RECLAMATION

Managing Water in the West

2007 Southwestern Willow Flycatcher Study Results

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

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

May 2008

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.

2007 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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U.S. Department of the Interior
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Executive Summary

Overview

During the summer of 2007, the Bureau of Reclamation (Reclamation) conducted surveys and nest monitoring of the federally endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*) (SWFL) in eight distinct reaches along approximately 200 kilometers of the Middle Rio Grande (MRG) in New Mexico adjacent to Velarde and between the Pueblo of Isleta and Elephant Butte Reservoir. Surveys were performed to contribute to current baseline population data of the SWFL along the Middle Rio Grande and also to meet Reclamation's Endangered Species Act (ESA) compliance commitments. There were 403 resident SWFLs documented in 232 territories forming 171 breeding pairs. As in previous years, the San Marcial reach of the river was by far the most productive containing 197 territories and 153 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 220 nests and fledging 315 SWFL young. The Sevilleta reach produced 6 nests and fledged 11 SWFL young. Overall, nest variables (success, predation, BHCO parasitism, and productivity) remained similar to the past several years.

Other studies were initiated or continued in 2007. These include: (1) BHCO point counts, (2) livestock grazing study, (3) SWFL nest-site vegetation quantification study, and (4) SWFL nesting hydrology study. These studies are designed to provide further insight into potential threats to and habitat requirements of SWFL populations. Aerial photos of the Rio Grande floodplain from Elephant Butte Reservoir to Bernardo were also taken during summer 2007 and will be used to update vegetation maps and the SWFL habitat model in 2008.

Survey Results

Reclamation funded:
Velarde – 0 territories
San Marcial – 197 territories

MRG Endangered Species Collaborative Program funded:
Belen – 10 territories
Sevilleta National Wildlife Refuge (NWR)/La Joya – 14 territories
San Acacia – 0 territories
Escondida – 0 territory
Bosque del Apache NWR – 7 territories
Tiffany – 4 territories

Recommendations

1. Continue annual surveying and nest monitoring within occupied and "critical habitat" reaches to determine reproduction, nest success, recruitment, and population trends of SWFLs within the Middle Rio Grande Basin.
2. Give special attention to the "core concentration area" between sites LF-17/17a and the Elephant Butte delta to document expansion of SWFLs into the Elephant Butte conservation pool.
3. Survey suitable/potential habitat in various reaches 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 generally arrive at their breeding grounds between early May and early June; by late July or August, they depart for wintering areas in Mexico, Central America, and northern South America (Sogge et al. 1997, USFWS 2002).

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

In October 2005, USFWS designated Critical Habitat for the SWFL along the Middle Rio Grande in three separate segments, separated by the Sevilleta and Bosque del Apache National Wildlife Refuges 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 2007 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

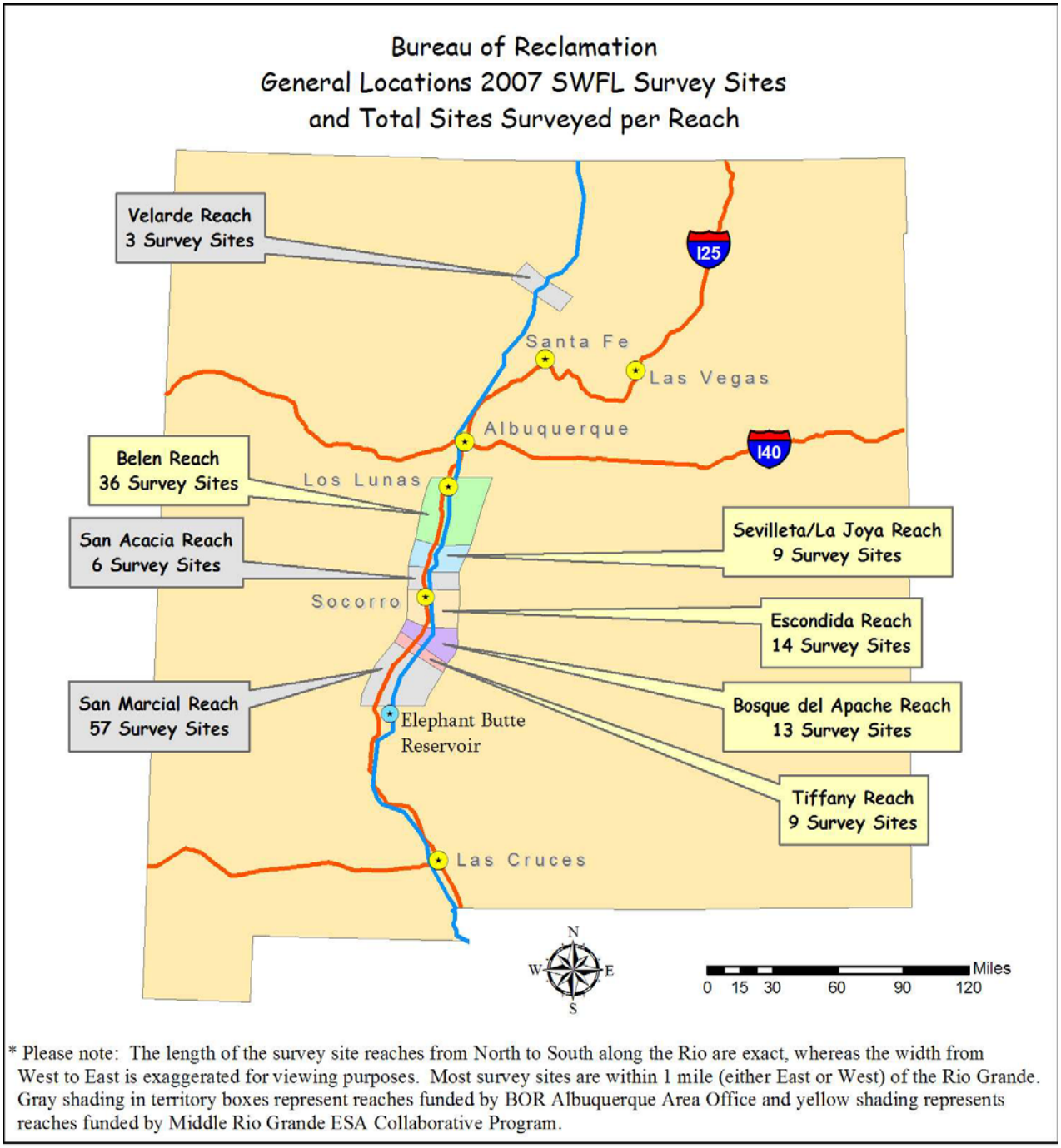


Figure 2. General locations of 2007 survey sites.

May 16 and July 26, 2007. Nest searches and nest monitoring of SWFL nests were conducted in conjunction with survey efforts by USFWS-permitted biologists. In addition to conducting presence/absence surveys for the SWFL, formal Yellow-billed Cuckoo (*Coccyzus americanus* occidentalis) surveys, based on protocol developed in cooperation with the Arizona Game and Fish Department and the U.S. Geological Survey (Halterman et. al. 2002, Laymon 1998), were conducted from Highway 380 to Elephant Butte Reservoir (Johanson, *in prep.*).

Goals and Objectives

Primary goals of the field studies performed in 2007 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 limiting factors.
- Assess nest site habitat characteristics and compare to unoccupied incoming/restored habitat.
- Determine relationships between SWFL nesting and hydrologic parameters.

Related Studies

In addition to the presence/absence surveys and nest monitoring conducted in 2007, the following related studies were either previously conducted or continued in 2007:

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

- Avian point counts were continued to determine the distribution and abundance of BHCOs and host bird species within the Middle Rio Grande Basin. Transects were established within four study areas to determine the distribution and density of BHCOs and to determine the effectiveness of the cowbird trapping program. Based on 1999 – 2007 data, BHCO abundance was greatest but decreasing within the Sevilleta and Bosque del Apache NWRs and has increased within the San Marcial reach during the past nine years. During three of the past four years, BHCO abundance has been greatest in the San Marcial reach. However, the ratio of mean number of hosts to mean number of BHCOs remained relatively steady with the exception of the

San Marcial reach, where it has increased. The Sevilleta and Bosque del Apache reaches are not grazed by livestock. However, livestock grazing was present adjacent to each of these areas and, based on telemetry data, cowbirds in this reach of the Rio Grande Basin traveled less than 2 km on a daily basis between feeding and breeding areas (Ahlers and Sechrist 2000). The higher numbers of BHCOs could be a result of greater host densities and/or the availability of alternative food sources. The methods and results of this study can also be found as a component of the following: *Riparian Obligate Nesting Success as Related to Cowbird Abundance and Vegetation Characteristics Along the Middle Rio Grande, New Mexico* (Moore 2006), *Cowbird Control Program: Middle Rio Grande, New Mexico, 2001* (Ahlers and Sechrist 2002) and *Brown-headed Cowbird Movement and Home Range Analysis in the Middle Rio Grande, New Mexico 1999* (Ahlers and Sechrist 2000).

- A study to monitor and evaluate the impacts of livestock grazing on the establishment and development of riparian vegetation was also continued. This study was initiated in 1997 to determine the effects of seasonal livestock grazing on the potential future habitat of the endangered SWFL and the physical disturbance to existing occupied habitats. Data from a series of established livestock exclosures and photo stations are collected biennially and processed. Study data are presented in the draft report *A Long Term Assessment of Livestock Impacts on Riparian Vegetation: Elephant Butte Project Lands* (Ahlers et al. 2008, *in prep*).

- 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 San Acacia Diversion Dam and Elephant Butte Reservoir had been classified using the Hink and Ohmart (1984) classification system through a cooperative effort with the U.S. Forest Service. This system identifies vegetation polygons based on dominant species and structure. Plant community types are classified according to the dominant and/or codominant species in the canopy and shrub layers. During the summer and fall of 2002, as part of the ESA Collaborative Program, Reclamation personnel updated vegetation maps from Belen to San Marcial using a combination of ground-truthing and aerial photo analysis. During the summer of 2004, the conservation pool of Elephant Butte Reservoir was again aerially photographed (true color) and vegetation heights were remotely-sensed using Light Detection and Ranging (LIDAR) methods. Most recently, aerial photographs were again taken during the summer and fall of 2007. These data are currently being processed and will be used to update the current SWFL GIS habitat model.

- A study to quantify the vegetation at known SWFL breeding sites began in 2003. Data gathered included nesting height and substrate, vegetation density, height diversity, canopy cover, and hydrology. Methodologies were refined in 2004 and a formal study was initiated. Between 2004 and 2006, data were gathered at 112 nests and will be used to increase overall knowledge of the

nesting and general habitat requirements of the species. The resulting analysis of these data will also help to provide guidelines for riparian restoration projects targeted for SWFL habitat. In 2007, data were gathered at 11 non-nest sites within maturing habitat in both the delta of Elephant Butte Reservoir and at the Los Lunas Restoration Site. These data will be compared to nest data to assess the suitability of these areas for nesting SWFLs. Data will be analyzed and a summary report will be forthcoming.

- 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. Currently, three sets of annual photos at each of the 13 stations have been taken and some have documented considerable vegetation growth. Results of this study can be found in *Elephant Butte Reservoir Delta Photo Stations – 2005-2007* (Ahlers 2007).

Methods

Study Area

Survey sites were selected based on environmental compliance needs related to Reclamation projects and a desire to continue updating the baseline population data of SWFLs in the Middle Rio Grande Basin. Sites consist of riparian habitat bounded by waterbodies, levees, or other physical features that are able to be surveyed by one person in one day. The 2007 survey area encompassed selected sites along the Rio Grande in New Mexico between Velarde and Elephant Butte Reservoir. This stretch contained eight distinct survey reaches: Velarde, Belen, Sevilleta/La Joya, San Acacia, Escondida, Bosque del Apache, Tiffany, and San Marcial. 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. Survey dates are summarized in Table 2.

The first survey conducted in late May increases the likelihood of detection, since territorial males are more vocal when establishing territories than after nesting has begun. It was anticipated that migrant WIFLs (Willow Flycatchers that are not the *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 2002 to derive a greater degree of confidence regarding the breeding status, habitat association, or presence/ absence of SWFLs at the selected sites. WIFLs documented on or after June 10 were considered resident birds (i.e., SWFLs). Each site was surveyed as thoroughly as conditions would allow.

Table 1. Number of sites and surveys per reach – Middle Rio Grande 2007.

Survey reach	Total sites surveyed	Number of surveys
Velarde	3	3
Belen	36	3: all sites but SV-11 (4 surveys)
Sevilleta/La Joya[1]	8	3
San Acacia	6	5
Escondida	14	3: all sites but LF-42, LF-43b, LF-44a, and LF-44b (5 surveys)
Bosque del Apache	13	3: all sites but BA-01 (5 surveys)
Tiffany[2]	9	3
San Marcial[3]	55	5
Total	144	See above

[1] Two sites in the Sevilleta/La Joya reach were not surveyed due to landowner issues.
[2] Site LF-26 was not surveyed in 2007 because the entire site burned in May 2006.
[3] Pre-season reconnaissance in sites EB-16 and 17 determined that habitat in these sites was unsuitable for breeding SWFLs, so no surveys were conducted.

Table 2. SWFL survey schedule for the 2007 field season

Survey number	Survey period*
1	May 15 – May 31
2	June 1 - June 21
3	June 22 – July 27
4	July 3 - July 14
5	July 15 - July 24

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

Nest Searches/Monitoring

Nest searches were conducted by a permitted biologist and/or 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. 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 1 week to minimize disturbance and allow for possible initiation of another nesting attempt. Then a re-nest/second brood search was performed to detect any subsequent nesting attempts. A re-nest is a nesting attempt that occurs after a nest fails while a second brood occurs after a nest successfully fledges young. When possible, nests were monitored through completion. However, the few nests that were not monitored to completion and had nestlings at least eight days old at the last visit were considered successful.

In 2002, the practice of addling BHCO eggs from parasitized nests was initiated when necessary and possible. This activity was continued in 2007. SWFL eggs were never disturbed and time spent at the nest was minimized. Frequently it was determined that the BHCO egg would not have a chance to hatch, based on nesting chronology. In these cases nests were monitored normally to minimize disturbance.

Hydrology Monitoring

In conjunction with SWFL nest monitoring, a hydrology monitoring study was implemented in 2004 and continued through 2007. Nineteen “hydrostations” (custom-built staff gauges) were installed in proximity to the “core” SWFL population in the headwaters of Elephant Butte Reservoir. These hydrostations were placed in locations representative of the overall site’s hydrology and were monitored approximately once a week during the SWFL breeding seasons from 2004 through 2007. These data were used to determine the relationship between flows in the LFCC and depth of water within the “core” SWFL breeding areas. Data from the 2004 through 2007 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 Southwestern Willow Flycatcher Nesting Parameters Within Elephant Butte Reservoir, NM 2002-2007 (Ahlers 2008, in prep.).

Results

Presence/Absence Surveys

During presence/absence surveys conducted from May 16 through July 26, 522 WIFLs were detected (351 males and 171 females). Based on detections prior to June 10 and the birds' lack of territorial behavior, 119 were believed to have been migrants (all of which were considered males due to singing). The remaining 403 birds (232 males and 171 females) were considered resident SWFLs. However, based on detection dates, 11 of the males were likely late migrants. SWFL detections within the Velarde, Belen, Sevilleta/La Joya, San Acacia, Escondida, Bosque del Apache, Tiffany, and San Marcial reaches are presented in Figures 3 through 11, respectively.

The 403 documented SWFLs established 232 territories and 171 pairs. Documented nesting attempts confirmed the existence of 142 pairs; they produced 232 nests. Twenty-nine additional pairs were observed and, although nesting was suspected, nests were not located in any of these territories. Of the 232 confirmed nesting attempts, 124 were believed successful, 96 failed, and the outcome of 12 was unknown. Successful nests include those which supported chicks at least 8 days old on the last nest visit. Every effort was made to monitor nests until nestlings were at least 10 days old. However, two 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. These nests contained nestlings 5 to 6 days old on the last visit of the nesting cycle. SWFL detection results for 2007 are summarized in Table 3.

During the 2007 season, four or five surveys were completed in 47 percent of the sites surveyed. Within these 67 sites (five surveys done in all but one site), 15 new SWFL territories were found during the fourth or fifth surveys in four sites (LF-17, LFCC-01, DL-08, and DL-09). With the exception of territories in LFCC-01, these territories were discovered during meticulous territory/nest searching and were in very close proximity to other territories. Therefore, it is likely that these birds were originally undetected or mistaken for the other territorial SWFLs nearby. The four territories in LFCC-01 were all discovered on July 3 in one small patch of habitat and were missed on previous surveys. These observations reinforce the importance of conducting fourth and fifth surveys in project areas and provide greater confidence to the absence of the species in unoccupied sites. 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).

