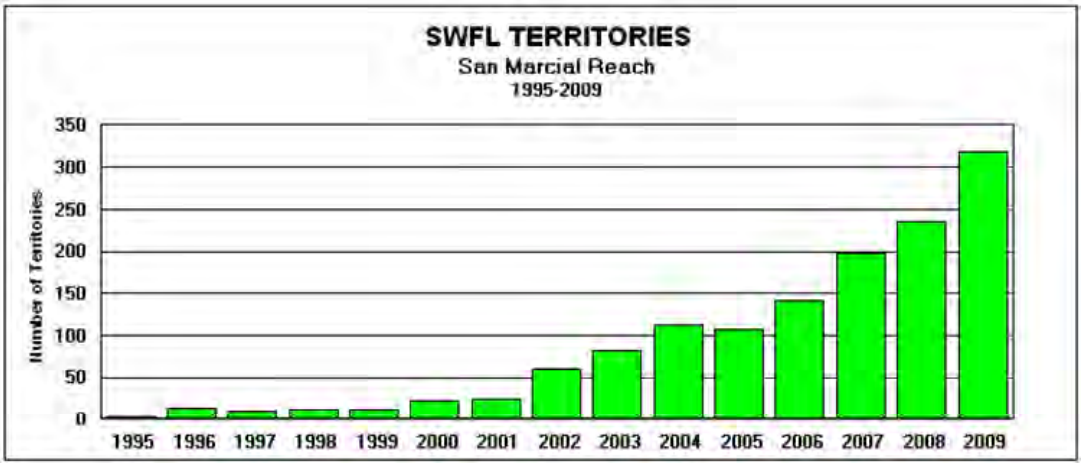


Figure 17. SWFL territories within the San Marcial reach - 1995-2009.

population will continue to expand into the near future.

As stated above, the LFCC provides water to much of the high quality SWFL habitat on the western portion of the floodplain. As described in the Hydrology Results section of this report, large portions of these sites are continually flooded, even with low flows in the LFCC. Habitats within these areas are beginning to show signs of stress in the form of reduced plant vigor and even death of individual trees. As this occurs, cattails and other emergent vegetation encroach on areas of monotypic willow habitat and vast expanses of cattails currently occupy large portions of sites LF-17, DL-01 and DL-02. A prolonged period of reduced LFCC flows sufficient to lower the water table in the flooded areas would likely be necessary to remove floodwaters from these sites and may actually be beneficial to the willow habitat in some areas.

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

Overview of Middle Rio Grande Nest Monitoring

General Nesting Data

During the 2009 SWFL breeding season a total of 310 nests of known outcomes were monitored. The results of this monitoring effort are summarized in Table 9. Overall parasitism, predation and abandonment rates were similar to those observed in previous years (Table 9 and Table 10). Nest success during the 2009 season was lower than the cumulative nest success over the past 11 years. Nest success in 2009 was 47.4 percent, compared to the 11 year overall nest success rate of 53.3 percent. Several patches of heavily occupied habitat within the upper pool of Elephant Butte Reservoir experienced lower than normal nest success rates during the 2009 season (e.g. Site 17a = 37 percent; DL-01 = 43 percent; DL-02 = 32 percent). These sites comprised a large percentage of the total nests, which reduced the overall nest success rate in 2009. Habitat within these sites, as discussed in the previous section, is beginning to show signs of stress presumably due to prolonged flooding, and habitat suitability is beginning to decrease.

The vast majority (77.1 percent) of SWFL nests found during the 2009 season were within *Salix* dominated territories, compared to only 1.6 percent found within exotic dominated territories (Table 9). Although only 1.6 percent were found within exotic dominated territories (i.e. saltcedar), 38.4 percent of the nests were found physically constructed in saltcedar. This disproportional use of saltcedar as the nest substrate suggest a preference for selecting saltcedar as the nest substrate.

Statistical analysis among the various nest parameters is generally difficult for a single year's data due to often small and skewed sample sizes. Therefore, statistical analysis for any given year was not typically conducted, however analysis was conducted when nest data over several years (i.e. 1999-2009) was combined resulting in larger sample sizes. This is not intended to imply that

Table 9. Summary of 2009 SWFL nesting parameters within the Middle Rio Grande.

General Nest Data		
Parasitism Rate 13.9% (43 out of 310 nests)		
Predation Rate 33.2% (103 out of 310 nests)		
Abandonment Rate 8.7% (27 out of 310 nests)		
Nest Success 47.4% (147 out of 310 nests)		
Territory Vegetation Type		
Number of nests in exotic-dominated territories	5	1.6% of total
Number of nests in *Salix*-dominated territories	239	77.1% of total
Number of nests in mixed dominance territories	66	21.3% of total
Nest Substrate Species		
Number of nests in *Salix* substrate	188	60.7% of total
Number of nests in saltcedar substrate	119	38.4% of total
Number of nests in Russian olive substrate	2	0.7% of total
Number of nests in other (*Baccharis*/cottonwood) substrate	1	0.3% of total
Nest Substrate/Territory Vegetation Combination		
Number of nests in saltcedar substrate within *Salix*-dominated territories	67	(28.0% of 239 nests)
Number of nests in *Salix* substrate within exotic or mixed dominance territories	16	(22.5% of 71 nests)
Nest Success Per Nest Substrate Species		
Percentage of successful nests in *Salix* substrate	47.9%	(90 out of 188 nests)
Percentage of successful nests in saltcedar substrate	47.1%	(56 out of 119 nests)
Percentage of successful nests in Russian olive substrate.	0%	(0 out of 2 nests)
Percentage of successful nests in other (*Baccharis*/cottonwood) substrate	100.0%	(1 out of 1 nests)
Nest Success Per Territory Vegetation Type		
Percentage of successful nests in *Salix*-dominated territories	49.8%	(119 out of 239 nests)
Percentage of successful nests in exotic-dominated territories	40.0%	(2 out of 5 nests)
Percentage of successful nests in mixed dominance territories	39.4%	(26 out of 66 nests)
Cowbird Parasitism Per Nest Substrate Species		
Percentage of nests parasitized in *Salix* substrate	13.3%	(25 out of 188 nests parasitized)
Percentage of nests parasitized in saltcedar substrate	14.3%	(17 out of 119 nests parasitized)
Percentage of nests parasitized in Russian olive substrate	50.0%	(1 out of 2 nests parasitized)
Percentage of nests parasitized in other (*Baccharis*/cottonwood) substrate	0%	(0 out of 1 nests parasitized)
Cowbird Parasitism Per Territory Vegetation Type		
Percentage of nests parasitized in *Salix*-dominated territories	13.4%	(32 out of 239 nests)
Percentage of nests parasitized in exotic-dominated territories	0%	(0 out of 5 nests)
Percentage of nests parasitized in mixed dominance territories	16.7%	(11 out of 66 nests)
Productivity[(1)] Per Territory Vegetation Type		
Productivity of nests found in *Salix*-dominated territories	2.73/nest	(325 young from 119 nests)
Productivity of nests found in exotic-dominated territories	3.00/nest	(6 young from 2 nests)
Productivity of nests found in mixed dominance territories	2.65/nest	(69 young from 26 nests)
Productivity[(1)] Per Nest Substrate Species		
Productivity of nests found in *Salix* substrate	2.71/nest	(244 young from 90 nests)
Productivity of nests found in saltcedar substrate	2.75/nest	(154 young from 56 nests)
Productivity of nests found in Russian olive substrate	0/nest	(0 young from 0 nests)
Productivity[(1)] Compared to Nest Substrate Species and Territory Vegetation Type		
Productivity of nests in *Salix* substrate within *Salix* dominated territories	2.72/nest	(231 young from 85 nests)
Productivity of nests in saltcedar substrate within *Salix* dominated territories	2.76/nest	(94 young from 34 nests)
Productivity of nests in saltcedar substrate within exotic dominated territories	3.00/nest	(6 young from 2 nests)
Total SWFL nests of known outcomes monitored during 2009	310	

Note: Summary data only from nests with known outcomes
([1])Productivity is defined as the number of SWFL young fledged per successful nest.

Table 10. Summary of SWFL nesting parameters within the Middle Rio Grande – 1999 to 2009.

General Nest Data		
Parasitism Rate 13.3% (190 nests out of 1433 nests)		
Predation Rate 29.3% (420 nests out of 1433 nests)		
Abandonment Rate 9.5% (136 nests out of 1433 nests)		
Nest Success 53.3% (764 nests out of 1433 nests)		
Territory Vegetation Type		
Number of nests in exotic-dominated territories	59	4.1% of total
Number of nests in *Salix*-dominated territories	1125	78.5% of total
Number of nests in mixed dominance territories	249	17.4% of total
Nest Substrate Species		
Number of nests in *Salix* substrate	859	59.9% of total
Number of nests in saltcedar substrate	532	37.1% of total
Number of nests in Russian olive substrate	37	2.6% of total
Number of nests in other (*Baccharis*/cottonwood) substrate	5	0.4% of total
Nest Substrate/Territory Vegetation Combination		
Number of nests in saltcedar substrate within *Salix*-dominated territories	320	(28.4% of 1125 nests)
Number of nests in *Salix* substrate within exotic or mixed dominance territories	56	(18.2% of 308 nests)
Nest Success Per Nest Substrate Species		
Percentage of successful nests in *Salix* substrate	54.1%	(465 out of 859 nests)
Percentage of successful nests in saltcedar substrate	51.5%	(274 out of 532 nests)
Percentage of successful nests in Russian olive substrate.	59.5%	(22 out of 37 nests)
Percentage of successful nests in other (*Baccharis*/cottonwood) substrate	60.0%	(3 out of 5 nests)
Nest Success Per Territory Vegetation Type		
Percentage of successful nests in *Salix*-dominated territories	54.8%	(617 out of 1125 nests)
Percentage of successful nests in exotic-dominated territories	50.8%	(30 out of 59 nests)
Percentage of successful nests in mixed dominance territories	47.0%	(117 out of 249 nests)
Cowbird Parasitism Per Nest Substrate Species		
Percentage of nests parasitized in *Salix* substrate	12.0%	(103 out of 859 nests parasitized)
Percentage of nests parasitized in saltcedar substrate	15.0%	(80 out of 532 nests parasitized)
Percentage of nests parasitized in Russian olive substrate	16.2%	(6 out of 37 nests parasitized)
Percentage of nests parasitized in other (*Baccharis*/cottonwood) substrate	20.0%	(1 out of 5 nests parasitized)
Cowbird Parasitism Per Territory Vegetation Type		
Percentage of nests parasitized in *Salix*-dominated territories	11.7%	(132 out of 1125 nests)
Percentage of nests parasitized in exotic-dominated territories	22.0%	(13 out of 59 nests)
Percentage of nests parasitized in mixed dominance territories	18.1%	(45 out of 249 nests)
Productivity[(1)] Per Territory Vegetation Type		
Productivity of nests found in *Salix*-dominated territories	2.65/nest	(1633 young from 617 nests)
Productivity of nests found in exotic-dominated territories	2.27/nest	(68 young from 30 nests)
Productivity of nests found in mixed dominance territories	2.56/nest	(299 young from 117 nests)
Productivity[(1)] Per Nest Substrate Species		
Productivity of nests found in *Salix* substrate	2.67/nest	(1241 young from 465 nests)
Productivity of nests found in saltcedar substrate	2.57/nest	(703 young from 274 nests)
Productivity of nests found in Russian olive substrate	2.23/nest	(49 young from 22 nests)
Productivity[(1)] Compared to Nest Substrate Species and Territory Vegetation Type		
Productivity of nests in *Salix* substrate within *Salix* dominated territories	2.66/nest	(1174 young from 442 nests)
Productivity of nests in saltcedar substrate within *Salix* dominated territories	2.63/nest	(457 young from 174 nests)
Productivity of nests in saltcedar substrate within exotic dominated territories	2.20/nest	(55 young from 25 nests)
Total SWFL nests of known outcomes monitored from 1999-2009	1433	

Note: Summary data only from nests with known outcomes 1999-2009
([1])Productivity is defined as the number of SWFL young fledged per successful nest.

comparison among some parameters on an annual basis is not warranted or valid. Although statistical analysis was not conducted, nests physically constructed in saltcedar during the 2009 season were as successful as those placed in *Salix*, 47.1 percent and 47.9 percent, respectively (Table 9). Parasitism rates among nests in saltcedar and *Salix* were also similar, 14.3 percent and 13.3 percent; as were productivity rates of successful nests between saltcedar and *Salix*; 2.75/nest and 2.71/nest, respectively. The productivity of successful nests based on the dominant vegetation within the respective territories was not comparable due to heavily skewed sample sizes; 119 nests were found within *Salix* dominated territories, while only two were found within exotic (i.e. saltcedar) dominated territories (Table 9).