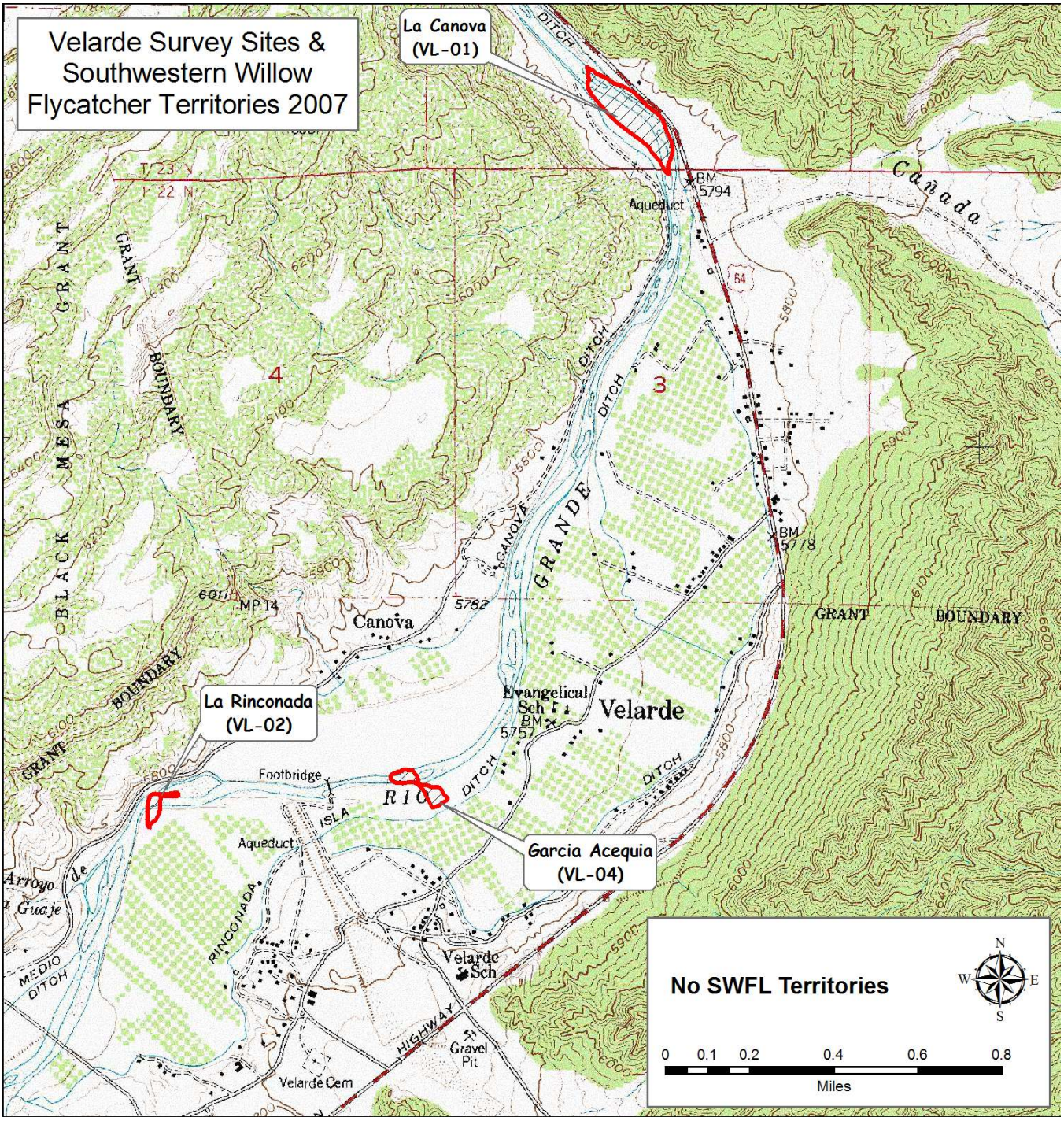


Figure 3. Overview of SWFL detections within the Velarde survey sites.

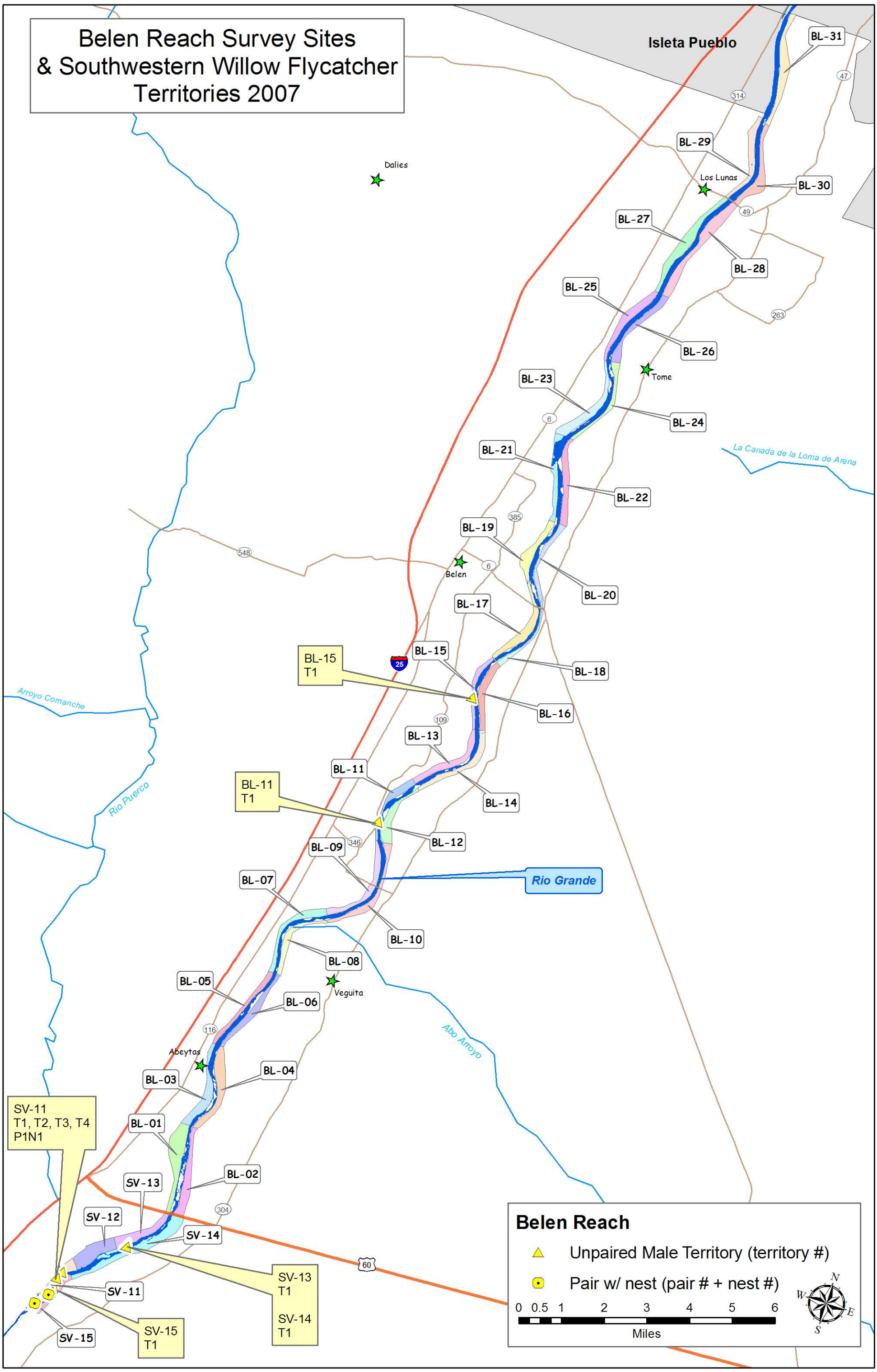


Figure 4. Overview of SWFL detections within the Belen survey sites.

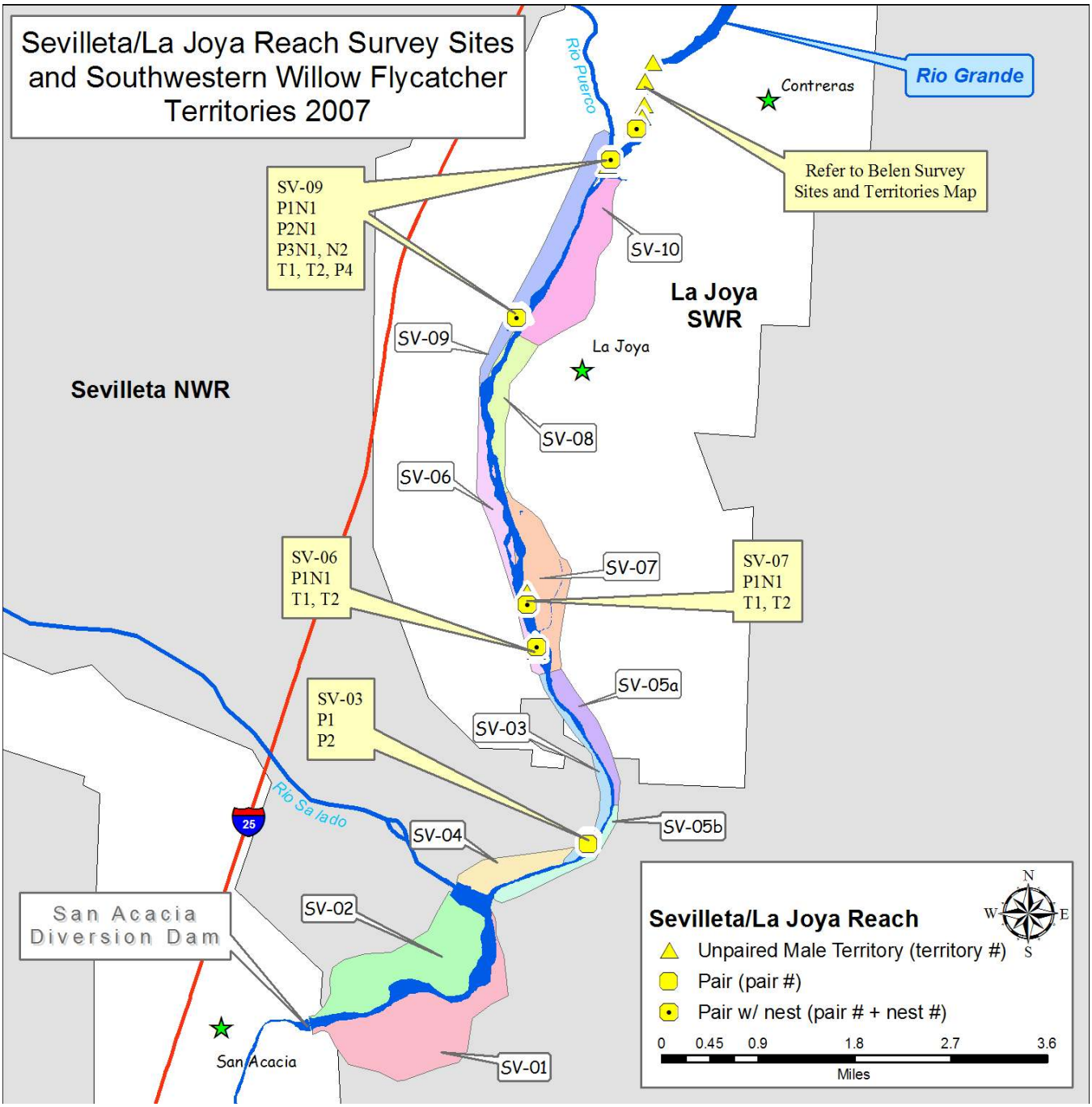


Figure 5. Overview of SWFL detections within the Sevilleta/La Joya survey sites.

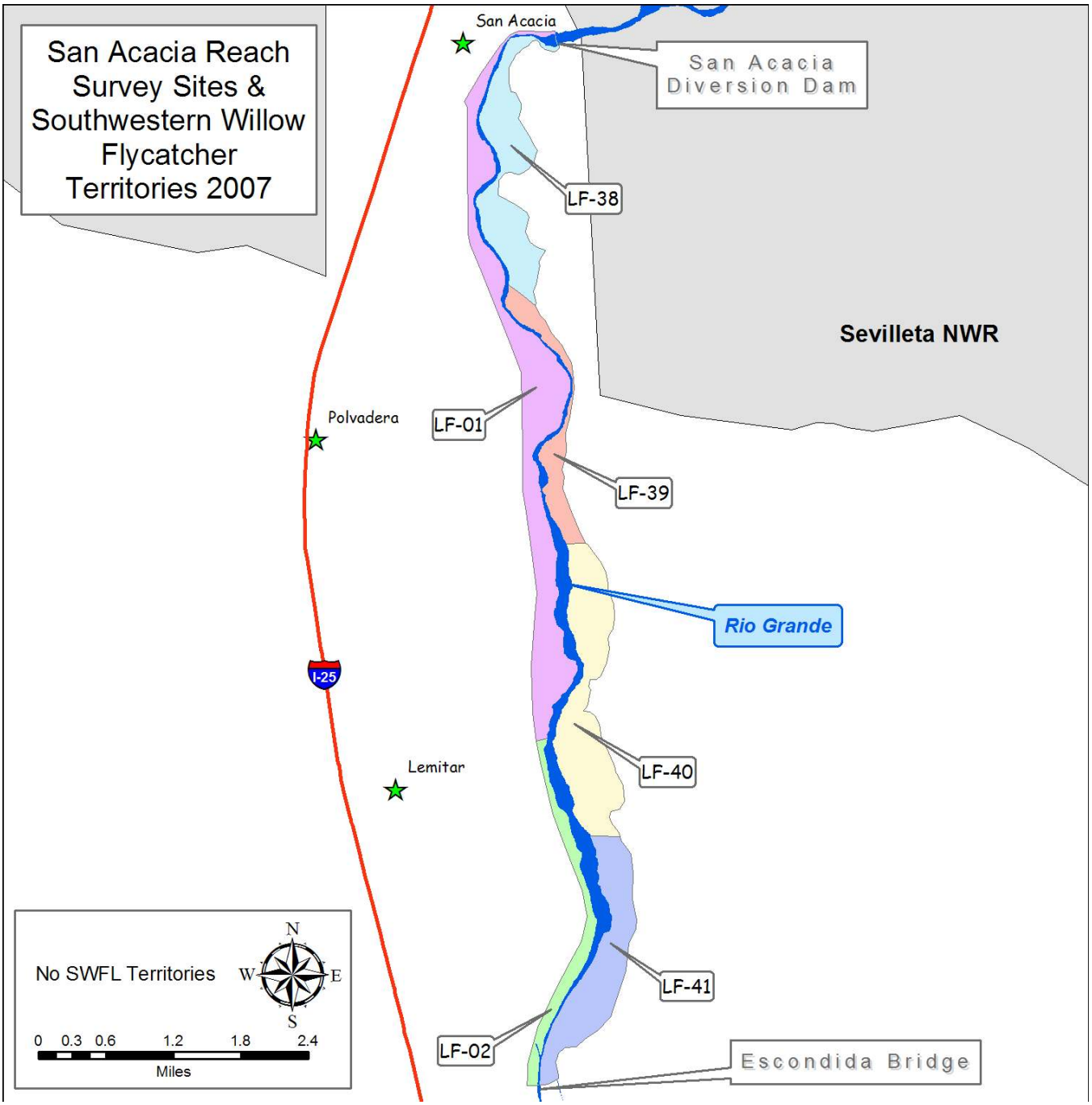


Figure 6. Overview of SWFL detections within the San Acacia survey sites.

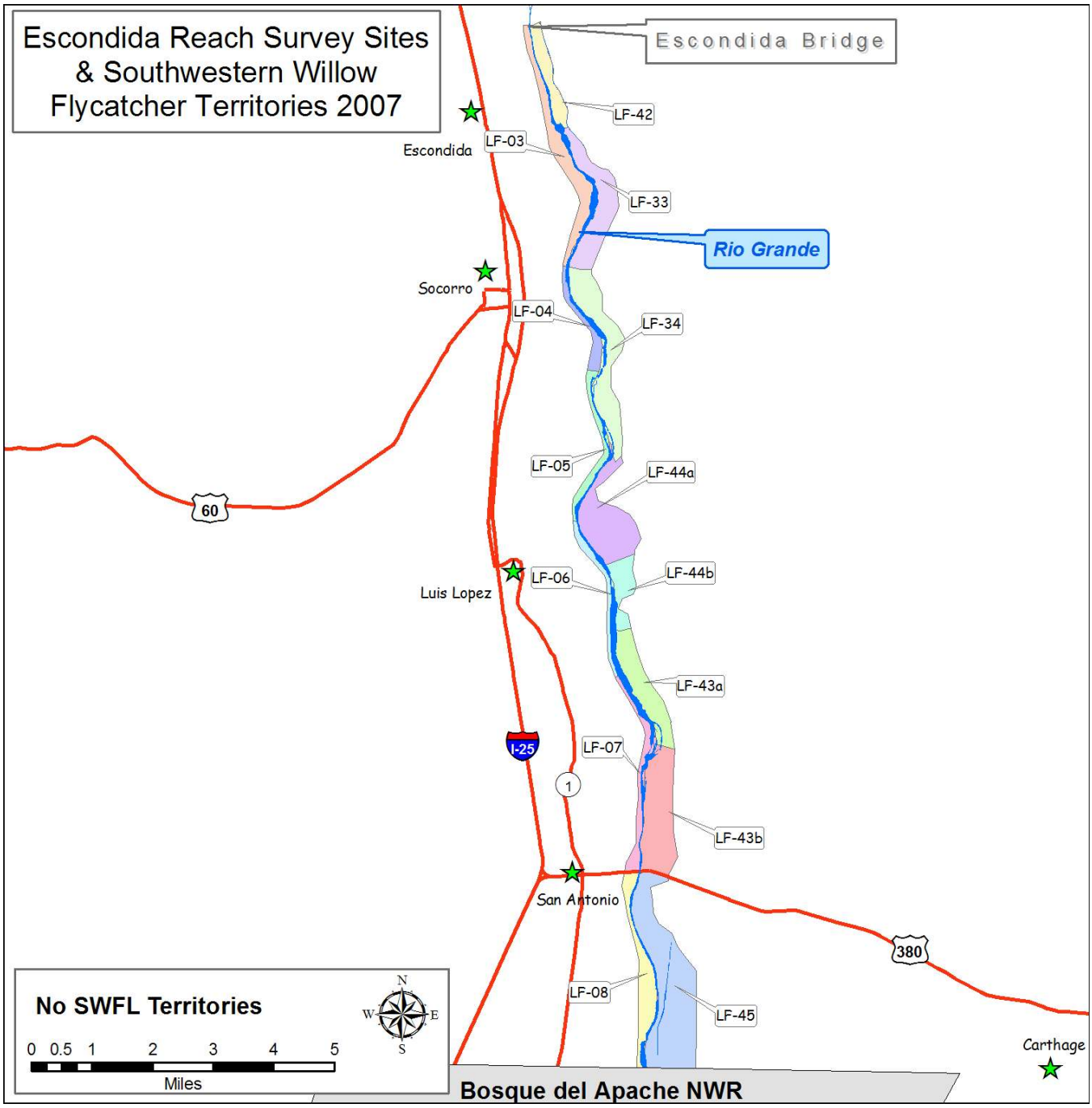


Figure 7. Overview of SWFL detections within the Escondida survey sites.

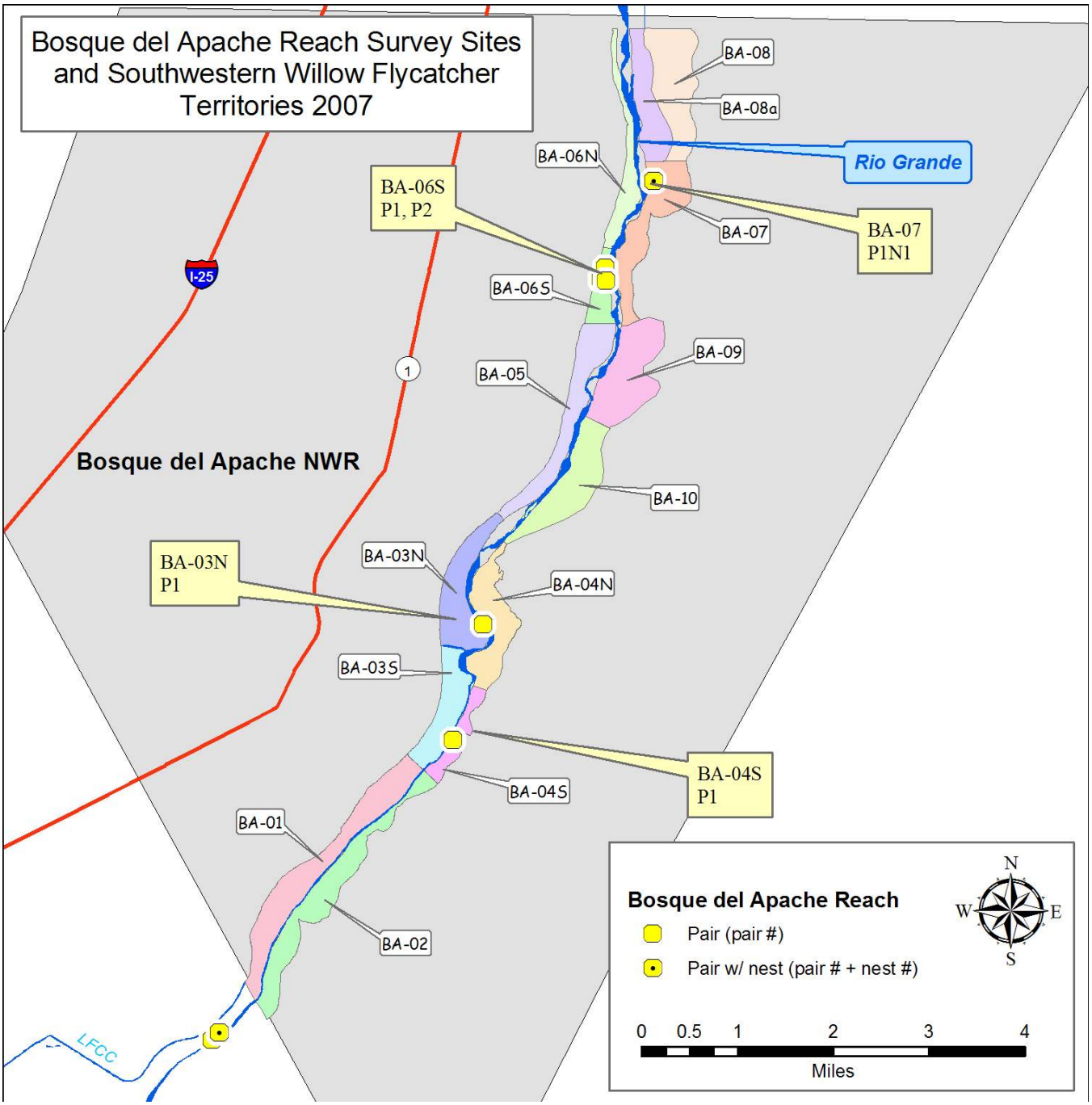


Figure 8. Overview of SWFL detections within the Bosque del Apache survey sites.

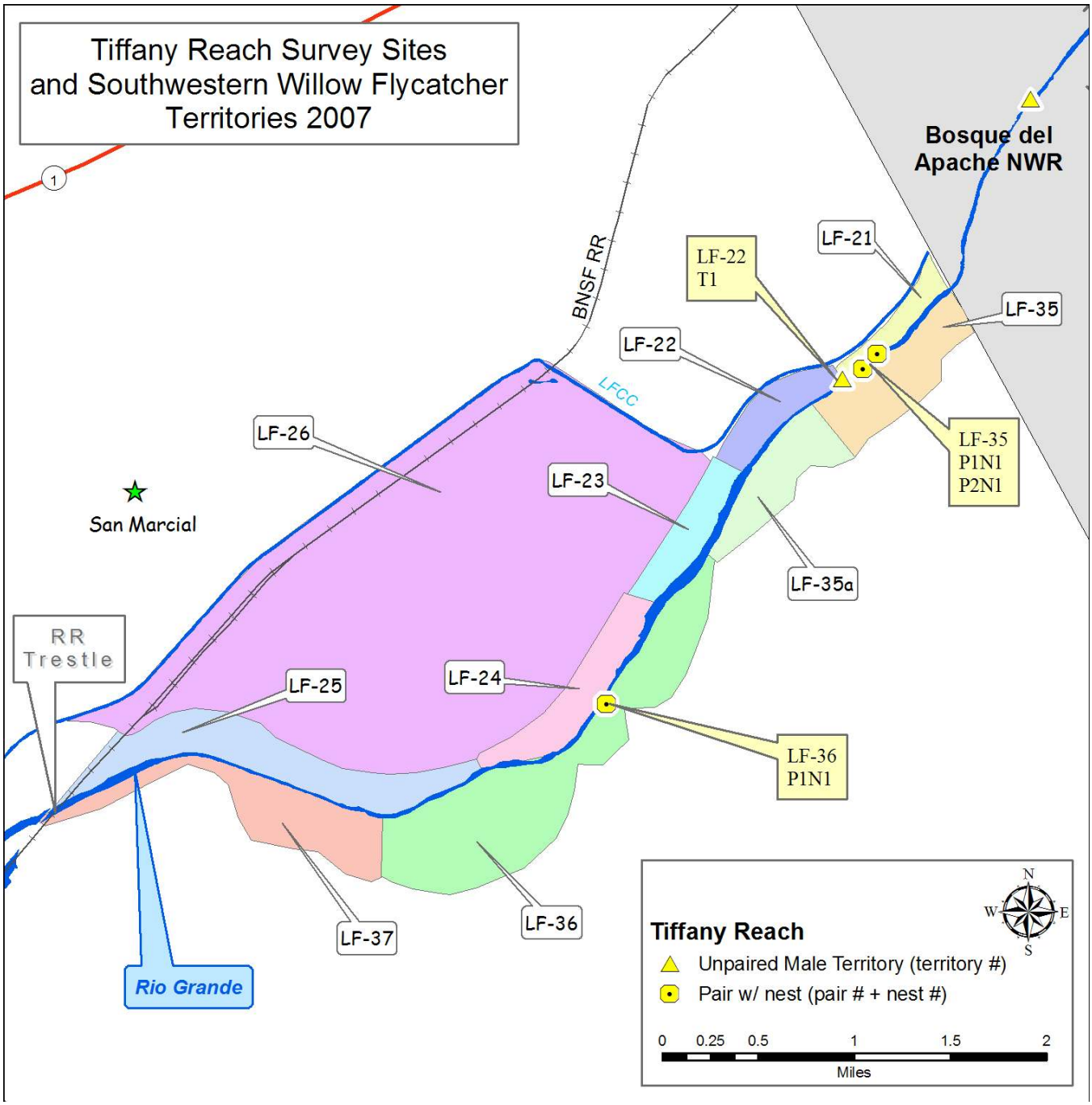
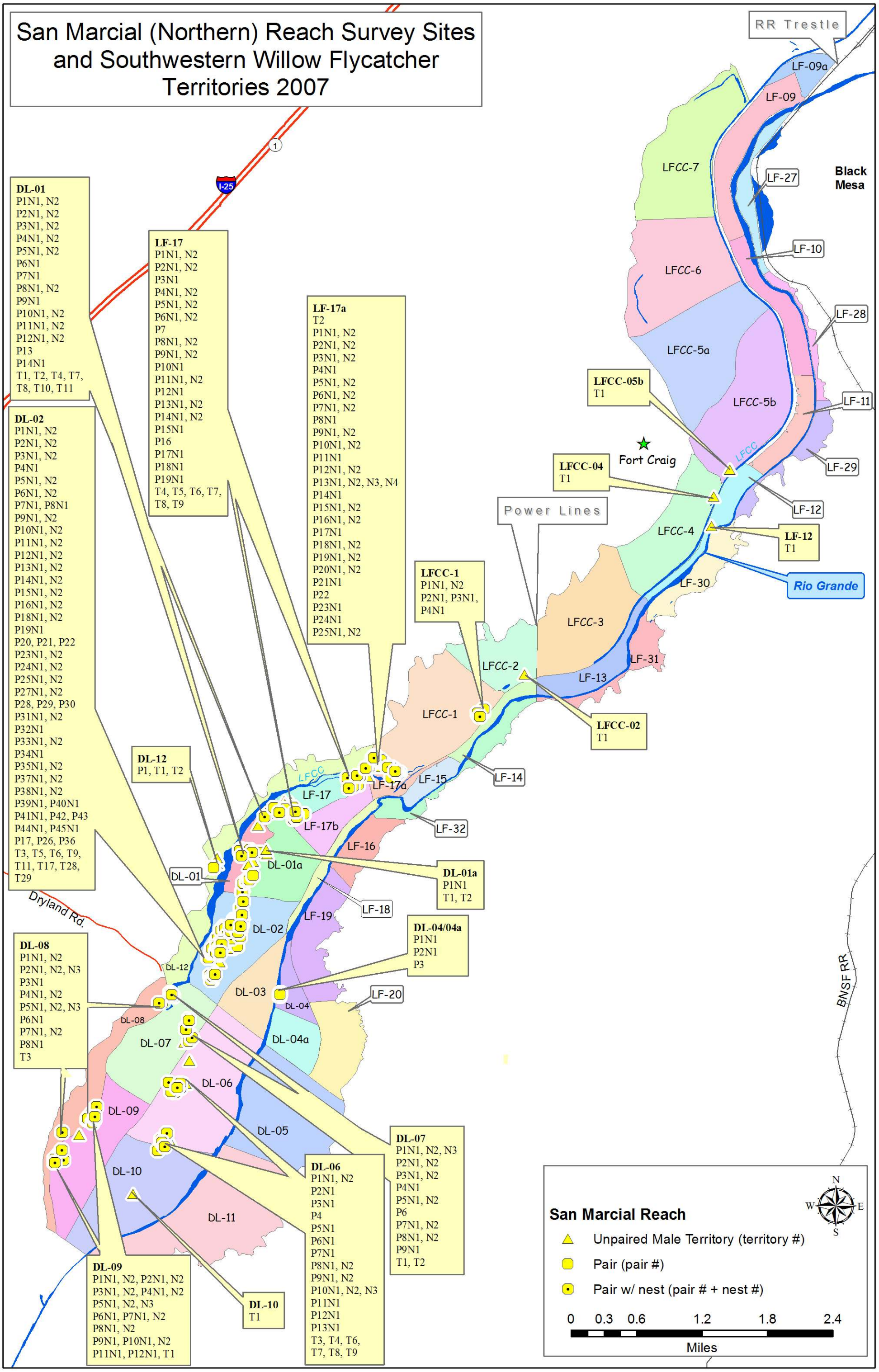


Figure 9. Overview of SWFL detections within the Tiffany survey sites.

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



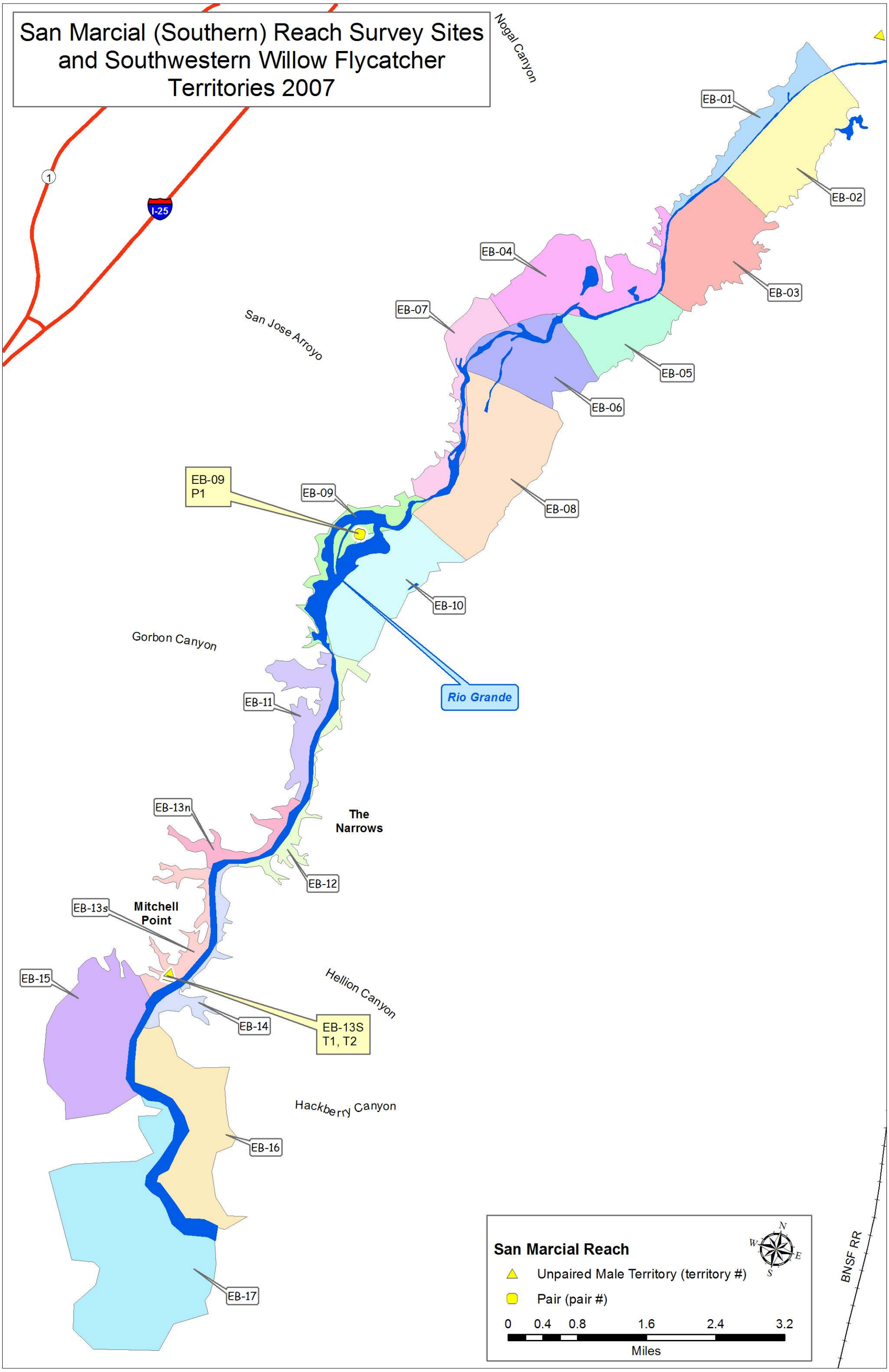


Figure 11. Overview of SWFL detections within the southern San Marcial survey sites.

Table 3. Summary of 2007 WIFL detections in the Middle Rio Grande.