Over the past eleven years, a total of 1433 SWFL nests (with known outcomes) have been monitored along the Middle Rio Grande. Although it can be difficult to draw conclusions from a single year's data, combining nest data over several years significantly increases the sample size, allowing for more valid comparisons of similarities and differences. Table 10 and this section of the report provide details of habitat comparisons for SWFLs nesting along the Middle Rio Grande between 1999 and 2009. Graphical illustrations of some key nesting parameters are also provided in the Attachment. Some of the key nesting parameters include habitat use and selection, nest success, productivity based on surrounding vegetation and the nest substrate, as well as the role hydrology plays in both nest success and productivity. Statistical comparisons between categories were made where appropriate.

General nest data from the 1433 monitored nests indicate an overall brood parasitism rate of 13.3 percent; a nest predation rate of 29.3 percent; a nest abandonment rate of 9.5 percent; and an overall nest success rate of 53.3 percent over the past 11 years. Although annual results were similar to the 11 year overall rates, the combined data set helps to decrease the annual variability often observed. Sound management decisions are best made using data from a number of years, and should not typically be based on a single year's dataset.

Nest substrate selection and habitat use were also evaluated. From 1999-2009, data on the nest substrate (i.e. what species the nest was physically constructed in) and dominant vegetation within the territory were collected at all 1433 nests of known outcomes. It is likely that the vegetative density and structure, along with hydrology, play a greater role in territory selection than species composition. However, as shown in Table 10, 78.5 percent of the SWFL territories were dominated by *Salix* spp., and only 4.1 percent of the territories were dominated by saltcedar. The remaining nests were found in mixed dominance stands (17.4 percent). From these data it is clearly evident that SWFLs select native dominated stands far more often than exotic dominated stands when establishing territories on the Middle Rio Grande. However, a disproportionate use of saltcedar as the nest substrate is also apparent. SWFLs selected saltcedar as the nest substrate 37.1 percent of the time, compared to 59.9 percent for *Salix spp*. These data suggest a preference for establishing territories within native dominated stands, but selecting saltcedar as the substrate when constructing a nest. It is likely that the preference for saltcedar as the nest substrate is due to the natural twig structure that saltcedar provides.

> An analysis was conducted to determine whether nests in mixed-dominance territories (n=249) or native dominated territories (n=1125) were more successful. Interestingly, a statistical difference in nest success did exist between these two data sets ($\chi^2 = 5.06$, df = 1, $P = 0.03$) (Table 11). Nests found in native dominated territories were more successful. A

possible explanation for the difference may be that the mixed stands of vegetation tend to be drier and perhaps lack in structure and/or density, and possibly a little less suitable when compared to the native stands. [The sample size of nests found in exotic (i.e. saltcedar) dominated territories (n=59) compared to 1125 nests in native habitats did not allow for a valid comparison due to the heavily skewed sample sizes]

A statistical analysis comparing nest success and nest substrate was also conducted. Nest constructed in *Salix sp*p. (n=859) were compared to those found in saltcedar (n=532). No statistical difference was detected (χ^2 = 0.91, df = 1, *P* = 0.34) (Table 11). The number of nests found in Russian Olive (n=37) from 1999-2009 did not allow for statistical comparison.

Table 11. Details of habitat comparison statistical tests performed on SWFL nest habitat data from 1999 – 2009 in the Middle Rio Grande.

Chi-square Test (α = 0.05)		
Comparison	Df and χ^2 value	*P*-value
Success and dominant territory vegetation (native vs. mixed)	Df=1, 5.06	0.03
Parasitism and dominant territory vegetation (native vs. mixed)	Df=1, 7.30	0.01
Success and substrate species (*Salix* vs. saltcedar)	Df=1, 0.91	0.34
Parasitism and substrate species (*Salix* vs. saltcedar)	Df=1, 2.67	0.10
Nest success based on Hydrology under the Nest	Df=2, 1.51	0.47
Predation Rates based on Hydrology under the Nest	Df=2, 3.22	0.20
Parasitism Rates based on Hydrology under the Nest	Df=2, 7.41	0.02
Anova (α = 0.05)		
Comparison	Df and F-ratio	*P*-value
Productivity of Successful Nests based on Hydrology under the Nest	Df=2, 4.25	P=0.01
W-test (α = 0.05)		
Comparison	W	*P*-value
Productivity and dominant territory vegetation (native vs. mixed)	-1700.5	0.38
Productivity and substrate species (native vs. saltcedar)	-4326.0	0.10

Data from known nest outcomes only. For all tests, degrees of freedom = 1.
* Due to small sample size of exotic-dominated territories, only *Salix*- and mixed-dominance territories included in statistical analyses.
Yellow = statistical significance

Although nest success is obviously a very important parameter to monitor when attempting to predict future population trends, nest productivity must also not be overlooked. Nest productivity among the dominant vegetation communities and nest substrates were compared using data from successful nests. A successful nest is defined as one which fledges at least one SWFL chick.

A statistical analysis was conducted to determine whether successful nests in mixed-dominated territories (n=117) or native dominated territories (n=617) were more productive. A statistical difference in nest productivity between these two data sets did not exist (W= -1700.5, *P* = 0.38) (Table 11). [The sample size of successful nests found in exotic (i.e. saltcedar) dominated territories (n=30), compared to 617 successful nests in native habitats did not allow for a valid comparison.]

An analysis comparing productivity rates and nest substrate was also conducted. The productivity of successful nests constructed in *Salix* spp. (n=465) were compared to those

found in saltcedar (n=274). No statistical difference was detected (W= -4326.0, $P = 0.10$) (Table 11). The number of successful nests found in Russian Olive (n=22) from 1999-2009 did not allow for statistical comparison.

Nesting Parameters and Hydrology immediately under the Nest

An in-depth study to evaluate the role that surface hydrology plays in various nesting parameters was initiated in 2004. The data set includes all 1172 nests of known outcomes from 2004 through 2009. Four different hydrologic conditions were assessed: 1) Dry all cycle; 2) Saturated/Flooded then Dry; 3) Saturated/Flooded all Cycle; and 4) Flooded all Cycle. Since hydrologic conditions are known to change throughout the breeding season, only the conditions during the respective nest cycle were evaluated. Also, it is important to note the "Flooded all Cycle" is a subset of "Saturated/Flooded all Cycle". The "Flooded all Cycle" dataset was established to determine whether the physical presence of water during the respective nesting cycle influenced the various nesting parameters. Graphical illustrations of the study results are presented in the Attachment.

A test to determine whether nests under three different hydrologic conditions experienced similar nest success was conducted. [The sample size of nests (n=27) with "Saturated/Flooded then Dry" did not allow for a valid comparison.] Although the percentage of successful nests found under "Dry all Cycle" (49 percent, n=269) was slightly less than highest nest success found under "Saturated/Flooded all Cycle" (53 percent, n=876), no statistical difference was detected ($\chi^2 = 1.51$, df = 2, $P = 0.47$) (Table 11). The reason nests found under the "Dry all Cycle" hydrologic conditions experienced the lowest nest success is because these nests also experienced the highest nest predation rates and the highest parasitism rates, when compared to the other hydrologic conditions.

A similar analysis comparing nest predation and the various hydrologic conditions was also conducted. [The sample size of nests (n=27) with "Saturated/Flooded then Dry" did not allow for statistical analysis.] The highest predation rates were observed under the "Dry all Cycle" (36 percent, n=269), while the lowest predation rates were observed under the "Saturated/Flooded all Cycle" (30 percent, n=876). No statistical difference was detected ($\chi^2 = 3.22$, df = 2, $P = 0.20$) (Table 11). It is possible that these nests under "Dry all Cycle" experienced higher nest predation due to reduced foliage density and subsequently reduced nest concealment and/or these nests may have been accessible to a wider range of potential predators compared to those found under saturated or flooded conditions.

Productivity rates of successful SWFL nests under the various hydrologic conditions were also evaluated. An ANOVA of the three hydrologic conditions that supported adequate sample sizes was conducted. [The sample size of nests (n=27) with "Saturated/Flooded then Dry" did not allow for a valid comparison.] The highest productivity was observed from nests found within the "Flooded all Cycle" dataset (2.74 young/nest, n=283), while the lowest productivity was observed from nests that were within the "Dry all Cycle" dataset (2.49 young/nest, n=131). A statistical difference was documented (F-ratio = 4.25, df = 2, $P = 0.01$) (Table 11). The reason for the difference is not readily apparent, however possible reasons include partial nest predation from cowbirds, resulting in reduced clutch size. Drier sites also experienced higher temperatures and lower relative humidity, both of which may reduce nest productivity.

Role and Usage of Saltcedar

Although this section discusses the nest parameters of the entire Middle Rio Grande SWFL population, a brief discussion of the population within Elephant Butte Reservoir is warranted when discussing the dominance and use of saltcedar in SWFL territories. Native vegetation (i.e. Goodding's willow) is the primary component of most SWFL territories within Elephant Butte Reservoir. However, over the period of study there has been a gradual increase in the number of territories found in mixed stands of native and exotic, and a gradual increase in the number of nests placed in saltcedar substrate.

The increased use of saltcedar as the nest substrate and its dominance within occupied SWFL territories within Elephant Butte Reservoir appears to correlate with a 2005 river channel degradation event. This resulted in a lowering of the water table, depriving some occupied, native-dominated stands of water, favoring the more drought-tolerant saltcedar. In 2002, 100 percent of all SWFL territories were found within native dominated stands; in 2009, 80.0 percent were considered as native dominated (Figure 18). The trend towards an increased use of saltcedar as the nest substrate (Figure 19) is likely due to an increased abundance of saltcedar within the currently occupied sites. Several of the occupied stands in the upper pool elevations appear to be slowly transitioning from native to exotic, increasing the abundance of saltcedar. In 2002, 29.2 percent of the nests were found in saltcedar, compared to 40.4 percent in 2009 (Figure 19). Based on current conditions, this trend in saltcedar dominance and use by SWFLs within the Elephant Butte Reservoir population will likely continue.

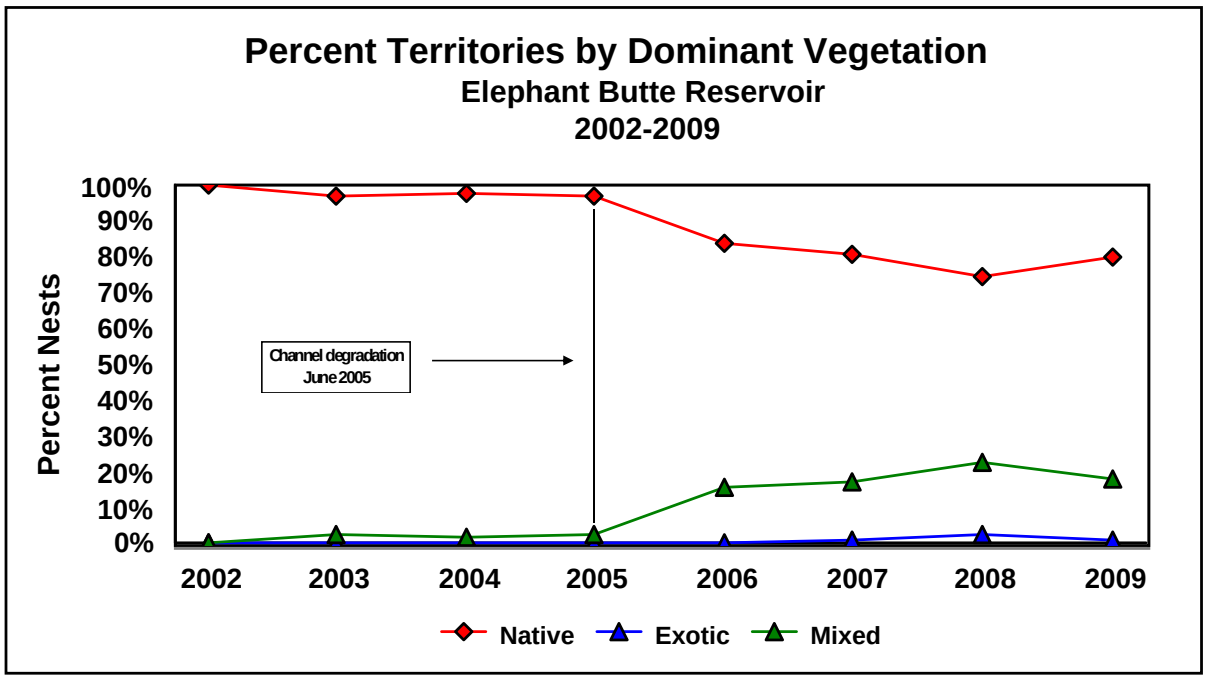


Figure 18. Dominant vegetation within SWFL territories - Elephant Butte Reservoir.