Site Name	WIFLs Observed[1]	Est. Number of Pairs	Est. Number of *E.t. extimus*[2]	Est. Number of Territories	Nest (s) Found[3]	Nest Success	Comments
BL-03	2	0	0	0	N/A	N/A	Both migrants
BL-05	3	0	0	0	N/A	N/A	All migrants
BL-07	4	0	0	0	N/A	N/A	All migrants
BL-08	1	0	0	0	N/A	N/A	Migrant
BL-09	1	0	0	0	N/A	N/A	Migrant
BL-10	1	0	0	0	N/A	N/A	Migrant
BL-11	1	0	1	1	N/A	N/A	Unpaired male (likely late migrant, detected 6/13)
BL-12	1	0	0	0	N/A	N/A	Migrant
BL-13	2	0	0	0	N/A	N/A	Both migrants
BL-14	1	0	0	0	N/A	N/A	Migrant
BL-15	2	0	1	1	N/A	N/A	1 unpaired male (likely late migrant, detected 6/12); and 1 migrant
BL-16	3	0	0	0	N/A	N/A	All migrants
BL-18	1	0	0	0	N/A	N/A	Migrant
BL-21	6	0	0	0	N/A	N/A	All migrants
BL-25	2	0	0	0	N/A	N/A	Both migrants
BL-27	3	0	0	0	N/A	N/A	All migrants
SV-11	6	1	6	5	2	2 failed	4 unpaired males; and 1 pr that nested twice
SV-13	1	0	1	1	N/A	N/A	Unpaired male
SV-14	2	0	1	1	N/A	N/A	1 unpaired male (possible late migrant, detected 6/18); and 1 migrant
SV-15	1	0	1	1	N/A	N/A	Unpaired male (possible late migrant, detected 6/18)
Belen Reach [(4)] Summary	44	1	11	10	2	2 failed	33 migrants; 4 unpaired males (possible late migrants); 5 unpaired males; 1 pr

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

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

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

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

Table 3 (cont'd). Summary of 2007 WIFL detections in 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-02	7	0	0	0	N/A	N/A	All migrants
SV-03	6	2	4	2	No	N/A	2 migrants; and 2 prs
SV-06	4	1	4	3	1	failed	2 unpaired males (possible late migrants, detected 6/13); and 1 pr w/nest
SV-07	5	1	4	3	1	successful	1 migrant; 2 unpaired males (possible late migrants, detected 6/13); and 1 pr w/nest
SV-09	10	4	10	6	4	3 successful 1 failed	2 unpaired males; 1 pr; and 3 prs w/nests (5 nests reflect 2nd attempt by 1 pr)
Sevilleta/La Joya [5] Reach Summary	32	8	22	14	6	4 successful 2 failed	10 migrants; 4 unpaired males (possible late migrants); 2 unpaired males; 3 prs; and 5 prs w/nests
LF-01	7	0	0	0	N/A	N/A	All migrants detected only on 1st survey
LF-02	2	0	0	0	N/A	N/A	Both migrants detected only on 1st survey
LF-40	5	0	0	0	N/A	N/A	All migrants detected only on 1st survey
San Acacia Reach [6] Summary	14	0	0	0	N/A	N/A	14 migrants
LF-03	3	0	0	0	N/A	N/A	Migrants detected only on 1st and 2nd surveys
LF-04	1	0	0	0	N/A	N/A	Migrant detected only on 1st survey
LF-08	7	0	0	0	N/A	N/A	All migrants detected only on 2nd survey
LF-34	1	0	0	0	N/A	N/A	Migrant detected only on 1st survey
LF-44b	1	0	0	0	N/A	N/A	Migrant detected only on 1st survey
Escondida Reach [7] Summary	13	0	0	0	N/A	N/A	13 migrants

[5] Sevilleta/La Joya Reach = From confluence of Rio Puerco and Rio Grande downstream to San Acacia Diversion Dam
[6] San Acacia Reach = From San Acacia Diversion Dam downstream to Escondida Bridge
[7] Escondida Reach = From Escondida Bridge downstream to north boundary of Bosque del Apache NWR

Table 3 (cont'd). Summary of 2007 WIFL detections in 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
BA-01	2	0	1	1	N/A	N/A	One detected only on 1st survey. Other detection on June 19th - possible late migrant.
BA-03N	2	1	2	1	No	N/A	1 pr – no nest found
BA-04S	2	1	2	1	No	N/A	1 pr – no nest found
BA-05	1	0	0	0	N/A	N/A	Migrant detected only on 1st survey
BA-06N	3	0	0	0	N/A	N/A	Migrants detected only on 1st survey and early 2nd survey
BA-06S	6	3	6	3	No	N/A	3 prs – no nests found
BA-07	2	1	2	1	1	Unk	1 pr w/nest
BA-08 & BA-08a	2	0	0	0	N/A	N/A	Migrants detected only on 1st survey
Bosque del Apache Reach [8] Summary	20	6	13	7	1	1 unk	7 migrants; 1 unpaired male (possible late migrant); 5 prs; and 1 pr w/nest
LF-22	1	0	1	1	N/A	N/A	1 unpaired male
LF-35	4	2	4	2	2	2 successful	2 prs w/nests
LF-36	2	1	2	1	1	Successful	1 pr w/nest
Tiffany Reach [9] Summary	7	3	7	4	3	3 successful	1 unpaired male and 3 pr w/nests
LF-09/09a	2	0	0	0	N/A	N/A	2 migrants
LF-12	1	0	1	1	N/A	N/A	1 unpaired male
LF-14	1	0	0	0	N/A	N/A	1 migrant
LF-16	5	0	0	0	N/A	N/A	All migrants
LF-17	45	19	45	26	27	16 successful 10 failed 1 unk	17 prs w/nests; 2 prs; and 7 unpaired males: 27 nests reflect multiple pr attempts
LF-17a	51	25	51	26	41	24 successful 15 failed 2 unk	24 prs w/nests; 1 pr; and 1 unpaired male: 41 nests reflect multiple pr attempts
LF-27	1	0	0	0	N/A	N/A	1 migrant
LF-30	1	0	0	0	N/A	N/A	1 migrant
LF-31	2	0	0	0	N/A	N/A	2 migrants
LFCC-01	9	4	8	4	5	4 successful 1 failed	4 prs w/nests and 1 migrant; 5 nests reflects 2nd attempt by 1 pr

[8] Bosque del Apache Reach = From north boundary of Bosque del Apache NWR downstream to southern boundary of Bosque del Apache NWR.

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

Table 3 (cont'd). Summary of 2007 WIFL detections in 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
LFCC-02	2	0	1	1	No	N/A	1 unpaired male and 1 migrant
LFCC-04	3	0	1	1	No	N/A	1 unpaired male and 2 migrants
LFCC-05b	1	0	1	1	No	N/A	1 unpaired male
DL-01a	4	1	4	3	1	successful	2 unpaired males and 1 pr w/nest
DL-01	34	13	33	20	19	11 successful 7 failed 1 unk	1 migrant; 7 unpaired males; 1 pr; and 12 prs w/nests; 19 nests reflects multiple pr attempts
DL-02	104	45	98	53	57	29 successful 26 failed 2 unk	6 migrants; 8 unpaired males; 11 prs; and 34 prs w/nests; 57 nests reflects multiple pr attempts
DL-03	6	0	0	0	N/A	N/A	All migrants
DL-04/04a	8	3	6	3	2	2 successful	2 migrants; 1 pr; and 2 prs w/nests
DL-06	34	12	30	18	17	6 successful 10 failed 1 unk	4 migrants; 6 unpaired males; 1 pr; and 11 prs w/nests; 17 nests reflects multiple pr attempts
DL-07	20	9	20	11	15	10 successful 4 failed 1 unk	2 unpaired males; 1 pr; and 8 prs w/nests; 15 nests reflects multiple pr attempts
DL-08	18	8	17	9	15	4 successful 10 failed 1 unk	1 migrant; 1 unpaired male; and 8 prs w/nests; 15 nests reflects multiple pr attempts
DL-09	26	12	25	13	21	10 successful 10 failed 1 unk	1 migrant; 1 unpaired male; and 12 prs w/nests; 21 nests reflects multiple pr attempts
DL-10	2	0	1	1	N/A	N/A	1 migrant; and 1 unpaired male
DL-12	5	1	4	3	No	N/A	1 migrant; 2 unpaired males; and 1 pr
EB-09	2	1	2	1	No	N/A	1 pr
EB-13N	1	0	0	0	N/A	N/A	1 migrant
EB-13S	4	0	2	2	N/A	N/A	2 migrants; and 2 unpaired males which may have been late migrants
San Marcial Reach [10] Summary	392	153	350	197	220	117 successful 93 failed 10 unk	42 migrants; 44 unpaired males; 20 prs; and 133 prs w/nests
TOTAL 2007 Survey Summary	**522**	**171**	**403**	**232**	**232**	**124 successful 97 failed 11 unk**	**119 migrants; 11 unpaired males (possible late migrants); 50 unpaired males; 29 prs; and 142 prs w/nests**

[10] San Marcial Reach = From railroad trestle downstream through the narrows of Elephant Butte Reservoir.

Belen Reach

This reach extends from the southern boundary of the Isleta Pueblo to the confluence of the Rio Puerco and Rio Grande and encompasses riparian habitat within the active floodplain. It contains 34 sites which were surveyed three times (with the exception of SV-11, which was 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 (*Salix exigua*) 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 2007, 44 WIFLs were recorded in this reach. However, 33 were determined to be migrants, four were possible late migrants that were recorded as territories because of date of detection, five were unpaired male territories and two formed a pair and nested in site SV-11.

Site BL-11 is approximately 9 kilometers (km) south of Belen on the west side of the Rio Grande (3828298 N 338175 E to 3825679 N 337557 E). Habitat within this site consists of a mature cottonwood canopy with sparse Russian olive and saltcedar below. These Russian olive and saltcedar patches are alive and relatively dense on the eastern and western edges of the site and mostly dead and decadent in the middle. Average canopy height is 10 meters (m). The WIFL detected was found in a Russian olive patch along the western levee on June 13 and was likely a late migrant.

Site BL-15 is 3 km south of Belen on the west side of the river (3833559 N 339629 E to 3830765 N 339764 E). The site is narrow and contains tall (15 to 20 m) cottonwood gallery with both live and dead saltcedar patches in the understory and dense Russian olive along the river. Sandbars were exposed along the river edge as the river dropped during the summer. One probable late migrant WIFL was found on June 12 in a coyote willow patch along the riverside drain on the west side of the levee.

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 (*Salix gooddingii*), and cottonwood. Six SWFLs were documented in the higher quality habitat adjacent to the river - four unpaired males and one pair which produced two nests.

Site SV-13 is immediately south of Highway 60 on the west side of the Rio Grande (3809930 N 334520 E to 3808021 N 333055 E). Habitat within the site is dominated by saltcedar, Russian olive and cottonwood. The northern section is sparse Russian olive, saltcedar and mesquite (*Prosopis* sp.) with some cottonwood canopy. The southern half of the site consists of a large river bar adjacent to the river dominated by young coyote willow and cottonwood and an upper terrace containing Russian olive, cottonwood and coyote willow. The remainder of the site is sparse saltcedar. One unpaired male SWFL was detected in suitable habitat in the southern end of the site.

Site SV-14 is located immediately south of Highway 60 on the east side of the river (3809922 N 334677 E to 3806618 N 331677 E). It is a narrow, 4.8 km long site with several lower terraces and riverbars along the riverside. Vegetation consists of sparse saltcedar, Russian olive, and overstory cottonwood on the interior of the site and dense, mid-age coyote willow, Goodding's willow, cottonwood, and Russian olive on riverbars and lower terraces. One unpaired male (which was possibly a late migrant) was detected on June 18.

Site SV-15 is south of site SV-14 on the east side of the Rio Grande north of the confluence with the Rio Puerco (3806618 N 331677 E to 3804617 N 330394 E). Good SWFL habitat in the form of coyote willow, Russian olive and cottonwood exists adjacent to the outfall of the San Juan drain at the southern end of the site, on a riverbar in the northern portion of the site and along the river's edge. Otherwise, habitat is dominated by historically burned, patchy saltcedar and other shrubs. One WIFL was detected in good habitat on the northern sandbar on June 18 and was never documented again; it was likely a late migrant.

Sevilleta/La Joya Reach

This reach extends from the confluence of the Rio Grande and Rio Puerco downstream to the San Acacia Diversion Dam and encompasses 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). The eight sites within this reach were surveyed three times. 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. The river in this reach is degraded and overbank flooding, particularly on the higher terraces, rarely occurs. 32 WIFLs were detected in this reach during 2007 surveys; 10 were determined to be migrants, four were probable late migrant WIFLs that were recorded as territories because of date of detection, two were unpaired male territories, and 16 formed pairs.

Site SV-03 is approximately 5 km upstream of the San Acacia Diversion Dam on the west side of the river (3797415 N 329795 E to 3794541 N 330046 E). Habitat is composed almost entirely of very dense saltcedar interspersed with Russian olive and gallery cottonwoods. This site is very dry and receives infrequent overbank flooding. Soil underneath the saltcedar canopy is occasionally moist due to rains or moisture trapped in the thick layer of saltcedar duff. During the winter of 2006-2007, several large saltcedar trees within the previously occupied habitat patch were blown down resulting in reduced habitat suitability for nesting SWFLs. Two SWFL pairs were documented in this site in 2007.

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. Territories found in this site in 2007 were located in Russian olive dominated habitat along high flow channels. Four SWFLs were documented: two unpaired males (that were likely late migrant WIFLs) and one pair.

Site SV-07, located on the west 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. SWFLs, including two unpaired males that were likely late migrant WIFLs and a pair, were found in dense Russian olive during surveys in 2007.

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 flow in certain areas. Several high flow channels in the northern end of the site periodically receive overbank flows. Five SWFLs were detected in coyote willow habitat in the northern end of the site and five were detected in mixed Russian olive and coyote willow habitat in the southern end of the site. SWFLs documented include two unpaired male territories and four pairs.

Bosque del Apache Reach

This reach encompasses riparian habitat within the active floodplain of the Bosque del Apache NWR. Thirteen sites were each surveyed three times during 2007 (with the exception of BA-01, which was surveyed five times). Habitat within this reach 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 less degraded and large stretches of the active floodplain flood during high spring and summer flows. Twenty WIFLs, including seven migrants, one unpaired male (possibly a late migrant), and six SWFL pairs, were detected in this site during 2007 surveys.

Site BA-01 is located immediately north of the southern Bosque del Apache boundary on the west side of the Rio Grande (3736814 N 325648 E to 3732924 N 322831 E). It is a long, linear site with vegetation composed almost exclusively of saltcedar and sporadic gallery cottonwoods. Patches of dense coyote willow and Russian olive occur occasionally along the river. There is a large high-flow channel in the northern end of the site and much of the site was flooded well into the 2007 survey season. Two WIFLs were detected in higher quality riverside habitat. One was a migrant and the other was considered a resident SWFL based on date of detection (June 19) but was likely a late migrant.

Site BA-03N is located on the Bosque del Apache NWR approximately 7 km north of the southern refuge boundary and immediately north of the Bosque Channel Widening Project (3741030 N 327004 E to 3738796 N 326371 E). The majority of the habitat in this site is dense, monotypic saltcedar with a few patches of native vegetation on the riverside. There is an older riverbar on the south end of the site that contains native vegetation in the form of large overstory cottonwoods and patches of coyote willow and seepwillow. Most of this site was flooded and one SWFL pair was documented on the southern riverbar during 2007 surveys.

Site BA-04S is located approximately 5 km north of the southern refuge boundary (3738231 N 326491 E to 3736814 N 325648 E). Vegetation within this site consists primarily of varying densities of decadent saltcedar and seepwillow with a patchy overstory of gallery cottonwoods.

Patches of higher quality coyote willow WIFL habitat exist adjacent to the river. One SWFL pair was documented in this site during 2007 surveys.

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 within this site 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. Nearly the entire site was flooded during the 2007 survey season; three SWFL pairs were documented here.

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 2007 survey season and dried out as the summer progressed. Habitat within the site varies from marsh in the northeastern portion of the site to young cottonwood, coyote willow, saltcedar and Russian olive adjacent to the river. A pair of SWFLs nested in the site in 2007.

Tiffany Reach

The Tiffany Reach extends from the southern boundary of the Bosque del Apache to the 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 receive overbank flooding and a sediment plug in the southern end of this reach in 2005 forced river water through habitat in the southern end of this reach. Seven SWFLs, including one unpaired male SWFL territory and three SWFL pairs, were observed in this reach in 2007.

Site LF-22 is approximately 1.5 km south of the southern Bosque del Apache boundary on the west side of the river (3732177 N 321944 E to 3731409 N 321097 E). It is a relatively short site (1.2 km long) and vegetation is dominated by mid-aged saltcedar. Along the river, patches of coyote willow, Goodding's willow and overstory cottonwoods occur. Also, there is a small patch of cottonwoods on the southern end of the site adjacent to the levee. One unpaired male territory was documented in this site during 2007 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. Two pairs of nesting SWFLs were documented in dense mature Russian olive adjacent to the river.

Site LF-36 is a large site located 3 km upstream of the San Marcial railroad trestle on the east side of the Rio Grande (3730728 N 320792 E to 3728521 N 318082 E). Much of the site is monotypic saltcedar, particularly the areas that are distant from the river, and a portion of the saltcedar in the

northern part of the site has been cleared. There are also several patches of willows and cottonwoods in the southern end of the site and this area also frequently holds surface water from a high water table and/or overbank flooding. One pair of SWFLs nested in mature Goodding's willow and coyote willow adjacent to the river.

San Marcial Reach

This reach is the longest of our survey reaches and contains the most survey sites and SWFL territories. It extends from the San Marcial railroad trestle downstream to the headwaters of Elephant Butte Reservoir. It encompasses 55 sites, both inside and outside the active floodplain, that were surveyed five times each. Habitat within this reach consists of some of the best native SWFL habitat within the subspecies' range. Vast expanses of native Goodding's willow and coyote willow formed in the conservation pool of Elephant Butte Reservoir as the reservoir receded during the late 1990's and early 2000's. This habitat currently sustains a large population of breeding SWFLs. 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 river channel provides very little overbank flooding in this reach. During 2007 surveys, 392 WIFLs, including 42 migrants, 44 unpaired male SWFL territories, and 153 SWFL pairs, were detected in this reach.

Site LF-12 is a long (2.5 km), mostly narrow site immediately east of Fort Craig on the west side of the Rio Grande (3723102 N 314765 E to 3721226 N 313069 E). Habitat within this site is primarily native and composed of a combination of overstory Goodding's willow, cottonwood and coyote willow with young saltcedar and coyote willow in the understory. In years past, this site flooded during high river flows. However, since a large river degradation event in 2005, high riverbanks have prevented any overbank flows and lowered the water table. Consequently, over the past two years, the overstory Goodding's willow has died out to a large degree. One unpaired male SWFL territory was documented in this site in 2007.

Site LF-17 is located in the northern end of the conservation pool of Elephant Butte Reservoir, and to the south of the breach in the LFCC (3718796 N 308899 E to 3718303 N 307471 E). The area encompassed by LF-17 in 2003 was split in two (LF-17 and LF-17b) prior to the 2004 survey season to allow more attention to the high quality, occupied habitat on the western side of the site. Formal surveys were not conducted within this site. Instead, experienced/permitted (nest monitoring) biologists conducted extensive nest searches/surveys. Thorough survey results were achieved without the additional disturbance/stress of "formal" surveys. For purposes of documentation, survey forms were completed to reflect abundance during the five survey periods. Due to water provided by the LFCC outfall, standing water or saturated soil was present in much of this site throughout the 2007 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 seems to be becoming more decadent and less attractive to nesting SWFLs as time progresses, as beaver activity takes its toll, and as understory trees are shaded out by large, overstory willows. Habitat within the southern end of the site is currently of higher quality and contains more SWFL territories. Nineteen SWFL pairs and seven unpaired male SWFL territories were documented during 2007 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 in this site 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 2007 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 one unpaired male SWFL territory were documented in this site in 2007.

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 seepwillow adjacent to the LFCC. It is in this patch that four breeding SWFL pairs were documented during 2007 surveys.

Site LFCC-02 is approximately 2 km north of Quates Canyon and the LFCC outfall on the west side of the LFCC (3720110 N 311419 E to 3719889 N 310952 E). The central and northwestern portion of the site is a large marsh containing open water, dead saltcedar, and cattails. Young cottonwoods and saltcedar are present on the southern end of the site adjacent to the LFCC and mature, decadent saltcedar occupies northern portions of the site. One unpaired SWFL territory was documented in this site in 2007.

Site LFCC-04 is located immediately south of the Fort Craig bridge on the west side of the LFCC (3722974 N 314143 E to 3721291 N 312988 E). Habitat within this site is almost exclusively decadent saltcedar. An old oxbow pond and associated cottonwood gallery exists adjacent to the LFCC and small patches of cottonwoods and/or coyote willows occur in several areas. Standing water is present in much of the site and one unpaired male SWFL territory was documented during 2007 surveys.

Site LFCC-05b is located north of the Fort Craig bridge on the west side of the LFCC (3725558 N 314857 E to 3722974 N 314143 E). A large area of flooded dead saltcedar and cattail marsh occupies the eastern portion of the site. The remaining vegetation is primarily young to mid-aged saltcedar with a few small stands of gallery cottonwoods. Standing water is often present throughout much of the site. One unpaired male territory was documented on the southern end of the site adjacent to the road.

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 by experienced and

permitted biologists. 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 suitable. 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 unpaired male SWFL territories and one SWFL pair were documented in this site in 2007.

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, 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. Seven unpaired male SWFL territories and 13 pairs were documented in this site in 2007.

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 on the western edge 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 eastern 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 2007. SWFLs in this site are concentrated in the high quality native habitat on the western edge along the LFCC. Eight unpaired male SWFL territories and 45 SWFL pairs were documented in this site in 2007.

Site DL-04/04a is located immediately southeast and across the Rio Grande from DL-02 (3716400 N 307841 E to 3715271 N 307545 E). Site DL-04 was split into DL-04 and DL-04a prior to the 2003 survey season to allow for increased attention to the high quality SWFL habitat adjacent to the river. Along the western edge, suitable SWFL habitat is composed of mature native species such as Goodding's willow and coyote willow. The interior of the site is composed of a mixture of mature saltcedar, Russian olive, and native species including coyote willow, Goodding's willow, and cottonwood. Habitat quality within this site has declined since 2005 when the river degraded and the water table dropped and SWFL territory numbers have reflected this decline. Three SWFL pairs were documented in this site in 2007.

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. Six unpaired male SWFL territories and 12 SWFL pairs were documented in this site in 2007.

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 northwestern end of the site along the LFCC outfall and former high-flow channels. The rest of the site is a mix of dead or decadent saltcedar and open areas with low-growing herbaceous vegetation such as grasses and emergent aquatics. There is a fair amount of marshy habitat within this site if water from the LFCC is present in sufficient quantity. Two unpaired male SWFL territories and nine SWFL pairs were detected during 2007 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. One unpaired male SWFL territory and eight 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 in the northern portions of the site. Much of the site was either flooded or saturated throughout the survey season. One unpaired male SWFL territory and 12 SWFL pairs were detected in this site during 2007 surveys.

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). Vegetation within the northern portion of this site is dominated by 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 the northern portion rarely contains standing water currently. One unpaired male SWFL territory was detected in Goodding's willow habitat in the middle of the site during 2007 surveys.

Site DL-12 is a long (4.8 km), narrow site bounded by the LFCC outfall on the east and uplands on the west. It runs from approximately Quates Canyon to Dryland Road (3719016 N 309039 E to 3715506 N 306009 E). Habitat within the site is varied and ranges from large swaths of cattail marsh to mid-aged coyote willow, Goodding's willow, and cottonwood to decadent saltcedar. Portions of the site contain standing water from a high water table and/or the LFCC outfall. Two unpaired males and one pair were documented in this site in 2007.

Site EB-09 is located within the pool of Elephant Butte Reservoir immediately upstream of the section of the reservoir called "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.). One SWFL pair was documented in this site in 2007.

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. Two unpaired male SWFL territories, which were likely late migrants, were located in the higher quality Goodding's willow habitat in this site.

Nest Searches/Monitoring

In 2007, Reclamation personnel monitored a total of 232 nests in the Middle Rio Grande valley. Of these, 124 were successful, 96 failed, and the outcome of 12 was unknown. Thirty-two nests were parasitized, and BHCO eggs or nestlings were manipulated (eggs addled, eggs or nestlings removed) in 11 of them. Of those 11 nests, four were predated, one was abandoned due to BHCO parasitism, and six successfully fledged SWFL young. Of the other 21 parasitized nests in which BHCO egg or nestling manipulation was either impossible or not warranted, 13 failed due to parasitism, seven were predated and one fledged SWFL young. The following is a reach-by-reach and site-by-site summary of the SWFL nest monitoring efforts of 2007. 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 and then one pair again produced two nests in 2007 in site **SV-11**. Both nests were predated and one was also parasitized.

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 have slowly declined to a low of six in 2007. Nest searching effort in this reach was reduced in 2007 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. Of the six nests discovered in 2007, one was a second brood. Four nests were successful and two failed. At least 11 young are believed to have successfully fledged from these nests. Two nests were known to be parasitized, however, both were successful. The following is a site-by-site breakdown of all SWFL nesting in the Sevilleta/La Joya reach during 2007:

Table 4. Summary of SWFL nest monitoring (1999-2007) – 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
Total	124	92	98	22 (27%)	26 (32%)	10 (12%)	17	43 (53%)	97	2.3

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

SV-03 – No nesting was documented in this site in 2007, although two pairs were documented.

SV-06 – One pair in this site produced one nest that was predated with unknown contents.

SV-07 – One pair in this site produced one nest that successfully fledged two SWFLs.

SV-09 – Three pairs in this site produced four nests; a fourth pair was documented but nesting was not confirmed. Of the four nests, three were successful and one was predated. Two nests were parasitized and both successfully fledged SWFLs.

Bosque del Apache reach

SWFL nesting in this reach has been sporadic during the past five breeding seasons; a total of five nests have been produced during this period. In 2007, one pair in **BA-07** produced one nest of which the outcome was unknown.

Tiffany reach

With the exception of 2004, during which 11 nests were documented, SWFL nests in this reach have not been abundant during the past six years. Nest numbers totaled four in 2005 and one in 2006. During 2007, two pairs produced three nests in this reach (including one second brood). All three were successful, fledging eight SWFLs, and none were parasitized. The following is a site-by-site breakdown of all SWFL nesting in the Tiffany reach during 2007:

LF-35 – One pair in this site produced two nests; another pair was documented but nesting was not confirmed. Both nests were successful, none were parasitized and a total of three SWFLs were fledged.

LF-36 – The one pair documented in this site produced one nest. It successfully fledged three SWFLs and was not parasitized.

San Marcial reach

A total of 153 pairs and 220 nests (including 49 re-nests and 37 second or third broods) were documented in this reach in 2007. All but four unpaired male territories occurred within the Elephant Butte Reservoir conservation pool. 133 pairs were confirmed by the presence of nesting activity, the other 20 did not construct nests or nests were not found. Fledging of SWFL young occurred in 117 of the 220 nests, 40 nests were predated, 31 were abandoned, 22 failed directly due to parasitism, and the outcome of 10 was unknown. The 133 nesting SWFL pairs in this reach produced at least 320 fledglings.

This reach contained 29 parasitized nests; 14 failed directly due to BHCO parasitism (abandoned), ten were subsequently predated, and five successfully fledged young SWFLs. Eight of the parasitized nests were accessible enough and timed right to allow BHCO egg or nestling manipulation; three were subsequently predated, one failed directly due to BHCO parasitism, and four fledged. Of the 21 parasitized nests where no manipulation occurred, 13 failed directly due to BHCO parasitism, seven were predated, and one successfully fledged SWFL young. 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 2007 SWFL breeding season. Table 5 details the SWFL nest monitoring done in the San Marcial reach since 1994.

DL-01 – SWFL pair and nest numbers in this site have remained relatively steady for the past three years after peaking at a high of 27 pairs and 47 nests in 2004. In 2007, 13 pairs were documented producing 19 nests, including three re-nests and three second broods. One pair either did not nest or a nest was not found. Eleven nests were determined to be successful, one failed directly due to parasitism, one was abandoned and the fate of one was unknown. One nest was parasitized. At least 32 SWFLs were assumed to have fledged from this site.

DL-02 – This site has experienced the biggest increase in SWFL pairs and nests of any site in the Middle Rio Grande during the past four years. Nests have increased from 12 in 2004 and 19 in 2005 to 57 in 2007. A total of 45 pairs were documented; 34 nested and nesting could not be confirmed for 11. Of the 57 nests, 29 were successful, 11 were predated, five were abandoned, 10 failed directly due to parasitism and the outcome of two were unknown. Twelve of the nests were re-nests and 11 were second broods. Thirteen nests were parasitized; ten failed directly due to parasitism, one was predated, and two successfully fledged SWFL young. At least 69 SWFL young fledged from this site.

Table 5. Summary of SWFL nest monitoring in the San Marcial reach (1996-2007).

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)
1996	13	1	1	0	0	1 (100%)	---	0	0	---
1997	10	3	2	0	0	0	0	2 (100%)	4	2.0
1998	11	4	2	0	0	0	0	2 (100%)	7	3.5
1999	12	5	5	1 (20%)*	1 (20%)*	1 (20%)*	0	4 (80%)	10	2.5
2000	23	20	19	2 (12%)*	1 (6%)	2 (12%)*	2	14 (82%)	29	2.1
2001	25	25	36**	0	7 (19%)	2 (6%)	0	27 (75%)	79	2.9
2002	60	50	66**	11 (17%)*	19 (29%)*	6 (9%)*	0	36 (55%)	≥86	2.4
2003	82	67	96**	17 (18%)*	31 (33%)*	13 (14%)*	3	48 (52%)	≥126	2.6
2004	113	92	153**	25 (17%)*	48 (32%)*	15 (10%)*	4	71 (48%)	187	2.6
2005	107	77	127**	16 (13%)*	37 (31%)*	7 (6%)*	7	68 (57%)	≥197	2.9
2006	142	117	148**	15 (10%)*	47 (33%)*	11 (8%)	4	83 (58%)	≥213	2.6
2007	197	153	220**	29 (14%)*	40 (19%)*	31 (15%)	10	117 (56%)	320	2.7
Total	798	614	875	116 (14%)	231 (27%)	89 (11%)	30	472 (56%)	1258	2.7

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

DL-04/04a – Pair numbers and nesting in this site have experienced a sizeable decrease during the past three years. Totals have decreased from 10 nesting pairs and 14 nests in 2005 to three pairs and two nests in 2007. The two nests were both successful, neither was parasitized, and five SWFL young fledged.

DL-06 – This site has also experienced a large increase in both pairs and nests during the past two years. It has gone from being unoccupied in 2005 to containing 12 pairs and 17 nests (including four re-nests and one second brood) in 2007. Nesting could not be confirmed for one pair. Six nests were successful, three were predated, five were abandoned, two failed due to BHCO parasitism, and the fate of one was unknown. Nineteen SWFL young fledged from this site.

DL-07 – Pair numbers in this site increased from seven in 2005 to 12 in 2006. In 2007, nine pairs and 15 nests (including three re-nests and four second broods) were documented. Nesting was not documented for one pair. Ten nests successfully fledged, three were abandoned, one was predated and the fate of one was unknown. One nest was parasitized and was successful. Twenty-eight SWFLs fledged from this site.

DL-08 – Eight pairs, which produced 15 nests (including six re-nests and one second brood), were documented in this site in 2007. Breeding SWFLs in this site have also increased greatly since first documented in 2005 (with one pair and one nest). Four nests were successful, five were predated, three were abandoned, and two failed due to BHCO parasitism. Three nests total were parasitized. Only one successfully fledged SWFL young. Nine SWFLs fledged from this site.

DL-09 – Twelve pairs and 21 nests were documented in this site in 2007. This represents a dramatic increase from the previous two years (six pairs, nine nests and one pair, two nests, respectively). Five of the nests were re-nests and four were second broods. Of the 21 nests, 10 were successful, two were predated, three were abandoned, five failed due to BHCO parasitism, and the fate of one was unknown. 29 SWFLs fledged from this site.

LF-17 – Pair and nest numbers have been relatively steady in this site since 2001. In 2007, 19 pairs and 27 nests (including six renests and four second broods) were documented. Sixteen nests were successful, four were predated, four were abandoned, two failed directly due to BHCO parasitism, and the fate of one was unknown. In total, three nests were parasitized, of which one successfully fledged SWFL young. A total of 46 SWFL young fledged from this site in 2007.

LF-17a – In 2007, this site was the second most productive in terms of SWFL nesting in our study area. 24 pairs produced 41 nests. Another pair was documented without nesting. Of the 41 nests, ten were re-nests and seven were second broods. Twenty-four of the nests were successful, nine were predated, six were abandoned, and the fates of two were unknown. One nest was parasitized but still managed to fledge SWFL young. Sixty-nine SWFL young fledged from this site in 2007.

LFCC-01- Nesting was documented in this site for the first time in 2006. In 2007, four pairs produced five nests. Four of the nests were successful and one was abandoned. None were parasitized. Twelve SWFLs fledged from the site.

Hydrology Monitoring

As shown in Figure 12, all but four hydrostations were flooded when LFCC flows reached 100 cfs between 2004 and 2007. Fourteen of 19 hydrostations were flooded when flows were at least 80 cfs. Stations that dried out at the highest flows were those stations located in survey site LF-17a. These stations are the first downstream of the LFCC breach where the LFCC begins to branch out over a larger floodplain, resulting in slower water velocities. These sites have aggraded during the past several years of sediment deposition, making them slightly higher in elevation (and thus, the first to dry out) than downstream sites that receive less sediment deposition. Consequently, it is likely that site LF-17a will continue to aggrade at a much faster rate than downstream sites and will be less prone to flooding as this occurs.

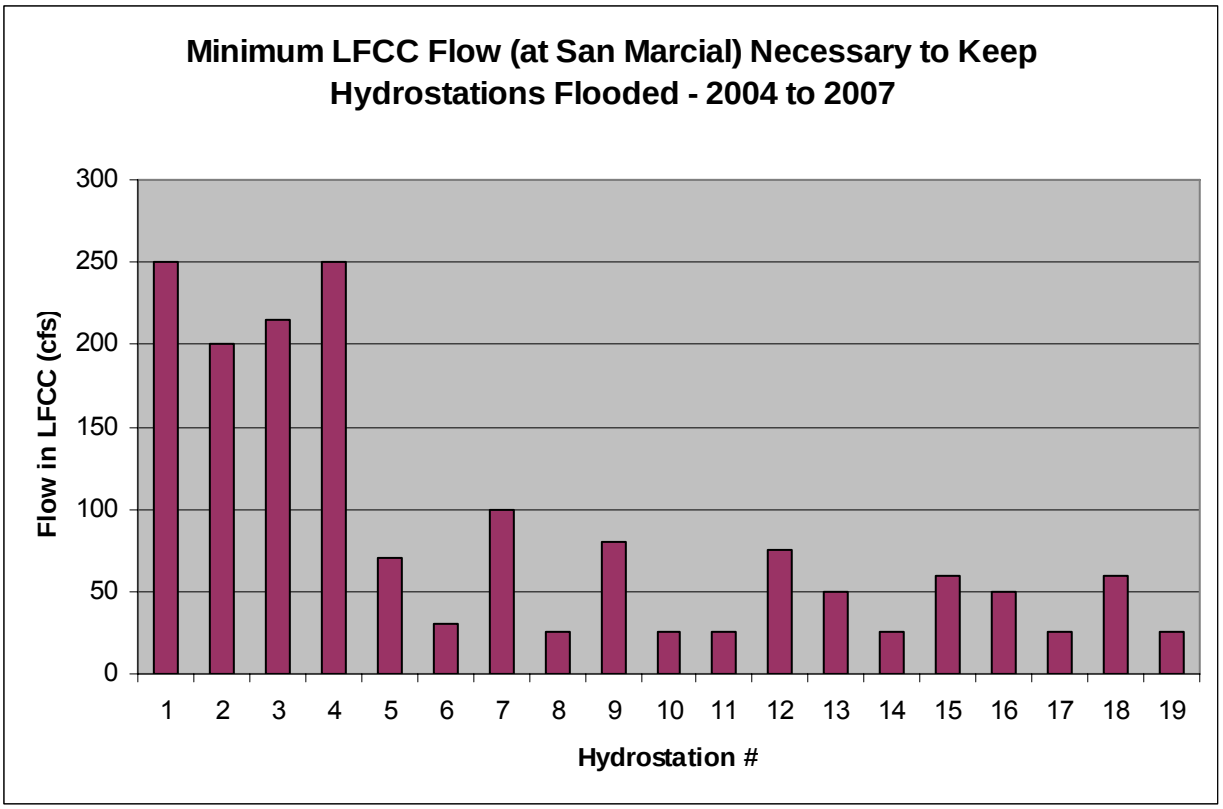


Figure 12. Minimum LFCC flows at San Marcial necessary to keep each hydrostation (and the adjacent habitat) flooded.

Hydrology data were compared to SWFL nest variables (i.e., success, productivity, predation, parasitism, and distance to water) from the 2004 through 2007 breeding seasons. Over the entire study area, 95 percent of nests (n=687) were within 100 m (328 feet) of water and 91 percent were within 50 m (164 feet) of water. Overall, based on current data, hydrology did not influence nest variables greatly. Nest success, predation rate, and parasitism rate were all similar based on distance to water and hydrology immediately under the nest. First nests were more successful than subsequent nests in areas that were flooded all season (Chi-square with Yates' correction, $P = 0.03$, df = 1, $\chi^2 = 4.99$). Successful nests that were either above saturated soil all season or above floodwater all season (a subset of saturated all season) produced more fledglings than successful nests that were above dry soil all season (ANOVA, $P = 0.02$, df = 2, F-ratio = 4.01). See Habitat and Nesting Variable Analysis section and Ahlers (2008, *in prep.*) for graphical representations of hydrology and nest variable comparisons.