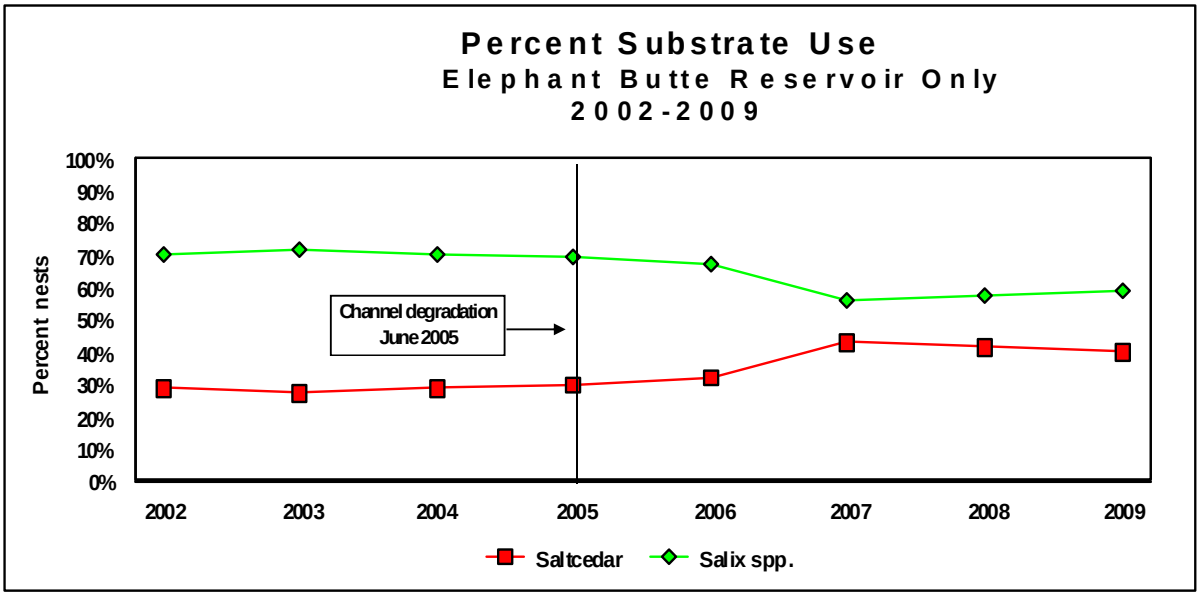


Figure 19. Nest substrate selection - Elephant Butte Reservoir.

Review of Cowbird Parasitism and Trapping Efforts

Since cowbird brood parasitism can be a key parameter leading to nest failure (USFWS 2002), and cowbird trapping was conducted within the San Marcial reach over a six year period from 1996 through 2001, specific discussion and analysis of cowbird parasitism is warranted.

An analysis was conducted to determine whether nests in mixed-dominated territories (n=249) or native dominated territories (n=1125) were parasitized more often. A statistical difference in parasitism rates did exist between these two data sets ($\chi^2 = 7.30$, df = 1, P = 0.01) (Table 11). Nests found in mixed dominated stands were parasitized more often than those found in native stands. The cause for this difference is not readily apparent. However, as previously mentioned the mixed stands of vegetation tend to be drier and perhaps lack the foliage density and respective nest concealment when compared to the native stands. [The sample size of nests found in exotic (i.e. saltcedar) dominated territories (n=59), compared to 1125 nests in native habitats did not allow for statistical analysis.]

A statistical analysis comparing parasitism and nest substrate was also conducted. Nest constructed in *Salix* spp. (n=859) were compared to those found in saltcedar (n=532). No statistical difference was detected ($\chi^2 = 2.67$, df = 1, P = 0.10) (Table 11). The number of nests found in Russian Olive (n=37) from 1999-2009 did not allow for statistical comparison.

A test comparing brood parasitism and the various hydrologic conditions was conducted. [The sample size of nests (n=27) with "Saturated/Flooded then Dry" did not allow for a valid comparison.] The highest parasitism rates were observed under the "Dry all Cycle" (17 percent, n=269), while the lowest parasitism rates were observed under the "Flooded all Cycle" (11 percent, n=546). A statistical difference was detected ($\chi^2 = 7.41$, df = 2, P = 0.02) (Table 11). It is possible that nests under "Dry all Cycle" experienced a statistically higher parasitism rate due to reduced foliage density and subsequently reduced nest

concealment, and/or the nests associated with the saturated/flooded conditions generally supported a wider range of potential cowbird host species thereby reducing the intensity of parasitism on the SWFL nests.

In 1995, four of six (66 percent) SWFL nests within the Tiffany Reach "Condo Site" were parasitized by cowbirds (NMNHP 1995). Cowbird control efforts were implemented within the San Marcial reach from 1996 through 2001; only 3 of 65 nests (5 percent) during this period were parasitized. From 2002 to present (i.e. 2009), cowbird trapping has not been conducted. During the period of no cowbird trapping, parasitism rates among San Marcial SWFL nests ranged from 3 to 18 percent, for an overall parasitism rate of 13% (n=1204) (Figure 20 and Table 6). The higher parasitism rate documented after cowbird trapping was discontinued may indicate that, on a local scale, cowbird trapping could be effective at reducing parasitism rates. However, nest success rates, which are the ultimate indicator of BHCO trapping success, were not affected. The relatively small sample size of SWFL nests during the cowbird trapping period (n=65 nests) compared to the over 1200 nests monitored after cowbird trapping may also be responsible for the different results.

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.

The practice of addling or removing BHCO eggs from parasitized SWFL nests was a practice initiated in 2002 and continued through 2009. In 2009, of nests with known outcomes (n = 310), 43 were parasitized and the BHCO eggs were addled in 16 of these nests. Of these 16 parasitized nests, four were subsequently abandoned, nine were predated and three successfully fledged SWFLs. From 2002 through 2009, 183 SWFL nests were parasitized and the outcomes known. BHCO eggs were addled or removed from 83 nests, 21 of which successfully fledged SWFL young (25.3 percent success). Parasitized nests over the past six seasons in the Middle Rio Grande that were unaltered were not as successful. Of 100 parasitized nests monitored, 84 failed and 16 successfully fledged young—a 16.0 percent success rate. However, there was not a statistically significant difference (χ^2 = 2.43, df = 1, P = 0.12) between altered and unaltered parasitized nests.

The following section is a brief reach-by-reach discussion of nest monitoring from 1995 through 2009. Insight into the habitat and/or nest variables driving the various populations and associated nesting is also provided where appropriate.

Velarde reach

Although SWFL surveys were conducted within various sites of the Velarde reach beginning in 1995, nest search and monitoring by Reclamation personnel was not initiated until 1997 (Table 12). Nesting was confirmed at three sites within this reach from 1997 to 2000. In 2001, although

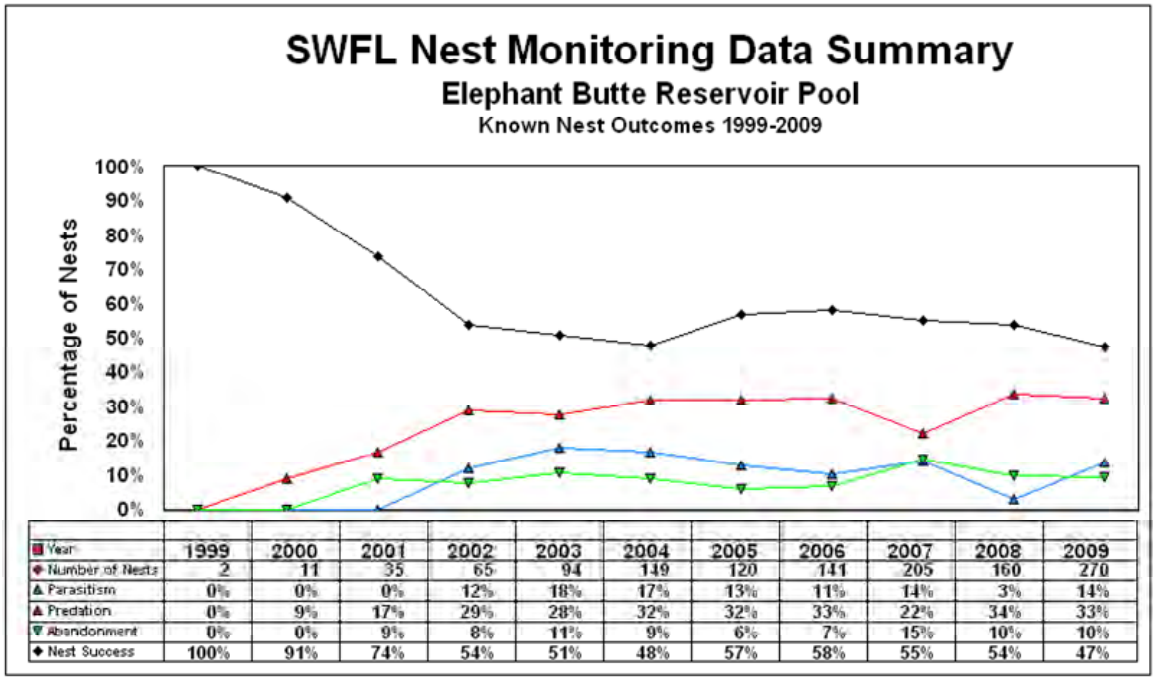


Figure 20. Nest summary for nests within Elephant Butte Reservoir pool.

Table 12. Rio Grande reach summary of SWFL nests in lands surveyed by Reclamation between 1995 and 2009.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Velarde	n/a[1]	n/a[1]	6	3	1	2	0	0	0	0	0	0	0	0	0
Belen	n/s	n/s	n/s	n/s	n/s	n/s	n/s	0	n/s	0	2	0	2	1	3
Sevilleta/ La Joya	n/s	n/s	n/s	n/s	3	6	9	13	12	21	10	18	6	13	14
Bosque del Apache	n/s	n/s	n/s	0	0	0	0	0	1	2	0	1	1	2	19
Tiffany[2]	6	0	n/s	n/s	n/s	n/s	n/s	1	2	11	4	1	3	0	3
San Marcial	0	1	2	2	5	19	36	66	96	153	127	148	220	186	294
Total	6	1	8	5	9	27	45	80	111	187	143	168	232	202	333

n/s = not surveyed
[1] Nest monitoring not conducted by Reclamation (NMNHP conducted nest monitoring)
[2] 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.

a pair was found, nesting could not be confirmed. Since 2001, neither pairing nor nesting has been detected within the surveyed sites of this reach. The only confirmed successful nesting attempt since Reclamation began monitoring in 1997 was a single fledgling from a nest at the La Rinconada site during the 1998 season. Since pairing has not been documented over the past eight years, and no territories have been recorded over the past three years, it is apparent that these sites lack the habitat requirements necessary to sustain a viable SWFL population. The primary factors attributing to nest failure were brood parasitism and nest predation.

Belen reach

SWFL nesting was first documented in this reach in 2005 when one pair produced two nests in site SV-11. A SWFL pair nested in approximately the same area in 2007 and again in 2008. In 2009, three SWFL pairs and three nests were found in the same general area of SV-11 that SWFLs had been detected in previous years (Table 12). Of these three nests; one failed, one was successful, and the outcome of the other was unknown. Occupied habitat within the SV-11 site consists of Russian olive and saltcedar with scattered coyote willow. No nesting has been documented anywhere else in this reach since surveys began in 2002. Visually suitable habitat patches exist sparsely throughout the reach and may be colonized in the near future.

Sevilleta/La Joya reach

Since comprehensive surveys and nest monitoring began within this reach in 2000, the number of SWFL nests found within the Sevilleta/La Joya reach has ranged from six to 21 nests (Table 12). In 2009, 14 SWFL nests were found and monitored; nine of the nests failed and the remaining five were successful. Since 2005, a total of 61 nests have been monitored within this reach; the outcomes of 10 nests were unknown, 29 failed, and 22 were confirmed as successful for an overall nest success of 43 percent.