Discussion

Presence/Absence Surveys

Velarde reach

SWFL territories in this survey reach have declined from a high of six in 1995 to one or zero between 2001 and 2007 (Table 6). Habitat quality in this reach has not declined greatly during this period suggesting that the amount of available breeding habitat in this reach may be insufficient to support a viable SWFL population. It is likely that limiting factors, such as predation and brood parasitism, are acting in concert with restricted amounts of available habitat to affect this local population that is unable to sustain itself. This local population is likely to fluctuate depending on local habitat conditions and reproductive success of nearby populations such as on the Ohkay Owinge Pueblo. Current trends seem to indicate that this small population in the Velarde reach has become unsustainable.

Belen reach

This reach was first surveyed in 2002 and one SWFL territory was detected at that time. Since then, territories have been documented in various sites within this reach. A cluster of territories was located in site SV-11 in 2007. However, with the exception of a single breeding pair in both 2005 and 2007, all territories have been either unpaired male territories or late migrants that were considered territorial due to their date of detection. Suitable SWFL habitat within this reach is limited. The majority of habitat consists of sparse, decadent saltcedar and Russian olive. Cottonwoods and grassy meadows are also interspersed throughout this reach. There are occasional stands of native willows adjacent to the river, most often mixed with Russian olive or saltcedar, which is where the SWFL territories were documented in 2007. This reach also receives very little overbank flooding, with the exception of a few areas. Small patches of habitat continue to improve in quality, particularly in areas where restoration projects have occurred and/or natural recruitment of native willows has occurred. Considering the habitat available and the presence of "source" populations on the Pueblo of Isleta and in the Sevilleta/La Joya reach, 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 and territory numbers increased through 2002. Since then, territory numbers have remained relatively constant. In 2007, numbers decreased slightly (Table 4), mostly due to a reduction in territories in sites SV-03 and SV-09. Habitat within SV-09 has not changed significantly over the past 5 years. However, 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, and

it is expected that SWFLs in this reach will continue to increase in number until the habitat is no longer suitable, available, or some other limiting factor impacts population growth.

Table 6. Reach summary of SWFL territories/pairs in lands within the active floodplain of the Rio Grande surveyed by Reclamation between 1995 and 2007.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
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
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
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
San Acacia	n/s	0	0	0	0	0	0	0	0	0	0	0	0
Escondida	n/s	n/s	0	0	0	0	0	4 T 0 P	0	0	0	1 T 0 P	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
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
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
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

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.

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

San Acacia reach

Habitat in this reach is dominated by dry, decadent exotic vegetation in the form of saltcedar and Russian olive with an occasional cottonwood overstory. Quality SWFL habitat within this reach is very limited and composed of small patches of native vegetation along the river channel. 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. These areas contain habitat that, given time and suitable hydrology, could mature into suitable SWFL habitat. However, with the current lack of suitable habitat in this reach, no territories or nesting SWFLs have been detected in the eight years Reclamation has been surveying this reach.

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 the water table has lowered in recent years so the patches of native vegetation are drying out and dying. Resident SWFLs were documented in this reach for the first time in 2002. Four territories were located early in the survey season, but not later on. Because of the date of their discovery, these birds were considered residents birds. Birds documented between June 10 and July 21 are typically considered resident SWFLs. It is likely that these birds were late migrants because of the habitat they were detected in and they were only detected once early in the season. Additionally, one SWFL territory was documented in 2006 in this reach but was also a late migrant that was not detected on subsequent surveys. Due to the lack of quality habitat, it is unlikely that resident SWFL will occupy this reach in the near future.

Bosque del Apache reach

Four SWFL territories were documented in this reach in 2006 and seven in 2007. Territory numbers in this reach have fluctuated between zero and seven the past six years. Territories, when documented, have been scattered throughout the reach and the same areas are not occupied each year. These facts indicate that highly suitable breeding habitat is lacking in this reach and that resident SWFLs select marginal habitat when it is available. It is encouraging that SWFLs have continued to occupy this reach and it will be interesting to see if this small population persists.

Tiffany reach

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

San Marcial reach

SWFL surveys have been conducted in this reach since 1994 (Table 6). Since 1995, SWFL territories and available habitat below the railroad bridge have increased greatly. During the 2000 season, a concentration of breeding SWFLs developed within the LF-17 and LF-17a sites. This increase in SWFL population in the "core" areas is likely a result of a consistent water supply provided by the LFCC outfall and the emergence of maturing native vegetation within the receding headwater area of Elephant Butte Reservoir, contributing to high levels of recruitment in the population. As the reservoir continued to recede during the following years and native vegetation became established, the population of SWFLs expanded in number and extent to inhabit suitable habitat from LF-17a and LF-17 downstream to DL-07 and DL-09. This expansion was facilitated by a number of factors including an increase in available nesting habitat and consistently high rates of pair nesting success. This population continues to expand, which implies that quality habitat is not limiting the local population's growth.

In the future, as the dynamics of the reservoir cause water levels to rise and fall, it is likely that breeding habitat will continue to be created and destroyed. It is this type of dynamic system that

SWFLs depend on for breeding habitat. From year to year there may be net gains and losses of habitat, but as a whole this population should persist and be a valuable source population for the surrounding areas into the foreseeable future.

Nest Searches/Monitoring

Belen reach

SWFL nesting was first documented in this reach in 2005. One pair (the only pair documented in the reach) produced two nests in site SV-11. In 2007, one pair again produced two nests in approximately the same location as 2005. Habitat in this area consists of Russian olive and saltcedar. No nesting has been documented anywhere else in this reach since surveys began in 2002. Due to this fact, one can assume that this particular area contains the best SWFL nesting habitat in the entire reach. However, the proximity of small SWFL populations in sites SV-06, 07, and 09 downstream also is a factor in the occupation of SV-11. Visually suitable habitat patches exist sparsely throughout the reach and may be colonized in the near future. However, the lack of a nearby large "source" population has likely prevented this from occurring to date.

Sevilleta/La Joya reach

Since 2001, SWFL nesting in the Sevilleta/La Joya reach has fluctuated between six and 21 nests. In 2007, six nests and eight pairs were documented which represent the lowest numbers of the past seven years (Tables 4 and 7). This reduction can likely be explained by two factors. The first is the reduction in nest searching effort in this reach. Nest searching in this reach has always been more difficult due to the saltcedar habitat present. This factor, in combination with personnel limitations and greater pair abundance in the San Marcial reach, prompted nest searchers to spend more time in the San Marcial reach. Additionally, habitat quality in site SV-03 (where the majority of SWFL pairs occurred in the past) declined due to a blowdown during the winter of 2006-2007. Conversely, habitat within several sites in this reach has improved as witnessed by newly colonized sites (i.e. SV-06 and SV-07). It will be interesting to observe, in upcoming years, if nesting in this reach continues to decrease or if nesting pairs move into newly developing habitat.

During the past several years, nesting SWFLs in this reach have shown a propensity for nesting higher in the substrate than the San Marcial population of SWFLs. This makes locating nests and monitoring them much more difficult and is the reason for the high percentage of unknown outcomes (17%, n = 98) among nests in this reach. It is unclear why SWFLs in this reach nest higher in the substrate.

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

why SWFLs are nesting higher in this reach would justify the time and expense needed to explore this issue.

A variable that could cause concern for the continued productivity of this population is the apparently higher level of BHCO parasitism experienced by SWFLs nesting in this reach. Since the discovery of this population in 1999, 22 nests (27 percent of known outcomes, n = 81) were parasitized as compared to 116 in the San Marcial reach (14 percent, n = 840). This represents a significant difference (Chi-square with Yates' correction, $\chi^2 = 9.32$, df = 1, $P < 0.01$) and is likely due to habitat differences and the greater density of BHCOs in the Sevilleta/La Joya reach (Moore 2006, Moore and Ahlers 2003). However, nest success rates are not significantly different (Chi-square with Yates' correction, $\chi^2 = 0.11$, df = 1, $P = 0.73$).

Table 7. Rio Grande reach summary of SWFL nests in lands surveyed by Reclamation between 1995 and 2007

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Belen	n/s	n/s	n/s	n/s	n/s	n/s	n/s	0	n/s	0	2	0	2
Sevilleta/ La Joya	n/s	n/s	n/s	n/s	3	6	9	13	12	21	10	18	6
Bosque del Apache	n/s	n/s	n/s	0	0	0	0	0	1	2	0	1	1
Tiffany[(1)]	6	0	n/s	n/s	n/s	n/s	n/s	1	2	11	4	1	3
San Marcial	0	1	2	2	5	19	36	66	96	153	127	148	220
Total	6	1	2	2	8	25	45	80	111	187	143	168	232

n/s = not surveyed

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

Tiffany reach

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

San Marcial reach

During the 2007 survey season, 220 SWFL nests were documented in this reach. After a slight decline in nesting and pair abundance in 2005 (Tables 5 and 7), this population seems to have

rebounded. Several new patches of habitat have become occupied and SWFLs in this reach continue to expand into developing vegetation. See Habitat and Nesting Variable Analysis section for graphical representations of SWFL nesting variables and habitat association in Elephant Butte Reservoir.

In 1995, four of six (66 percent) SWFL nests discovered in the riparian area upstream of the railroad bridge had been parasitized by cowbirds (NMNHP 1995). Cowbird control efforts were implemented between 1996 and 2001 and only 3 of 65 nests (5 percent) downstream of the railroad bridge were parasitized. Between 2002 and 2007 no cowbird trapping was done, and the parasitism rate among San Marcial SWFL nests ranged from 10 to 18 percent (Table 5). These higher numbers seem to indicate that, on a local scale, cowbird trapping may be effective at reducing parasitism rates. However, nest success rates, which are the ultimate indicator of BHCO trapping success, were not affected.

A riparian-obligate nest monitoring study was initiated in 1999 and continued through 2004 to study the effectiveness of BHCO trapping at reducing parasitism rates and increasing nesting success. Data analysis indicates that, while during certain years trapping may significantly lower BHCO parasitism rates, there was no statistically significant difference in nesting success rates between trapped and untrapped locations (Moore 2006). With many variables involved, including hydrology, vegetation characteristics, predator abundance, and the overall dynamism of the Rio Grande floodplain, it is difficult to determine what is responsible for the variation in BHCO parasitism and nest success rates between years. The SWFL recovery plan (USFWS 2002) states that "cowbird control should be considered if parasitism exceeds 20-30% after collection of two or more years of baseline data," so the decision to end the trapping program continues to be justified based on this recommendation.

Overall, during the 2006 and 2007 breeding seasons, 368 SWFL nests have been monitored in this reach, making it one of the most productive SWFL breeding areas in the subspecies' range and the largest source population in the Middle Rio Grande Basin. This holds special implications for the population as a whole. Responsible nest monitoring of this population needs to be continued to detect any significant increases in nest failure, cowbird parasitism, or any other variable detrimental to the survival of this population. Continued efforts should also be made to minimize disturbance both at occupied survey sites and individual nest sites.

Middle Rio Grande as a whole

Over the past nine years, a total of 997 SWFL nests have been monitored along the Middle Rio Grande. Table 8 and the final section of this report provide details of habitat comparisons for SWFLs nesting along the Middle Rio Grande between 1999 and 2007. Statistical comparisons between categories were made using Chi-square tests. The following comparisons were considered: nesting success vs. nest substrate and dominant territory vegetation, BHCO parasitism vs. nest substrate and dominant territory vegetation, and BHCO parasitism vs. survey reach. Between 1999 and 2007, 63 nests (6.3 percent) were in saltcedar-dominated territories, 793 (79.5 percent) were in *Salix*-dominated territories, and 141 (14.1 percent) were in mixed-dominance territories. Saltcedar- and *Salix*-dominated territories are defined as >90 percent saltcedar or *Salix*, respectively. Mixed-dominance occurs when a dominant vegetation type is not obvious. In considering nest success for these situations, SWFL nests in *Salix*-dominated (56.8 percent, n = 764) areas were no more successful than those placed in saltcedar-dominated (57.1 percent, n = 49) or mixed-dominance areas

Table 8. Habitat comparison of SWFL nesting within the Middle Rio Grande – 1999 to 2007.

Territory Vegetation Type		
Number of nests in exotic-dominated territories	63	6.3% of total
Number of nests in *Salix*-dominated territories	793	79.5% of total
Number of nests in mixed dominance territories	141	14.1% of total
Nest Substrate Species		
Number of nests in *Salix* substrate	587	58.9% of total
Number of nests in saltcedar substrate	369	37.0% of total
Number of nests in Russian olive substrate	36	3.6% of total
Number of nests in other (*Baccharis*/cottonwood) substrate	5	0.6% of total
Nest Substrate/Territory Vegetation Combination		
Number of nests in saltcedar substrate within *Salix*-dominated territories	225	(28.4% of 793 nests)
Number of nests in *Salix* substrate within saltcedar or mixed dominance territories	22	(10.8% of 204 nests)
Nest Success Per Nest Substrate Species		
Percentage of successful nests in *Salix* substrate	56.8%	(322 out of 567 nests)
Percentage of successful nests in saltcedar substrate	53.2%	(183 out of 344 nests)
Percentage of successful nests in Russian olive substrate.	63.6%	(21 out of 33 nests)
Percentage of successful nests in other (*Baccharis*/cottonwood) substrate	50.0%	(2 out of 4 nests)
Nest Success Per Territory Vegetation Type		
Percentage of successful nests in *Salix*-dominated territories	56.8%	(434 out of 764 nests)
Percentage of successful nests in saltcedar-dominated territories	57.1%	(28 out of 49 nests)
Percentage of successful nests in mixed dominance territories	46.7%	(63 out of 135 nests)
Cowbird Parasitism Per Nest Substrate Species		
Percentage of nests parasitized in *Salix* substrate	12.7%	(72 out of 567 nests parasitized)
Percentage of nests parasitized in saltcedar substrate	17.4%	(60 out of 344 nests parasitized)
Percentage of nests parasitized in Russian olive substrate	15.2%	(5 out of 33 nests parasitized)
Percentage of nests parasitized in other (*Baccharis*/cottonwood) substrate	25.0%	(1 out of 4 nests parasitized)
Cowbird Parasitism Per Territory Vegetation Type		
Percentage of nests parasitized in *Salix*-dominated territories	12.6%	(96 out of 764 nests)
Percentage of nests parasitized in saltcedar-dominated territories	26.5%	(13 out of 49 nests)
Percentage of nests parasitized in mixed dominance territories	21.5%	(29 out of 135 nests)
Productivity[1] Per Territory Vegetation Type		
Productivity of nests found in *Salix*-dominated territories	2.66/nest	(1154 young from 434 nests)
Productivity of nests found in saltcedar-dominated territories	2.21/nest	(62 young from 28 nests)
Productivity of nests found in mixed dominance territories	2.60/nest	(164 young from 63 nests)
Productivity[1] Per Nest Substrate Species		
Productivity of nests found in *Salix* substrate	2.68/nest	(863 young from 322 nests)
Productivity of nests found in saltcedar substrate	2.56/nest	(460 young from 180 nests)
Productivity of nests found in Russian olive substrate	2.29/nest	(48 young from 21 nests)
Productivity[1] Compared to Nest Substrate Species and Territory Vegetation Type		
Productivity of nests in *Salix* substrate within *Salix* dominated territories	2.67/nest	(832 young from 312 nests)
Productivity of nests in saltcedar substrate within *Salix* dominated territories	2.64/nest	(320 young from 121 nests)
Productivity of nests in saltcedar substrate within saltcedar dominated territories	2.13/nest	(49 young from 23 nests)
Total SWFL nests monitored	997	

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

(46.7 percent, n = 135) (χ^2 = 4.84, df = 2, P = 0.09). Table 9 provides details of pertinent statistical tests.

Parasitism rates between different habitat types were compared using a Chi-square test including all three types of dominant vegetation (saltcedar, *Salix*, and mixed). Parasitism rates in *Salix*-dominated territories were significantly lower than those in both saltcedar-dominated and mixed dominance territories (χ^2 = 13.29, df = 2, P < 0.01). The statistical significance may be attributed to the differences in sample size. However, it is possible that habitat provided by native vegetation is higher quality and the fact that all of the saltcedar dominated territories are located in the Sevilleta/La Joya reach which has historically had the highest abundance of BHCOs (based on point count data, see below).

An ANOVA (α = 0.05) showed that productivity of nests, defined as number of birds fledged per successful nest, in *Salix*-dominated (2.66 fledged birds/nest, n = 434) and mixed-dominance territories (2.60 fledged birds/nest, n = 63) was significantly greater than nests located in saltcedar-dominated habitats (2.21 fledged birds/nest, n = 28) (F-ratio = 3.79, df = 2, P = 0.02). Based on these data, SWFLs appear to select native-dominated habitat when available, and appear to have more productive nests in non-saltcedar habitat. [Heavily skewed sample sizes may be biasing statistical results.]

Table 9. Details of habitat comparison statistical tests performed on SWFL nest habitat data from 1999 – 2007 in the Middle Rio Grande.

Chi-square Tests (α = 0.05)			
Comparison	χ^2 value	Degrees of freedom	*P*-value
Success and dominant territory vegetation	4.84	2	0.09
Parasitism and dominant territory vegetation*	13.29	2	<0.01
Chi-square Tests with Yates' Correction (α = 0.05)			
Comparison	χ^2 value	Degrees of freedom	*P*-value
Success and substrate species	0.98	1	0.32
Parasitism and substrate species	3.51	1	0.06
Salix-dominated vs. saltcedar-dominated territories*	6.58	1	0.01
Salix-dominated vs. mixed-dominance territories*	6.89	1	0.01
Saltcedar-dominated vs. mixed-dominance territories	0.27	1	0.60
Sevilleta/La Joya vs. San Marcial*	9.32	1	<0.01
Analysis of Variance (α = 0.05)			
Comparison	*P*-value	Degrees of freedom	F-ratio
Productivity and dominant territory vegetation*	0.02	2	3.79
Productivity and substrate species	0.06	2	2.83

Data from known nest success only.
* Denotes statistically significant differences documented.

Nest substrate is defined as the species of tree where a SWFL nest is physically located. Though 79.5 percent of SWFL nests over the past 9 years were found in *Salix*-dominated areas, 37.0 percent

of all nests and 28.4 percent of nests in *Salix*-dominated habitats were physically located in a saltcedar. Nest success is similar in three substrate categories (*Baccharis*/cottonwood was ignored due to its small sample size of 4): 56.8 percent (*Salix*), 53.2 percent (saltcedar), and 63.6 percent (Russian olive). No statistically significant difference was found to exist between Salix and saltcedar substrates ($\chi^2 = 0.98$, df = 1, $P = 0.32$ – Russian olive omitted due to difference in sample size). Additionally, parasitism rates between nests placed in the three different substrates (*Salix* 12.7 percent, saltcedar 17.4 percent, and Russian olive 15.2 percent) were similar and again no significant difference was found between *Salix* and saltcedar ($\chi^2 = 3.51$, df = 1, $P = 0.06$). Productivity of SWFL nests in *Salix* (2.68 fledged birds/nest, n = 322) and saltcedar (2.56 fledged birds/nest, n = 180) substrates was slightly greater than those located in Russian olive substrate (2.29 fledged birds/nest, n = 21), although an ANOVA showed no significant difference (F-ratio = 2.83, df = 2, $P = 0.06$). Productivity values of nests found in Russian Olive may be biased due to the small sample size.

Parasitism rates from 9 years of nesting data from the two primary nesting reaches within the Middle Rio Grande were also compared. The rate of parasitism within the Sevilleta/La Joya reach (27.2 percent, n = 81) appears to be greater than that experienced by nesting SWFLs within the San Marcial reach (13.8 percent, n = 840). Parasitism data from these reaches were compared and a significant difference was found ($\chi^2 = 9.32$, df = 1, $P < 0.01$). However, these statistical results may be biased due to the skewed sample sizes between the two reaches. Physical differences in vegetation types and BHCO abundance do exist within these reaches. Territories within the Sevilleta/La Joya reach are either saltcedar-dominated or mixed. Conversely, nearly all territories within the San Marcial reach are dominated by native vegetation. Native habitat may provide better concealment and protection from BHCO parasitism. However, BHCOs are more abundant in the Sevilleta/La Joya reach than in the San Marcial reach. Point counts have been conducted for the past 9 years in four different study reaches (Sevilleta/La Joya, San Acacia, Bosque del Apache, and San Marcial). Data from 1999 to 2006 showed that the mean number of cowbird detections per point varied annually but averaged almost two times greater within the Sevilleta/La Joya reach than within the San Marcial reach (Moore 2006). The Sevilleta/La Joya reach supported the greatest density of cowbirds compared to all other monitored reaches within the Middle Rio Grande and this could be responsible for the increased parasitism rate.

In the 2004 SWFL survey results report (Moore and Ahlers 2005) attention was given to an apparent trend of decreasing nest success in the Elephant Butte reservoir delta population of SWFLs. However, following 2004, 57 percent of nests in the delta have been successful. It is likely that this fluctuation is natural, and that this population is not being limited by habitat or human-caused factors. Additionally, when factoring-in multiple broods and looking at individual pair success and pair success over the entire Elephant Butte population, it is easy to see why this population has continued to expand at such a rapid rate. Even when individual nest success rates declined, the SWFL's tendency for multiple broods per season allowed this population to continue expanding. See Habitat and Nesting Variable Analysis section for a graphical representation of individual and pair nest success.

Lastly, in coordination with the USFWS, addling or removal of BHCO eggs from parasitized SWFL nests is a practice that was begun in 2002 and continued through 2007. Of the 130 SWFL nests parasitized during that period with known outcomes, BHCO eggs were addled or removed from 58 nests, 16 of which successfully fledged SWFL young (27.6 percent success). Parasitized nests over

the past six seasons in the Middle Rio Grande that were unaltered were not as successful. Of 72 parasitized nests monitored, 58 failed and 14 successfully fledged young—a 19.4 percent success rate. However, a Chi-square test with Yates' correction did not show a statistically significant difference ($\chi^2 = 0.78$, df = 1, $P = 0.38$) between altered and unaltered parasitized nests.

Recommendations

Recommendations for future work in 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 site
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.
- The value of documenting the occurrence of Neotropical migrants of special concern should be assessed on an annual basis. If this information continues to be of value to resource managers, the occurrence of these species should be documented concurrent with the presence/absence surveys for the SWFL.
- Assess habitat features at nest sites and occupied patches—both at the territory and patch level—to determine components characteristic of SWFL breeding areas where populations are expanding, remaining stable, or becoming extirpated.

Non Survey-related

- The SWFL Nest Vegetation Quantification Report will be finalized. Recommendations for further field work will be made.
- The SWFL nesting hydrology study initiated in 2004 should be continued and additional hydrostations should be added in newly colonized habitat.
- Analysis of new aerial photography and ground-truthing of vegetation should be conducted to update the SWFL habitat suitability GIS model.

Conclusions

Presence/absence data will be beneficial when establishing a long-term monitoring plan and will aid in better understanding of the species' distribution, abundance, and potential threats to it. All available data will prove beneficial in the implementation of the Southwestern Willow Flycatcher Recovery Plan. As defined by the Recovery Plan for the Southwestern Willow Flycatcher (USFWS 2002), the Middle Rio Grande Management Unit, a part of the Rio Grande Recovery Unit, extends from just upstream of Cochiti Reservoir to Elephant Butte Dam. The recovery goal for this reach is 100 SWFL territories. Even without considering the territories occurring on the Pueblo of Isleta (14 documented in 2000; NMNHP 2000), the recovery goal for the Middle Rio Grande Management Unit has been sustained for 5 consecutive years (Table 6). Additional population growth is still needed in other Management Units for recovery objectives to be met within the Rio Grande Recovery Unit.

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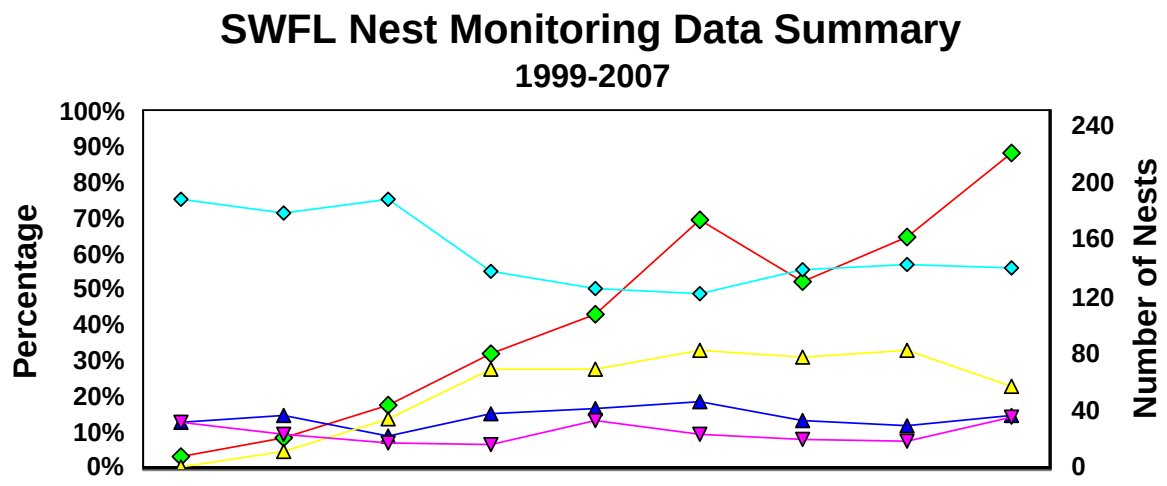
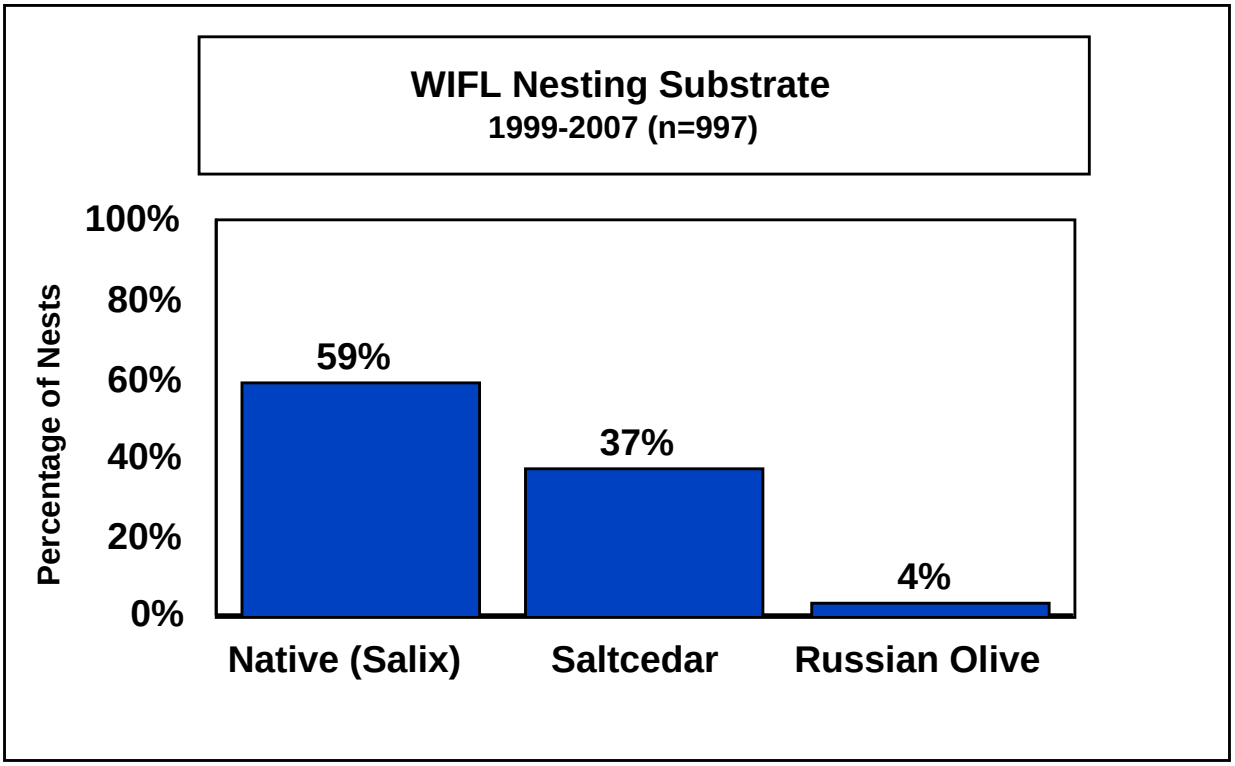
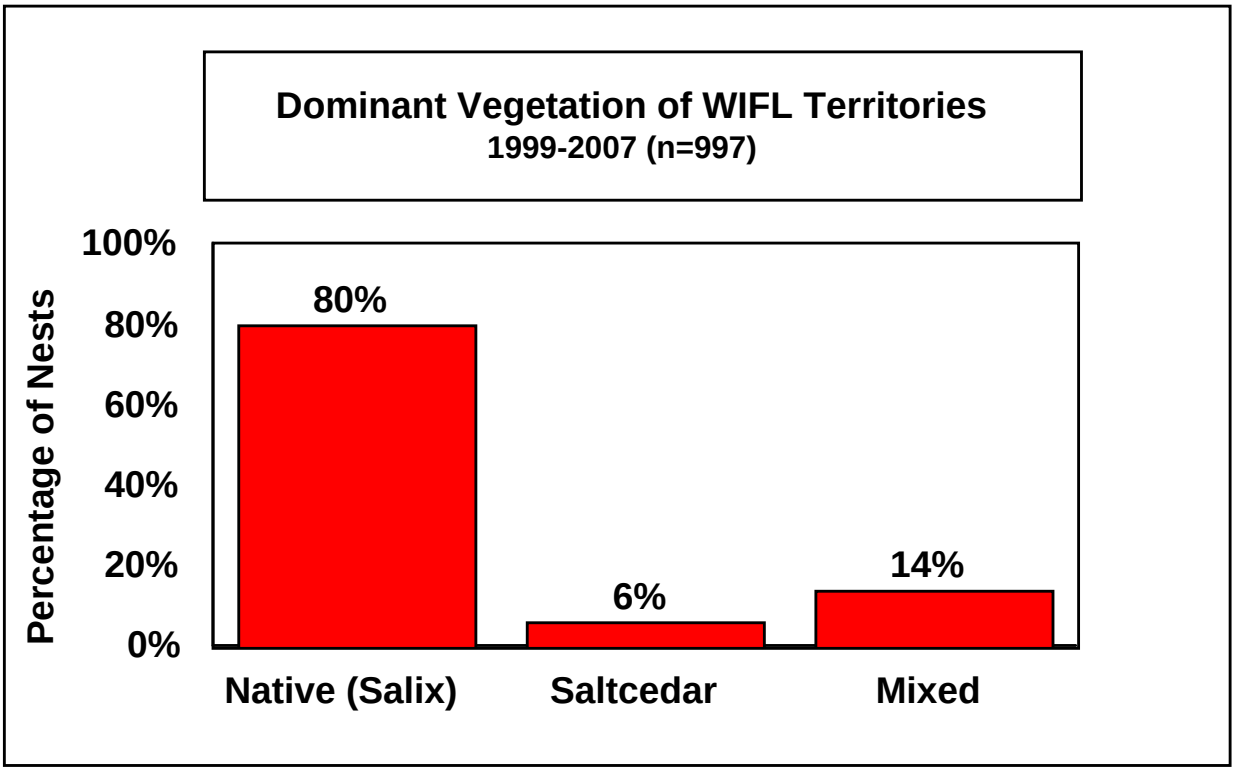
Habitat and Nesting Variable Analysis