Over the past several years there has been an obvious shift of SWFL territories and associated nesting within the Sevilleta/ La Joya reach. In the early to mid-2000s, the majority of nesting SWFLs were found within the SV-03 site. Since the habitat of the SV-03 site has diminished in recent years, the number of SWFLs within SV-06, SV-07 and SV-09 has increased. The suitability of habitat within the SV-03 site diminished due to vegetation blowdown during the winter of 2006-2007. Presently, relatively large patches of suitable habitat do exist within sites SV-06, SV-07 and SV-09 in the form of saltcedar, Russian olive and coyote willow.

Nest searching within this reach is significantly more difficult than other reaches of the study area due to the density of Russian olive within the occupied habitat.

Bosque del Apache reach

SWFL nesting in this reach was limited from 2003 through 2008; only seven nests were found and monitored over the entire seven year period. However, in 2009 SWFLs established 20 territories and constructed at least 19 nests within the active floodplain of the Bosque del Apache NWR (Table 12). Of these 19 nests; the outcome of one nest was unknown, seven failed, and 11 were successful for a nest success rate of 61 percent. The dramatic increase in territories and associated nesting is likely a factor of overbank flooding, and the SWFL's apparent affinity for establishing territories within flooded suitable vegetation. Barring any catastrophic event, this population is likely to expand into the near future.

Tiffany reach

SWFL nesting in this reach declined from 11 nests in 2004 to zero in 2008. However, in 2009 three SWFL nests were discovered; one was successful and the other two failed. In 1995, this reach supported the only known SWFL population and nesting within the Middle Rio Grande study area (Table 12). These SWFLs occupied a patch referred to as the "Condo Site" by the NMNHP. Although the "Condo Site" was once the primary SWFL breeding population within the Middle Rio Grande, it currently supports less than 1 percent of all nests within the study area. As stated in the survey discussion, the reason for this decline is not apparent. Habitat in this reach does not appear to have significantly decreased in quality, although the Goodding's willow habitat of the "Condo Site" has matured – possibly past its suitability for breeding SWFLs. The abundance of habitat immediately downstream in the San Marcial reach may be attracting birds that otherwise would have continued north and established territories in the Tiffany reach. Overall, it appears that this population will remain small at best, and at worst may not persist.

San Marcial reach

During the 2009 survey season, 294 SWFL nests were discovered in this reach. It continues to be, by far, the most productive SWFL nesting reach in the study area (Table 12). Over 88 percent of all nests found during the 2009 breeding season were within the San Marcial reach; and more specifically within the exposed area of Elephant Butte Reservoir. For a detailed discussion of the SWFL distribution and nesting within Elephant Butte Reservoir please see *A Review of Vegetation and Hydrologic Parameters Associated with the Southwestern Willow Flycatcher – 2002 to 2008: Elephant Butte Reservoir Delta* (Ahlers 2009). A summary of known nest outcomes from 1999 through 2009 within Elephant Butte Reservoir is shown in Figure 20.

From 1996 through 2009, 1355 SWFL nests have been found and monitored within the San Marcial reach (Table 12). Of the known outcomes 53 percent of these nests (n=1252) have been successful. The relatively high nest success, in combination with an abundance of currently unoccupied suitable habitat should permit this population to expand into the near future. For a detailed assessment of the current population within the San Marcial reach and Elephant Butte Reservoir and predicted population trends see *Elephant Butte Reservoir Five-Year Operational Plan: Biological Assessment* (Reclamation 2009).

Hydrology Monitoring

Southwestern Willow Flycatcher habitat can be succinctly described as dense and wet. Hydrology is often the most important factor in the creation and maintenance of high quality SWFL habitat. The hydrology studies conducted by Reclamation during the past six years aimed to quantify the hydrology at various occupied patches within the study area and to determine its effects on habitat and nesting variables. Habitat within the conservation pool of Elephant Butte Reservoir (where all hydrostations are located) has continued to expand in extent since the reservoir level began dropping during the late 1990's. Flow from the LFCC outfall provides water to vast expanses of habitat on the west side of the floodplain and many of these areas rarely, if ever, dry out, even with minimal flows in the LFCC. Conversely, in several areas large patches of primarily Goodding's willow have begun to be impacted by being flooded for too long. Periodically drying the site, particularly during seed dispersal, would benefit these areas.

Rising reservoir levels and inundation of potential/occupied habitat is another concern regarding hydrology within the reservoir pool. Habitat created by reduced reservoir elevations could be stressed and/or killed if flooded for an extended period. Occupied SWFL habitat within "The Narrows" (i.e. sites EB-13 and 14) is frequently flooded by rising reservoir levels. This has been a benefit to habitat quality so far, since reservoir levels have subsequently declined and not negatively impacted habitat. A detailed assessment of impacts to SWFL habitat within the reservoir was conducted for the *Elephant Butte Reservoir Operations Biological Assessment* (Reclamation 2009). It states that, even under the "wet" modeling scenario, only a small amount of habitat would be lost and/or SWFLs displaced from rising reservoir levels during the next five years. This loss could be offset by the creation of habitat adjacent to the main channel resulting from higher than average flows.

Recommendations

Recommendations for future SWFL related studies within the Middle Rio Grande fall into three categories:

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

Annual Surveys

- Presence/absence surveys should continue in occupied reaches of the Middle Rio Grande 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 and within Critical Habitat designation areas.
- 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 (if available) 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.
- 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 SWFL nesting hydrology study initiated in 2004 should be continued and additional hydrostations should be added in newly colonized habitat.
- A report comparing and contrasting habitat requirements of both SWFLs and YBCUs should be prepared. The information from this report would allow resource managers to make informed decisions based on available information regarding the respective species.

- If funding is available, obtain aerial photography for the Elephant Butte Reservoir portion of the study area every 3-5 years and for the entire study area every 5- 7 years.

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 the Middle Rio Grande Management Unit is 100 SWFL territories. This goal has been exceeded for seven consecutive years. Although the recovery goal for the Middle Rio Grande Management Unit has been exceeded, the remaining Management Units within the Rio Grande Recovery Unit are far from reaching their respective goals, and down listing or delisting appears unlikely in the near future.

Although it is likely the population of SWFLs within the San Marcial reach will continue to increase over the next few years, it is essential to recognize that changes in hydrology, natural succession, or perhaps a catastrophic event will likely reduce the extent of suitable SWFL habitat at some point in the future. Therefore, additional SWFL habitat restoration projects within the Middle Rio Grande should be considered and initiated in an effort to provide suitable habitat in 5 to 10 years.

Acknowledgments

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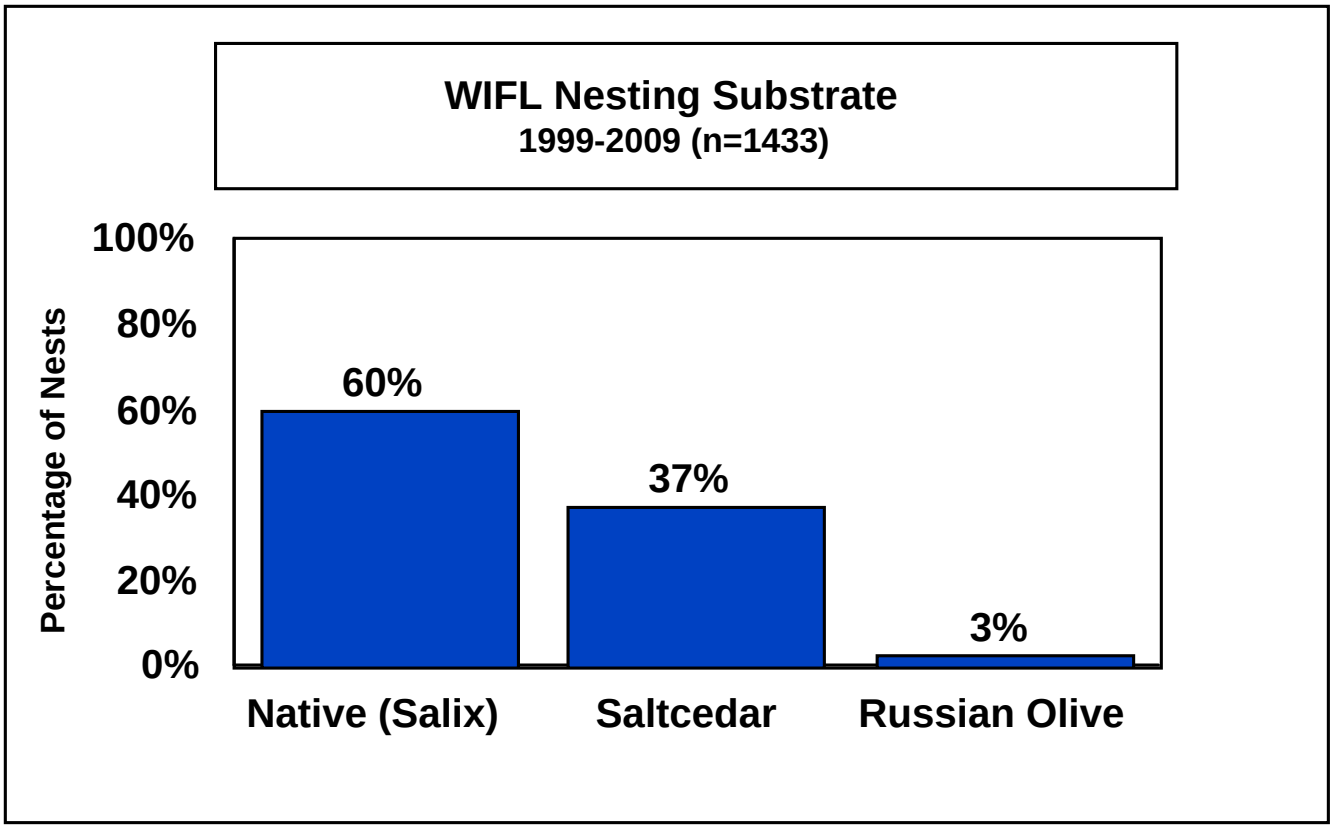
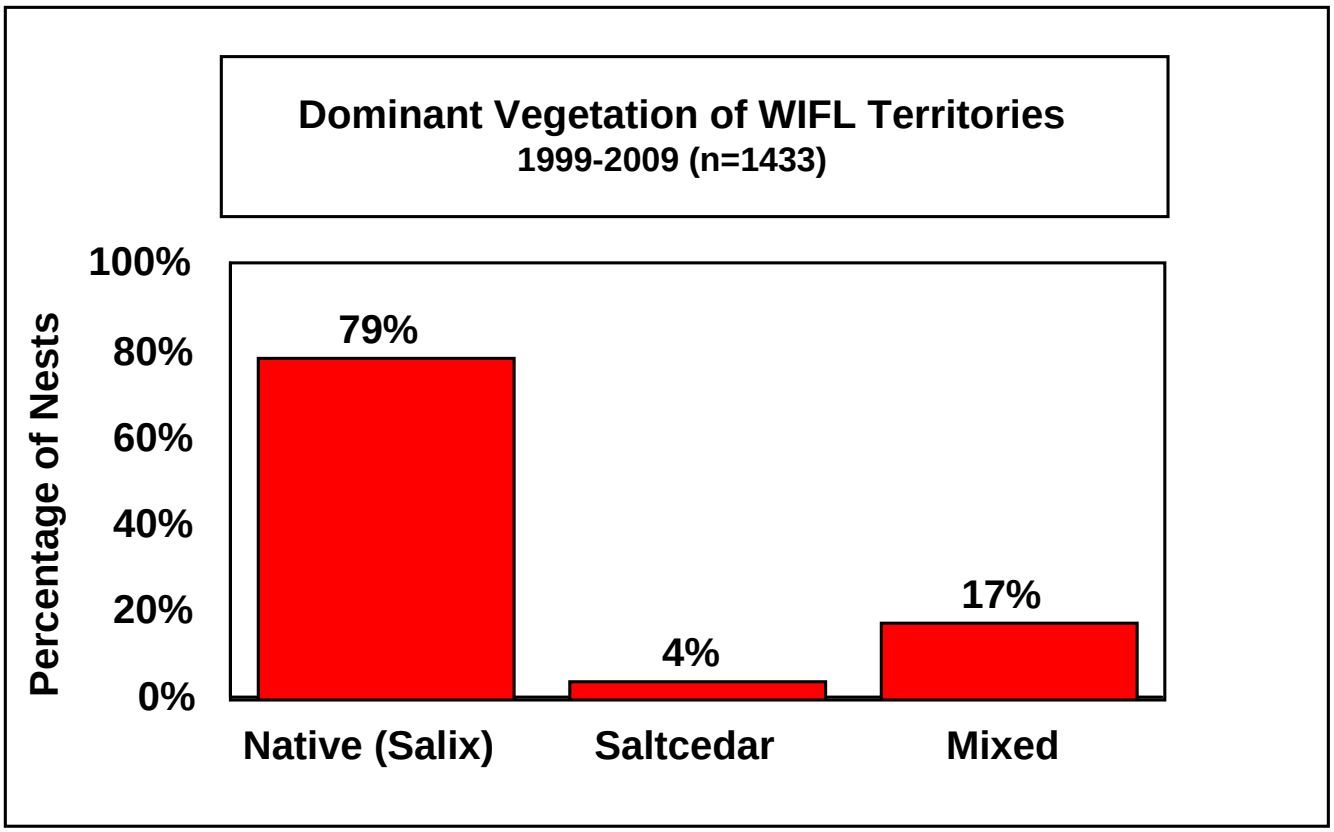
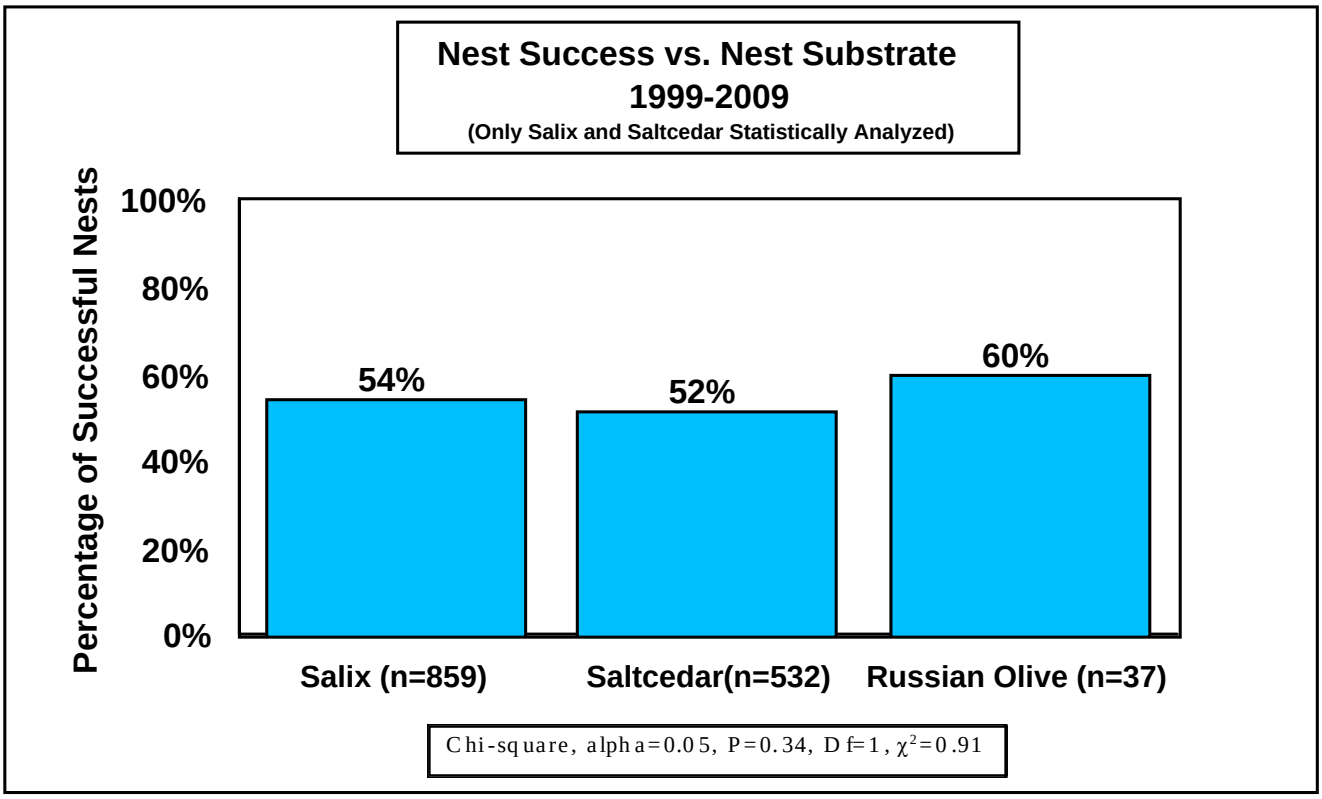
Attachment

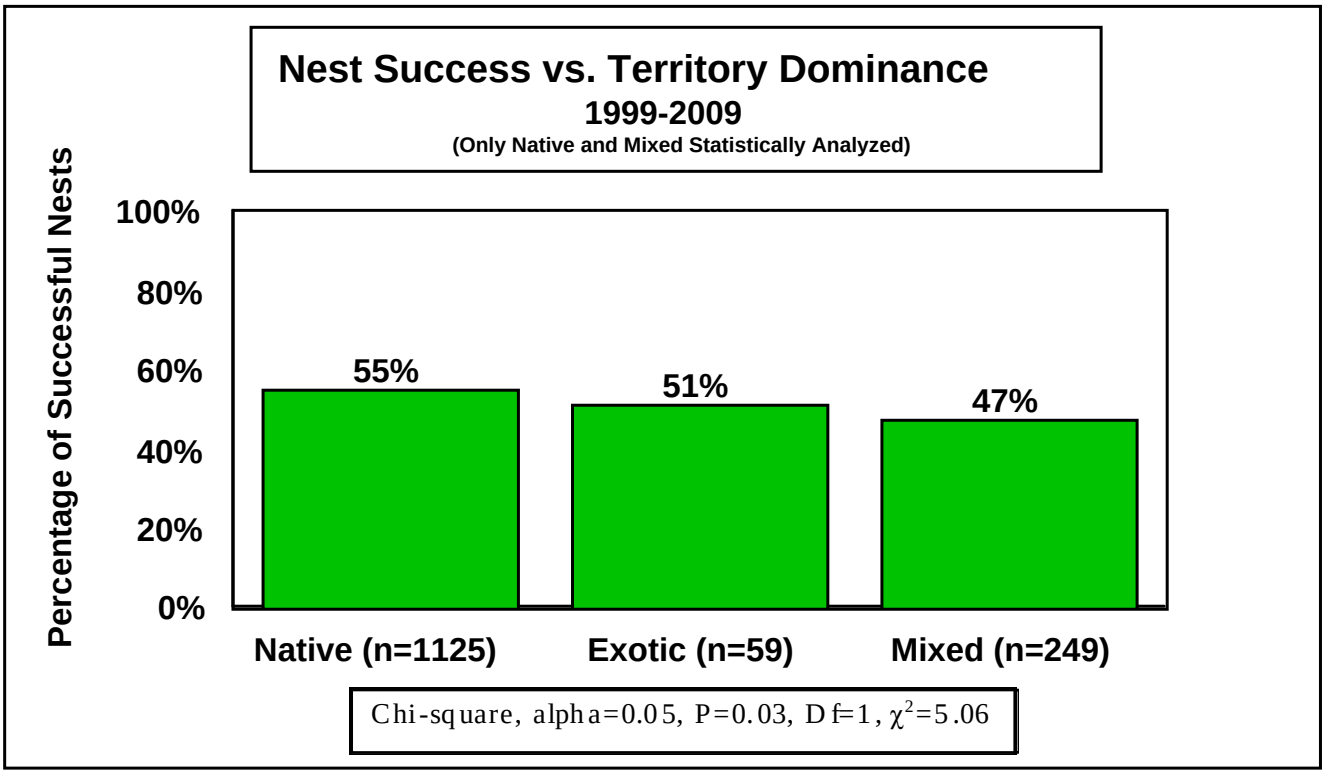
Habitat and Nesting Variable Analysis

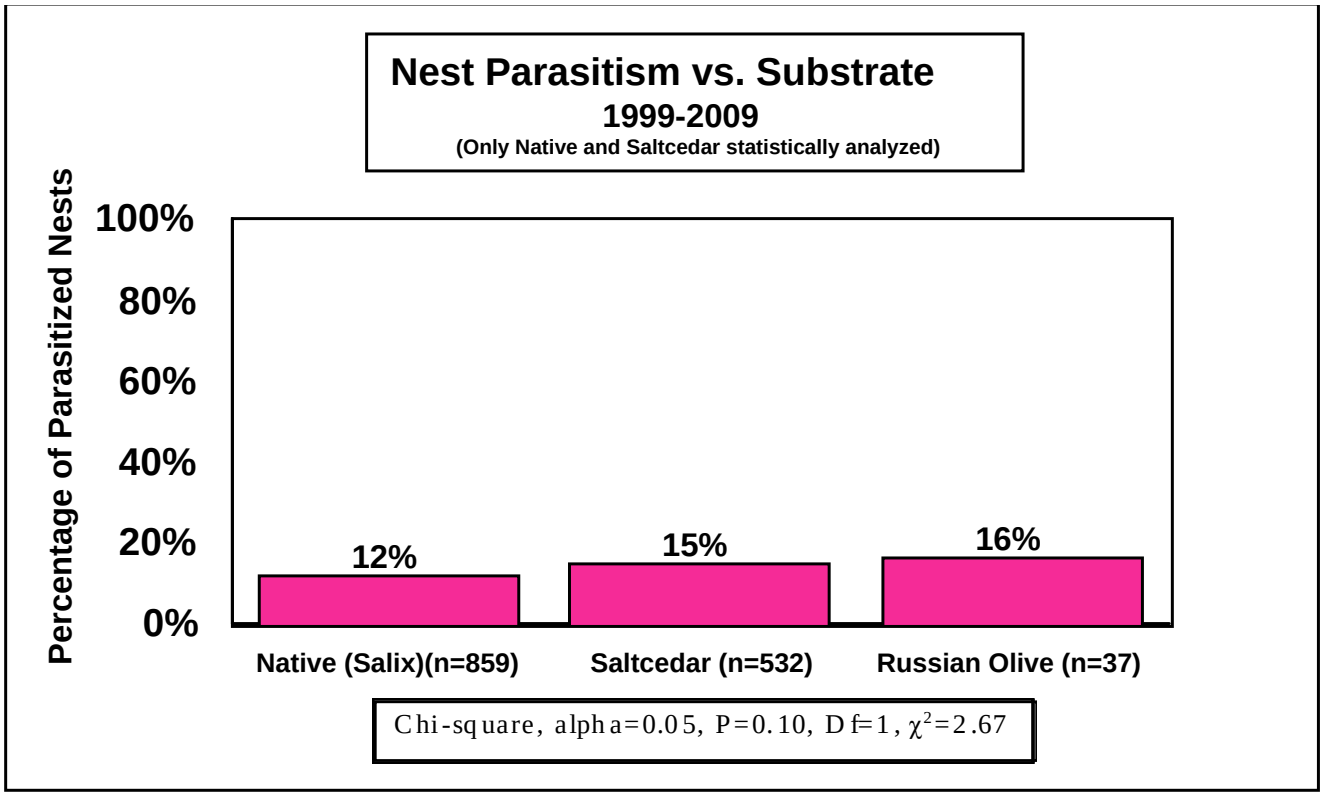
All Nests in Middle Rio Grande

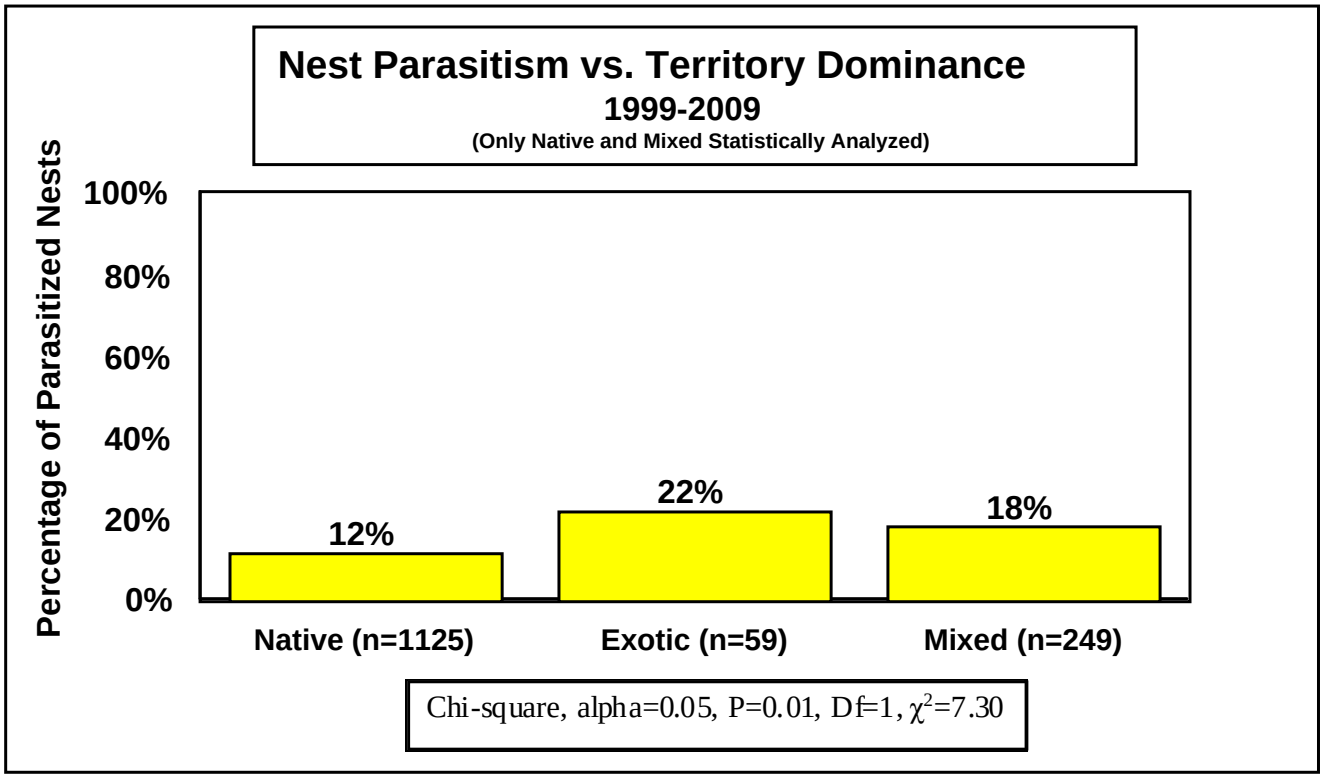

WIFL Nesting Substrate
1999-2009 (n=1433)
Percentage of Nests
100%
80%
60%
40%
20%
0%
60%
37%
3%
Native (Salix)
Saltcedar
Russian Olive


Dominant Vegetation of WIFL Territories
1999-2009 (n=1433)
Percentage of Nests
100%
80%
60%
40%
20%
0%
79%
4%
17%
Native (Salix)
Saltcedar
Mixed


Nest Success vs. Nest Substrate
1999-2009
(Only Salix and Saltcedar Statistically Analyzed)
Percentage of Successful Nests
100%
80%
60%
40%
20%
0%
54%
52%
60%
Salix (n=859)
Saltcedar(n=532)
Russian Olive (n=37)
Chi-square, alpha=0.05, P=0.34, Df=1, χ^2=0.91

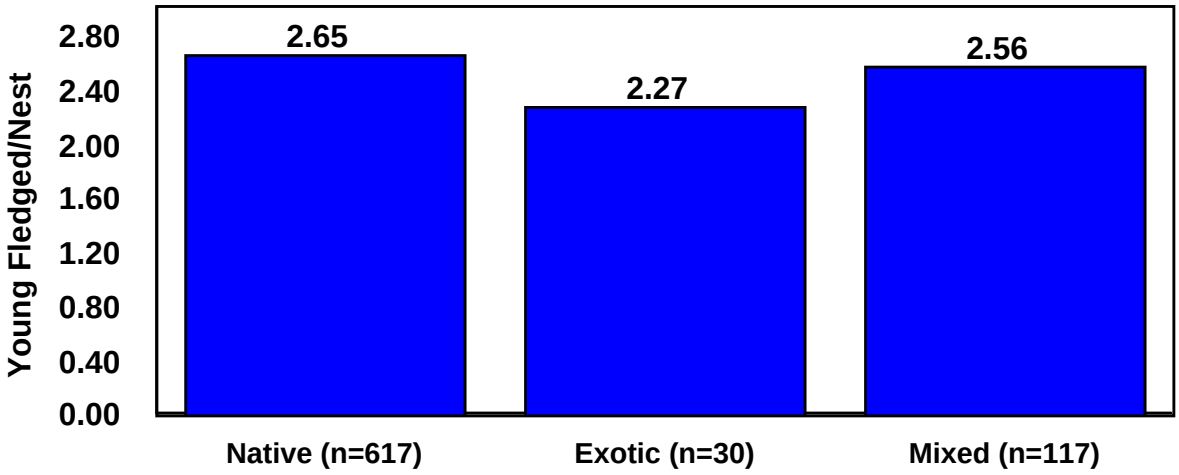

Nest Success vs. Territory Dominance
1999-2009
(Only Native and Mixed Statistically Analyzed)
Percentage of Successful Nests
100%
80%
60%
40%
20%
0%
55%
51%
47%
Native (n=1125)
Exotic (n=59)
Mixed (n=249)
Chi-square, alpha=0.05, P=0.03, Df=1, χ^2=5.06


Nest Parasitism vs. Substrate
1999-2009
(Only Native and Saltcedar statistically analyzed)
Percentage of Parasitized Nests
100%
80%
60%
40%
20%
0%
12%
15%
16%
Native (Salix)(n=859)
Saltcedar (n=532)
Russian Olive (n=37)
Chi-square, alpha=0.05, P=0.10, Df=1, χ^2=2.67


Nest Parasitism vs. Territory Dominance
1999-2009
(Only Native and Mixed Statistically Analyzed)
Percentage of Parasitized Nests
100%
80%
60%
40%
20%
0%
12%
22%
18%
Native (n=1125)
Exotic (n=59)
Mixed (n=249)
Chi-square, alpha=0.05, P=0.01, Df=1, χ^2=7.30

Productivity of Successful Nests based on Territory Dominance 1999-2009

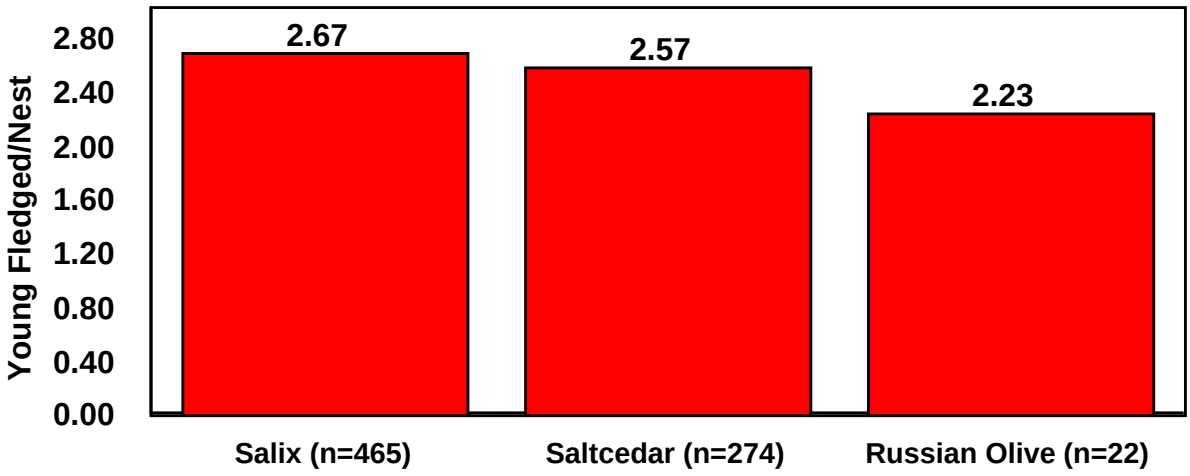
(Only Native and Mixed Statistically Analyzed)



W-test, alpha=0.05, P=0.38, W=-1700.5

Productivity of Successful Nests based on Nest Substrate 1999-2009

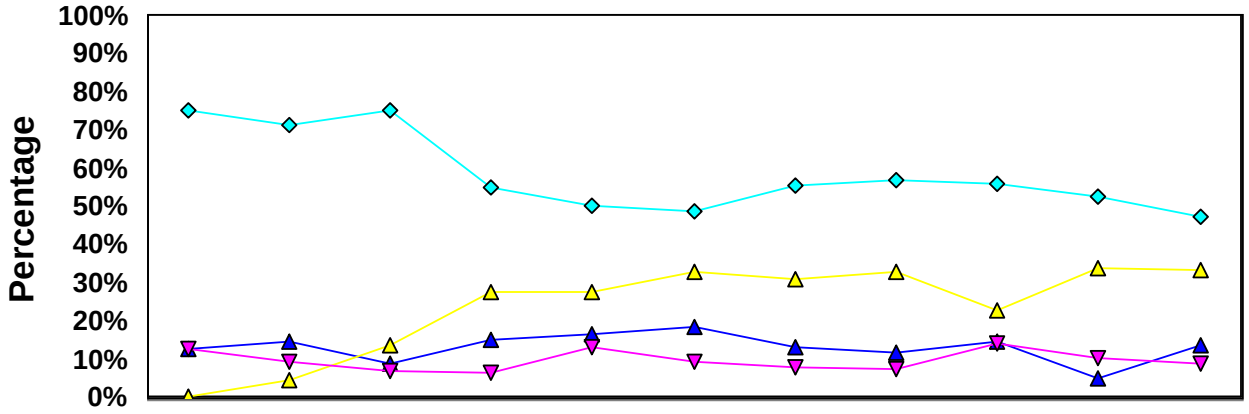
(Only Salix and Saltcedar Statistically Analyzed)



W-test, alpha=0.05, P=0.10, W=-4326.0

SWFL Nest Monitoring Data Summary

1999-2009

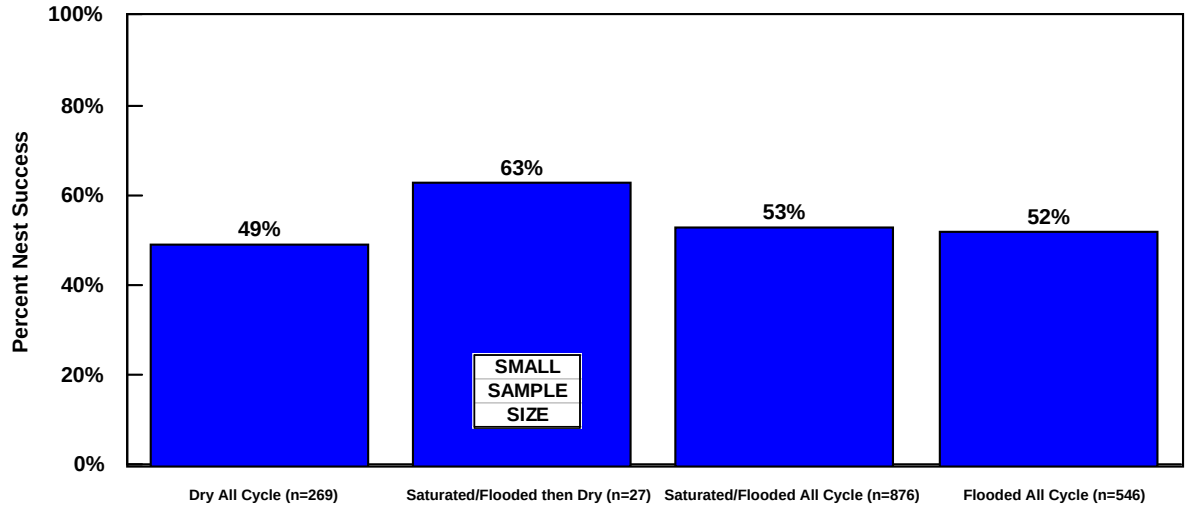


Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Nest	8	21	44	80	108	174	130	162	221	175	310
Parasitism	13%	15%	9%	15%	17%	19%	13%	12%	14%	5%	14%
Predation	0%	5%	14%	28%	28%	33%	31%	33%	23%	34%	33%
Abandonment	13%	10%	7%	6%	13%	9%	8%	7%	14%	10%	9%
Nest Success	75%	71%	75%	55%	50%	49%	55%	57%	56%	53%	47%

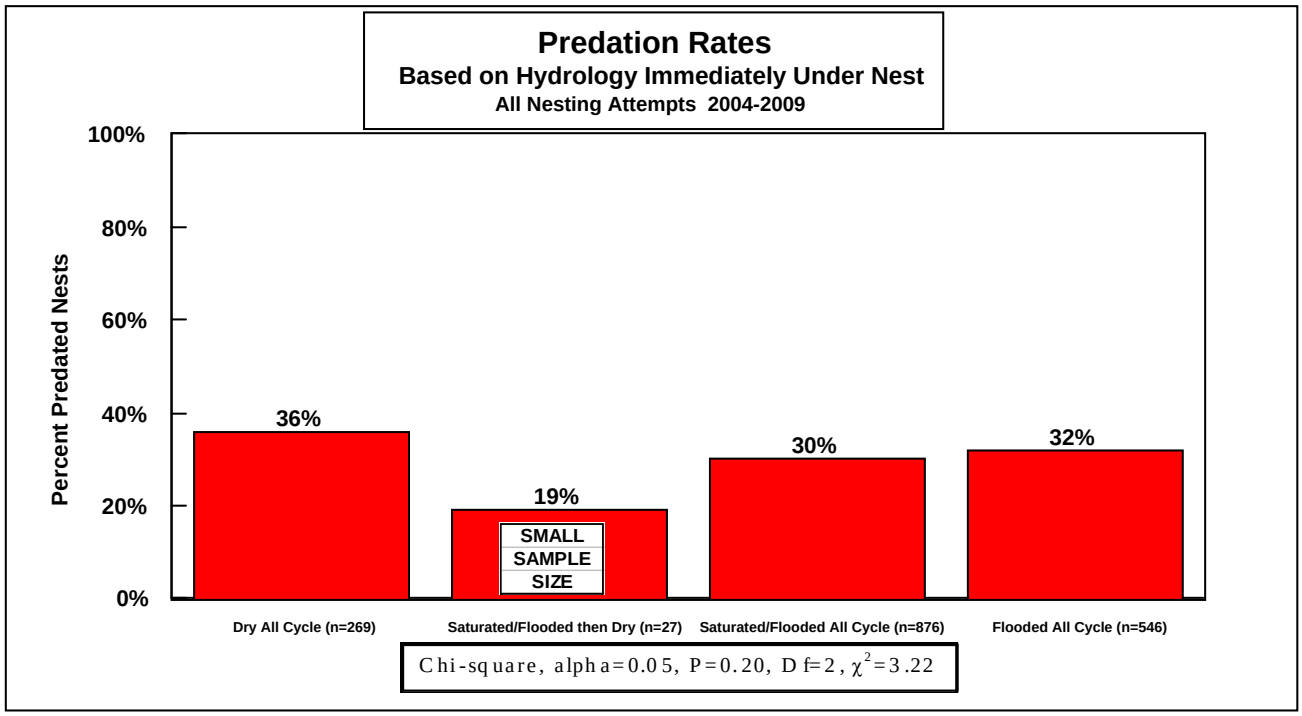
Nesting Success

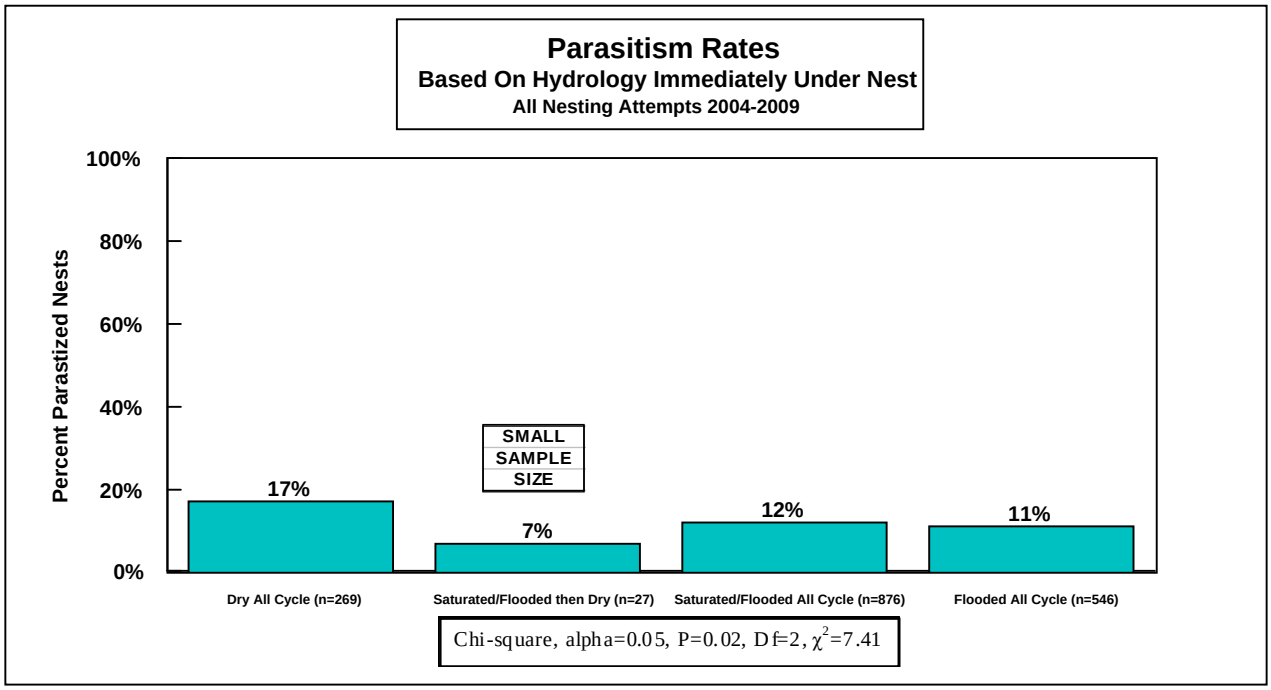
Based on Hydrology Immediately Under Nest

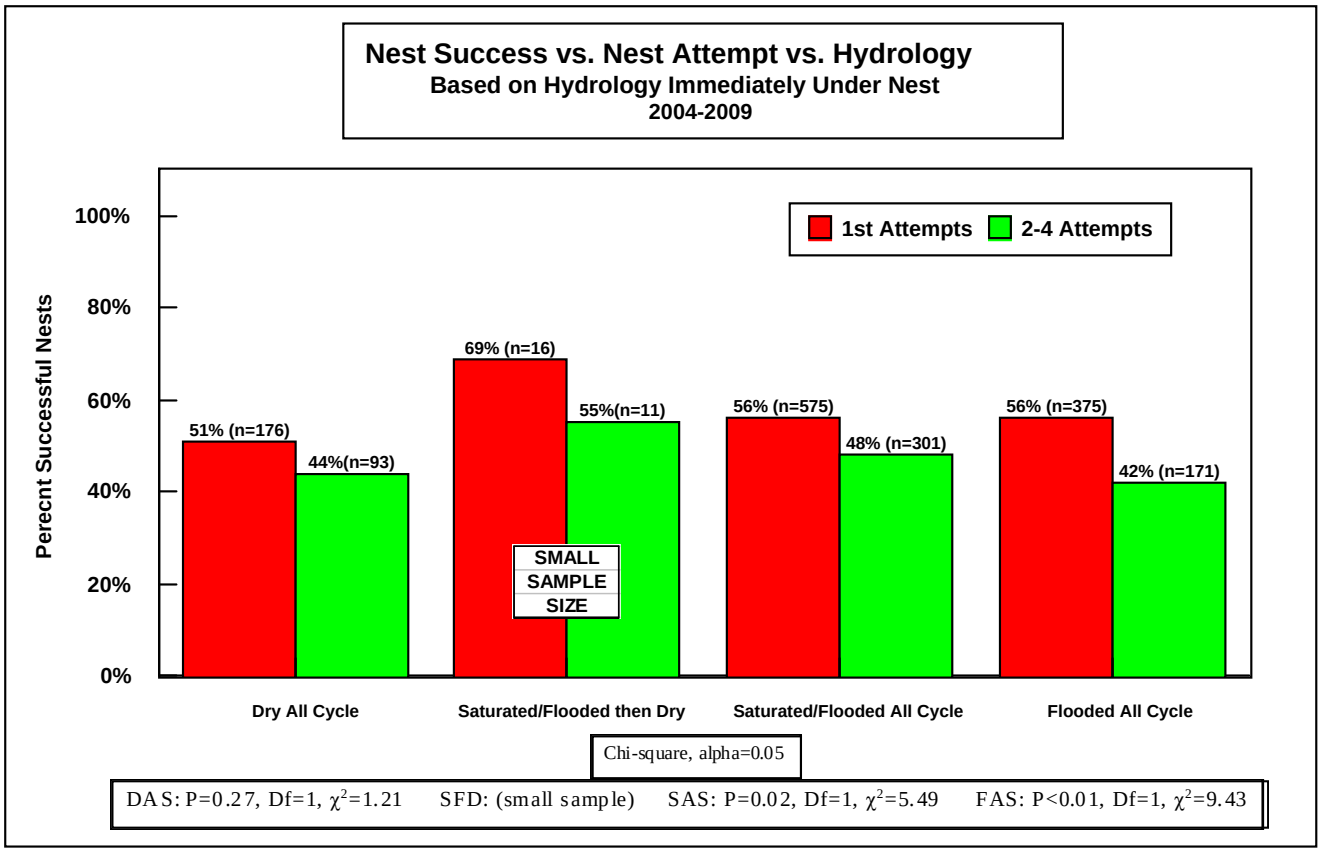
All Nesting Attempts 2004 - 2009

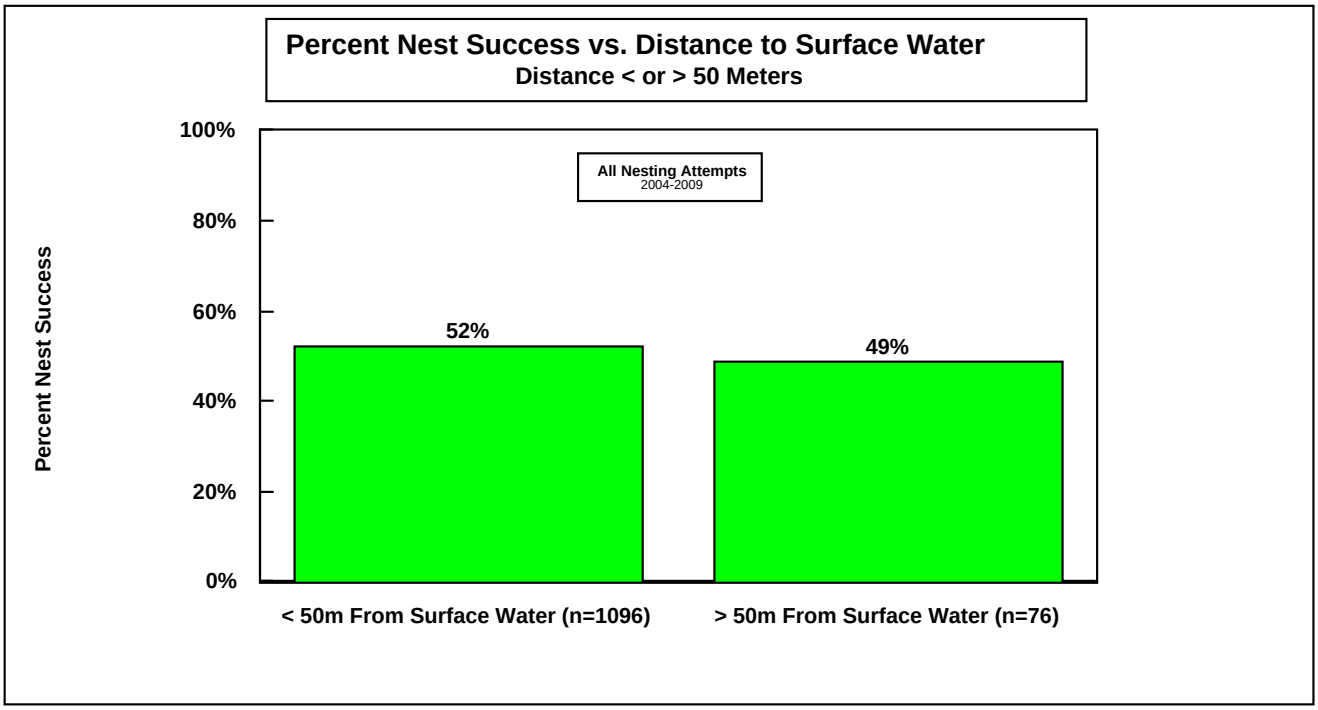


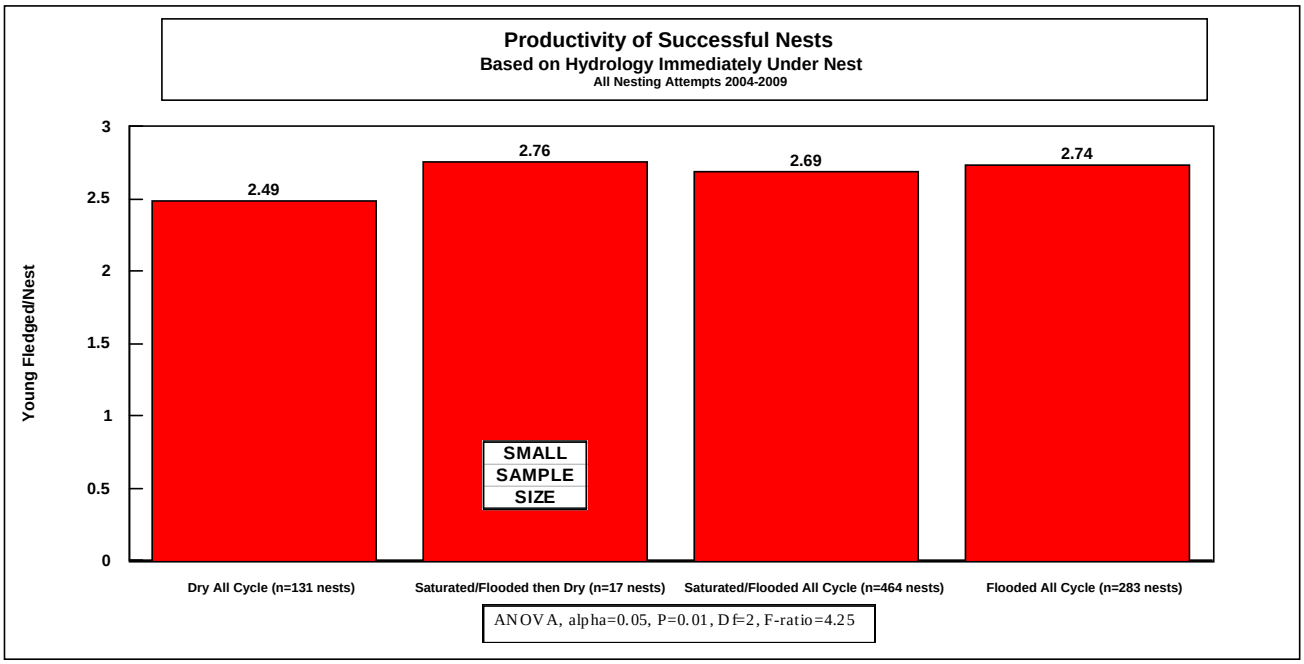
Chi-square, alpha=0.05, P=0.47, Df=2, χ^2=1.51

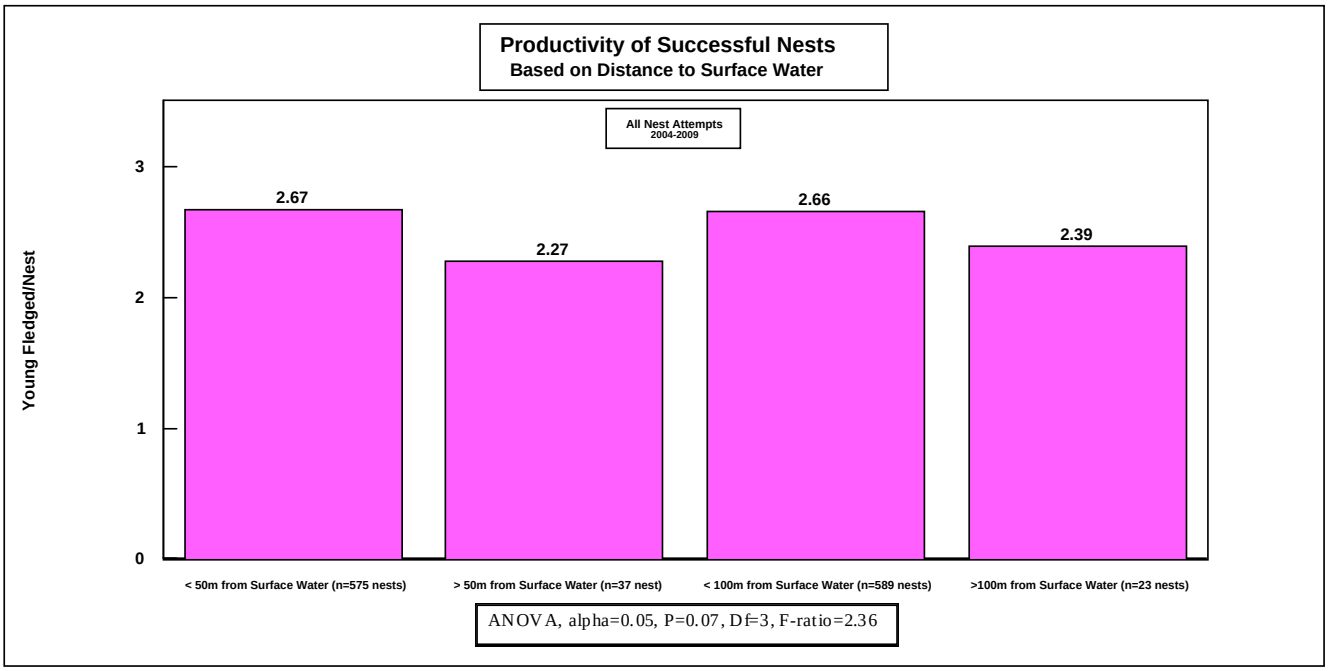

Predation Rates
Based on Hydrology Immediately Under Nest
All Nesting Attempts 2004-2009
Percent Predated Nests
100%
80%
60%
40%
20%
0%
36%
19%
SMALL SAMPLE SIZE
30%
32%
Dry All Cycle (n=269)
Saturated/Flooded then Dry (n=27)
Saturated/Flooded All Cycle (n=876)
Flooded All Cycle (n=546)
Chi-square, alpha=0.05, P=0.20, Df=2, χ^2=3.22

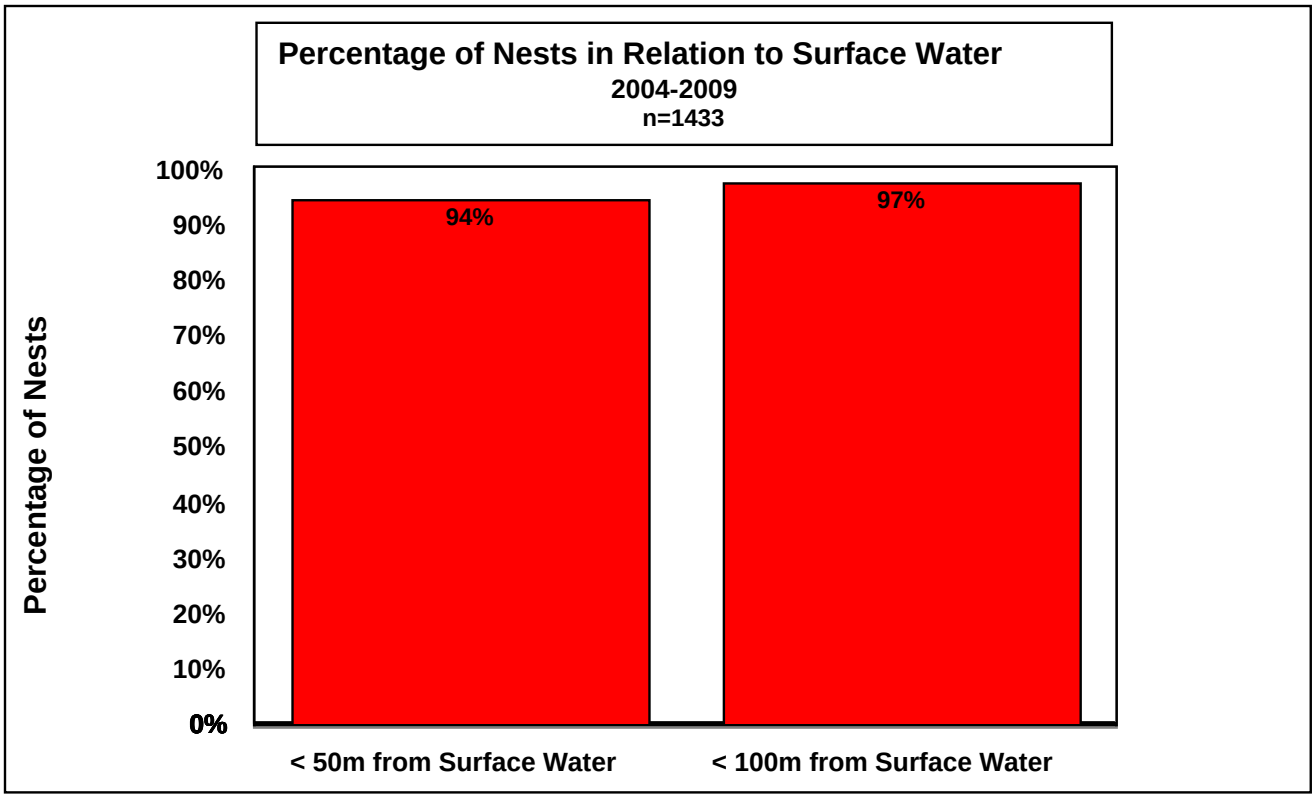

Parasitism Rates
Based On Hydrology Immediately Under Nest
All Nesting Attempts 2004-2009
Percent Parasitized Nests
100%
80%
60%
40%
20%
0%
17%
SMALL SAMPLE SIZE
7%
12%
11%
Dry All Cycle (n=269)
Saturated/Flooded then Dry (n=27)
Saturated/Flooded All Cycle (n=876)
Flooded All Cycle (n=546)
Chi-square, alpha=0.05, P=0.02, Df=2, χ^2=7.41


Nest Success vs. Nest Attempt vs. Hydrology
Based on Hydrology Immediately Under Nest
2004-2009
Perecnt Successful Nests
100%
80%
60%
40%
20%
0%
1st Attempts
2-4 Attempts
51% (n=176)
44%(n=93)
69% (n=16)
55%(n=11)
56% (n=575)
48% (n=301)
56% (n=375)
42% (n=171)
SMALL SAMPLE SIZE
Dry All Cycle
Saturated/Flooded then Dry
Saturated/Flooded All Cycle
Flooded All Cycle
Chi-square, alpha=0.05
DAS: P=0.27, Df=1, χ2=1.21
SFD: (small sample)
SAS: P=0.02, Df=1, χ2=5.49
FAS: P<0.01, Df=1, χ2=9.43


Percent Nest Success vs. Distance to Surface Water
Distance < or > 50 Meters
Percent Nest Success
100%
80%
60%
40%
20%
0%
All Nesting Attempts
2004-2009
52%
49%
< 50m From Surface Water (n=1096)
> 50m From Surface Water (n=76)


Productivity of Successful Nests
Based on Hydrology Immediately Under Nest
All Nesting Attempts 2004-2009
Young Fledged/Nest
3
2.5
2
1.5
1
0.5
0
2.49
2.76
2.69
2.74
SMALL SAMPLE SIZE
Dry All Cycle (n=131 nests)
Saturated/Flooded then Dry (n=17 nests)
Saturated/Flooded All Cycle (n=464 nests)
Flooded All Cycle (n=283 nests)
ANOVA, alpha=0.05, P=0.01, Df=2, F-ratio=4.25


Productivity of Successful Nests
Based on Distance to Surface Water
All Nest Attempts 2004-2009
Young Fledged/Nest
3
2
1
0
2.67
2.27
2.66
2.39
< 50m from Surface Water (n=575 nests)
> 50m from Surface Water (n=37 nest)
< 100m from Surface Water (n=589 nests)
>100m from Surface Water (n=23 nests)
ANOVA, alpha=0.05, P=0.07, Df=3, F-ratio=2.36


Percentage of Nests in Relation to Surface Water
2004-2009
n=1433
Percentage of Nests
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
94%
97%
< 50m from Surface Water
< 100m from Surface Water