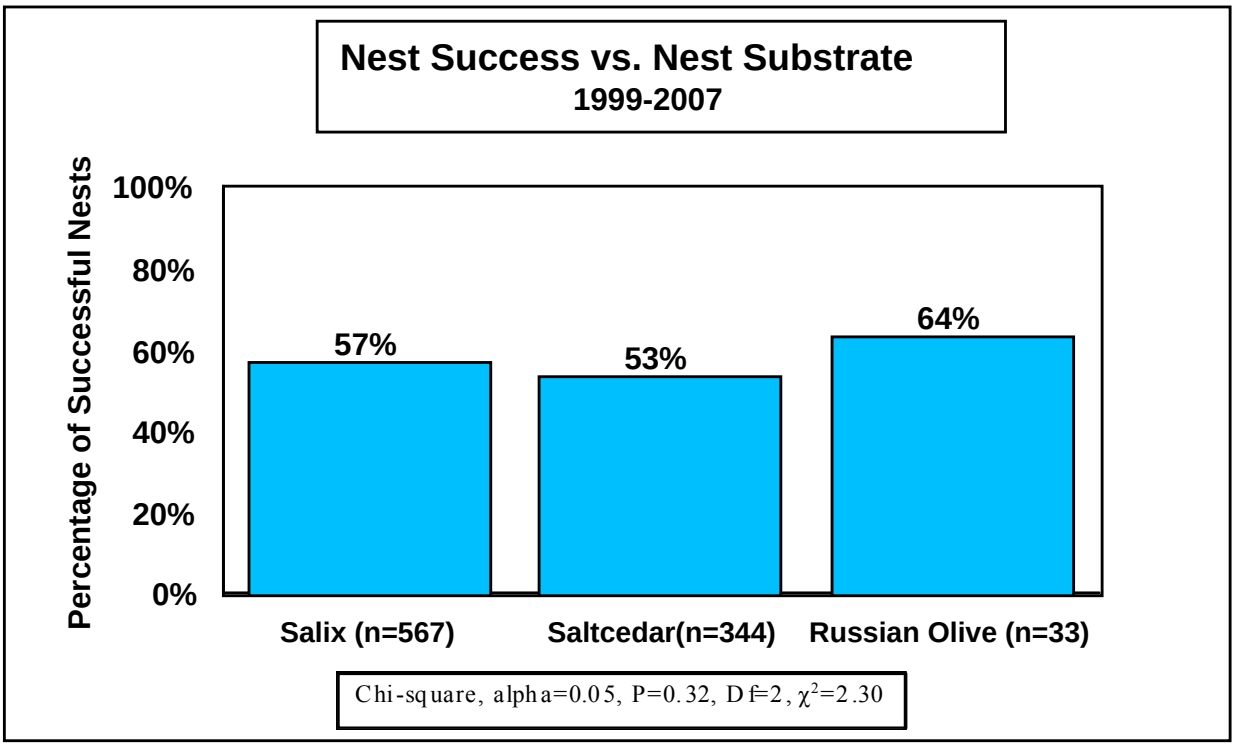
All Nests in Middle Rio Grande

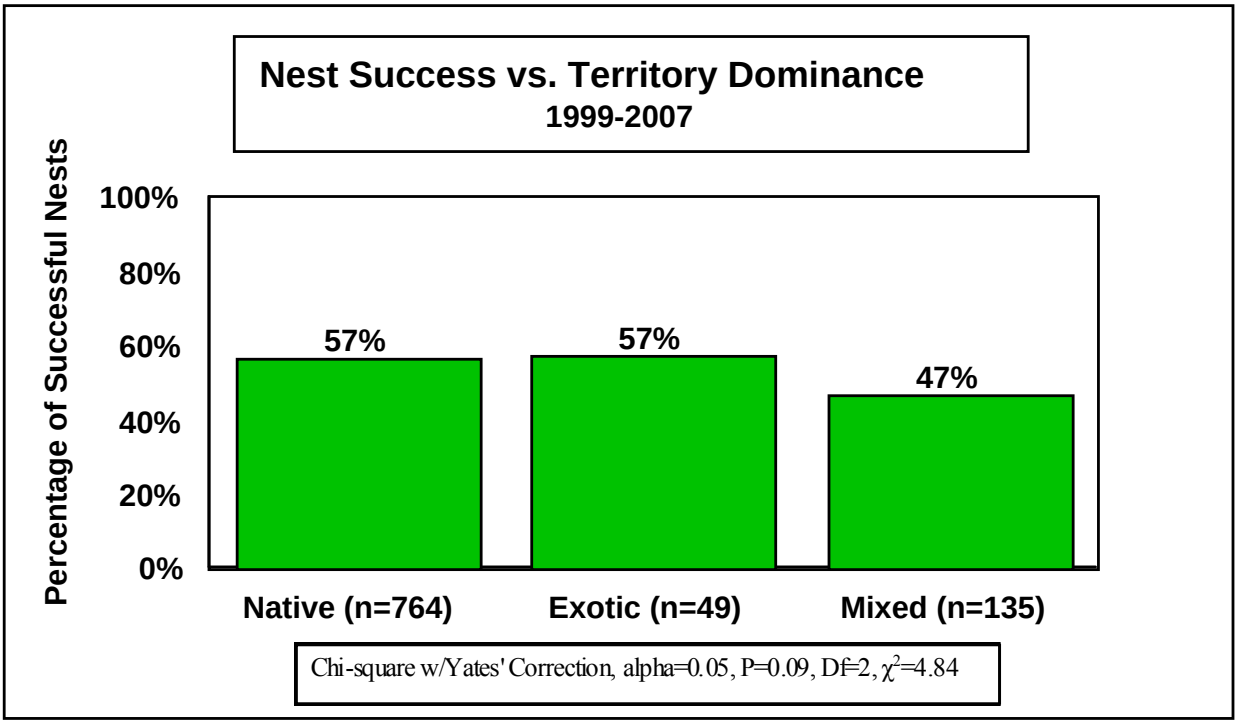


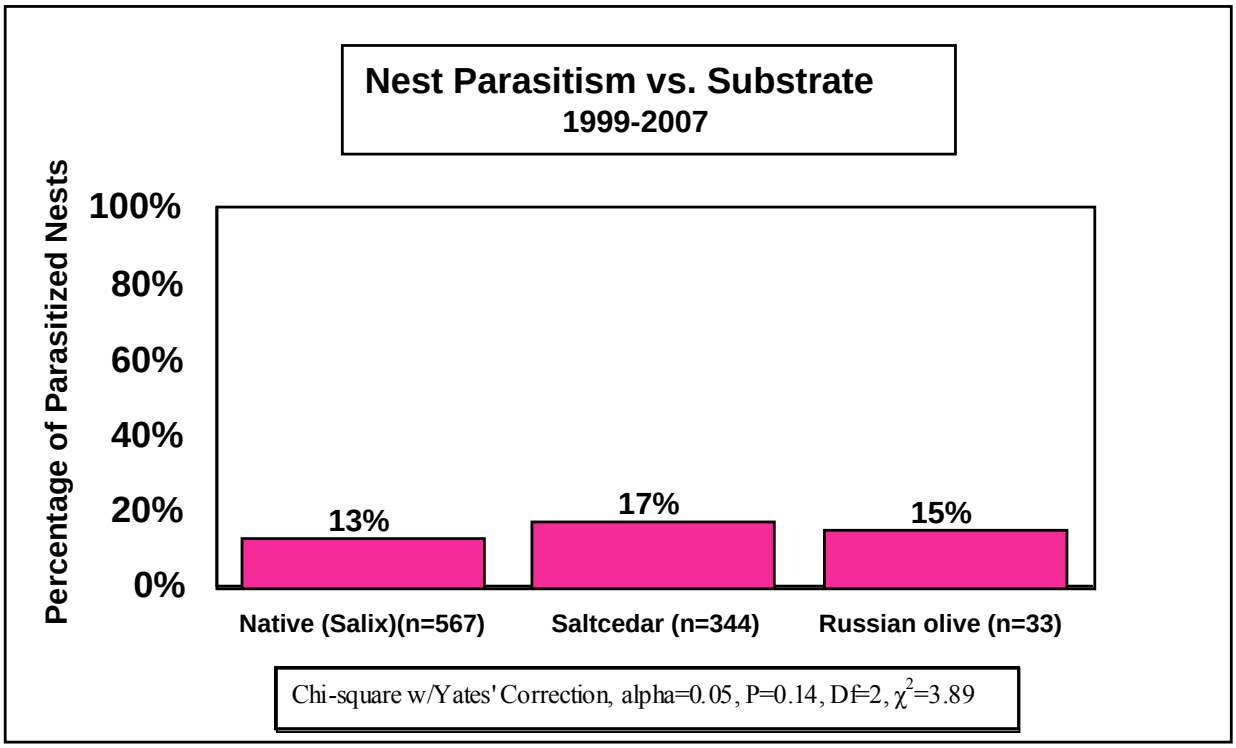
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of Nest	8	21	44	80	108	174	130	162	221
Parasitism	13%	15%	9%	15%	17%	19%	13%	12%	14%
Predation	0%	5%	14%	28%	28%	33%	31%	33%	23%
Abandonment	13%	10%	7%	6%	13%	9%	8%	7%	14%
Nest Success	75%	71%	75%	55%	50%	49%	55%	57%	56%

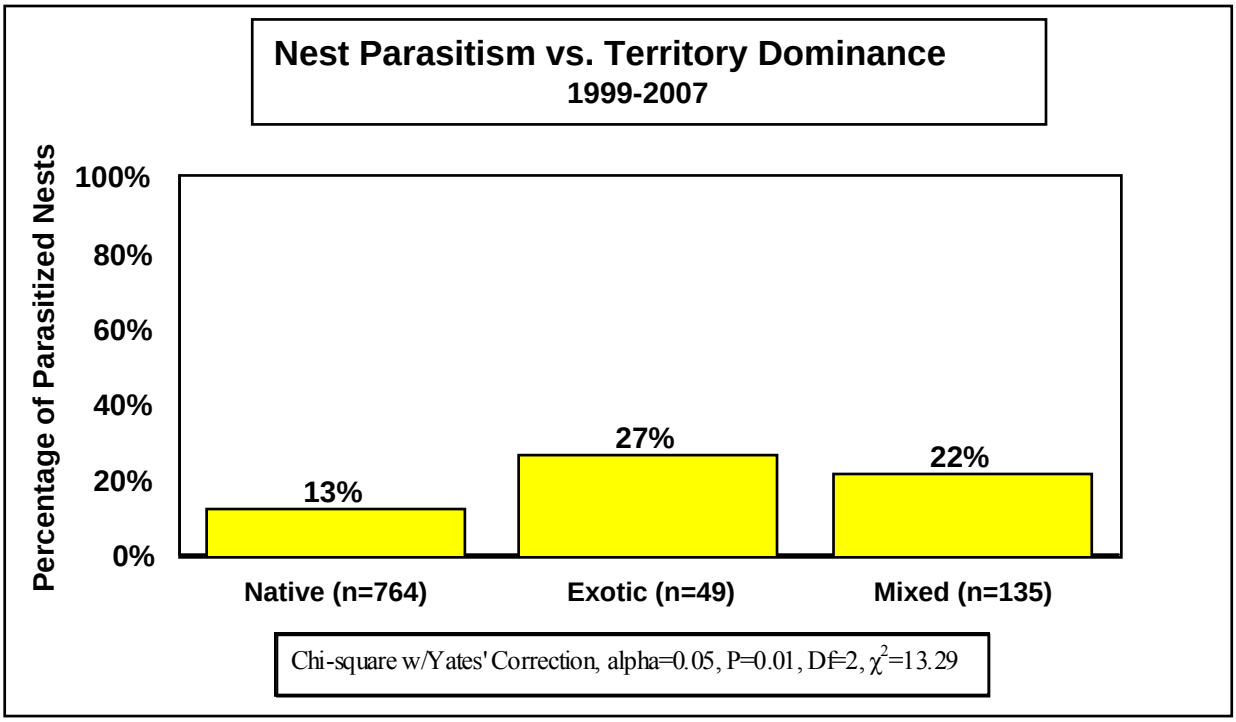

WIFL Nesting Substrate
1999-2007 (n=997)
Percentage of Nests
100%
80%
60%
40%
20%
0%
59%
37%
4%
Native (Salix)
Saltcedar
Russian Olive

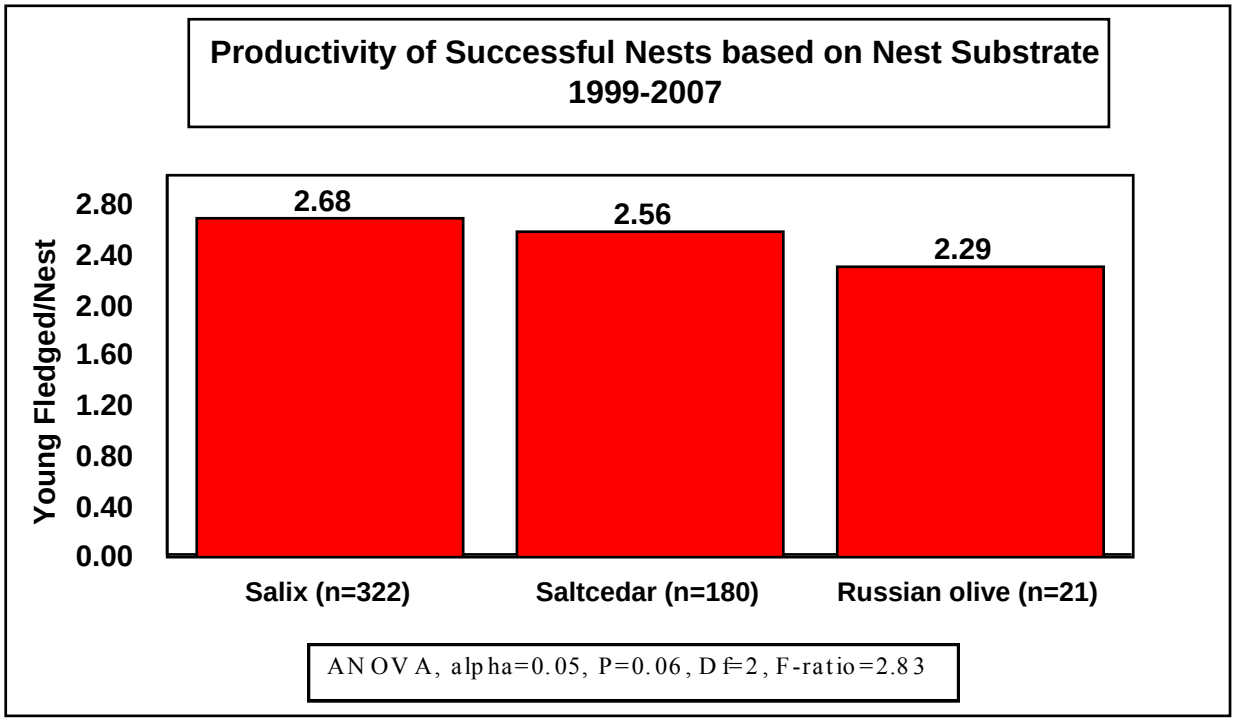

Dominant Vegetation of WIFL Territories
1999-2007 (n=997)
Percentage of Nests
100%
80%
60%
40%
20%
0%
80%
6%
14%
Native (Salix)
Saltcedar
Mixed

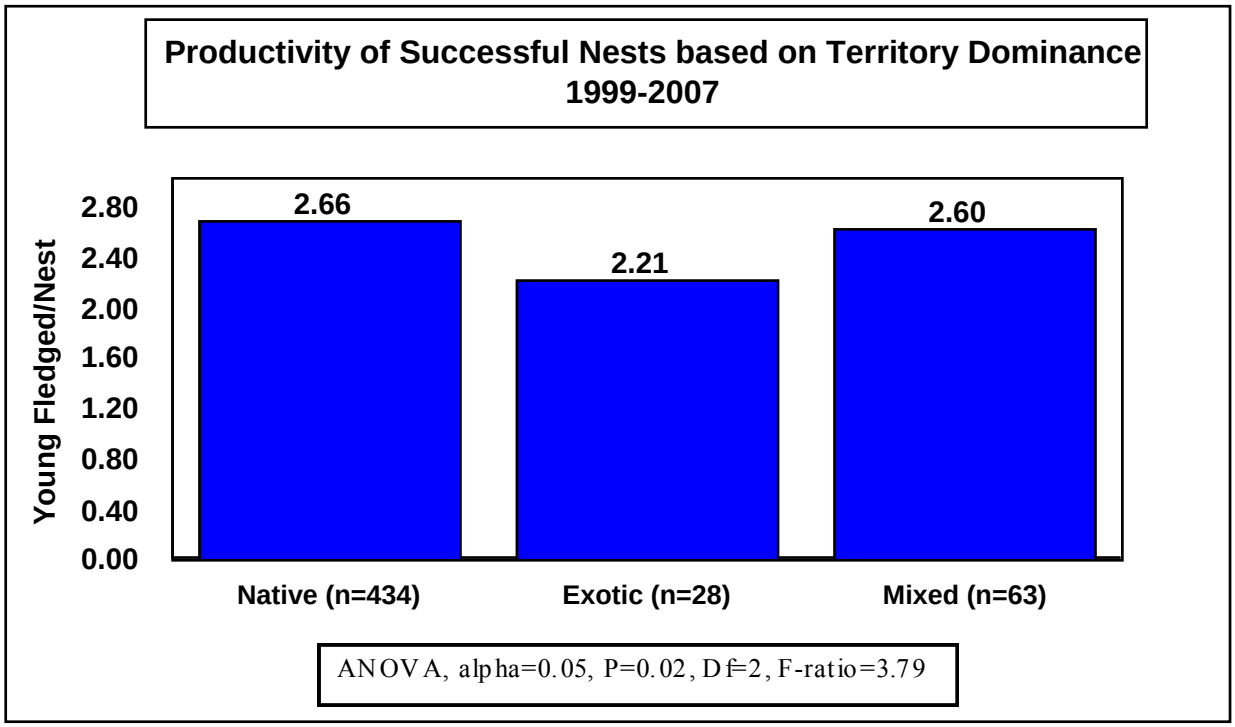

Nest Success vs. Nest Substrate
1999-2007
Percentage of Successful Nests
100%
80%
60%
40%
20%
0%
57%
53%
64%
Salix (n=567)
Saltcedar(n=344)
Russian Olive (n=33)
Chi-square, alpha=0.05, P=0.32, Df=2, χ2=2.30

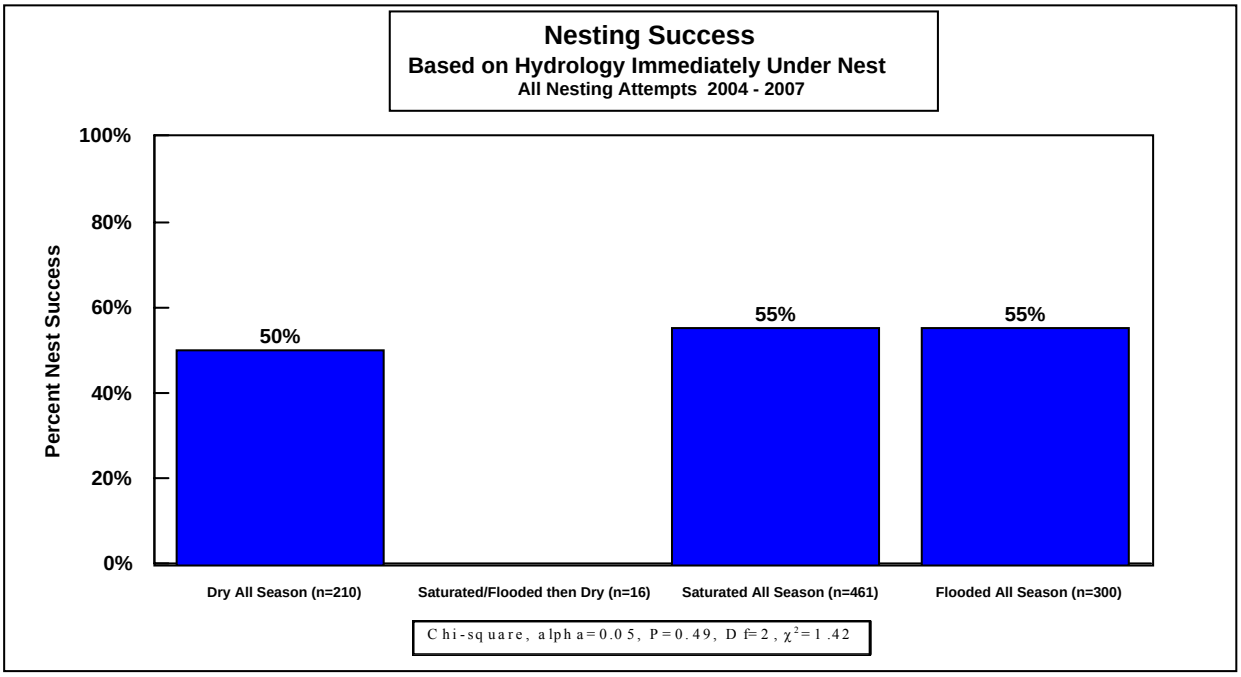

Nest Success vs. Territory Dominance
1999-2007
Percentage of Successful Nests
100%
80%
60%
40%
20%
0%
57%
57%
47%
Native (n=764)
Exotic (n=49)
Mixed (n=135)
Chi-square w/Yates' Correction, alpha=0.05, P=0.09, Df=2, χ2=4.84

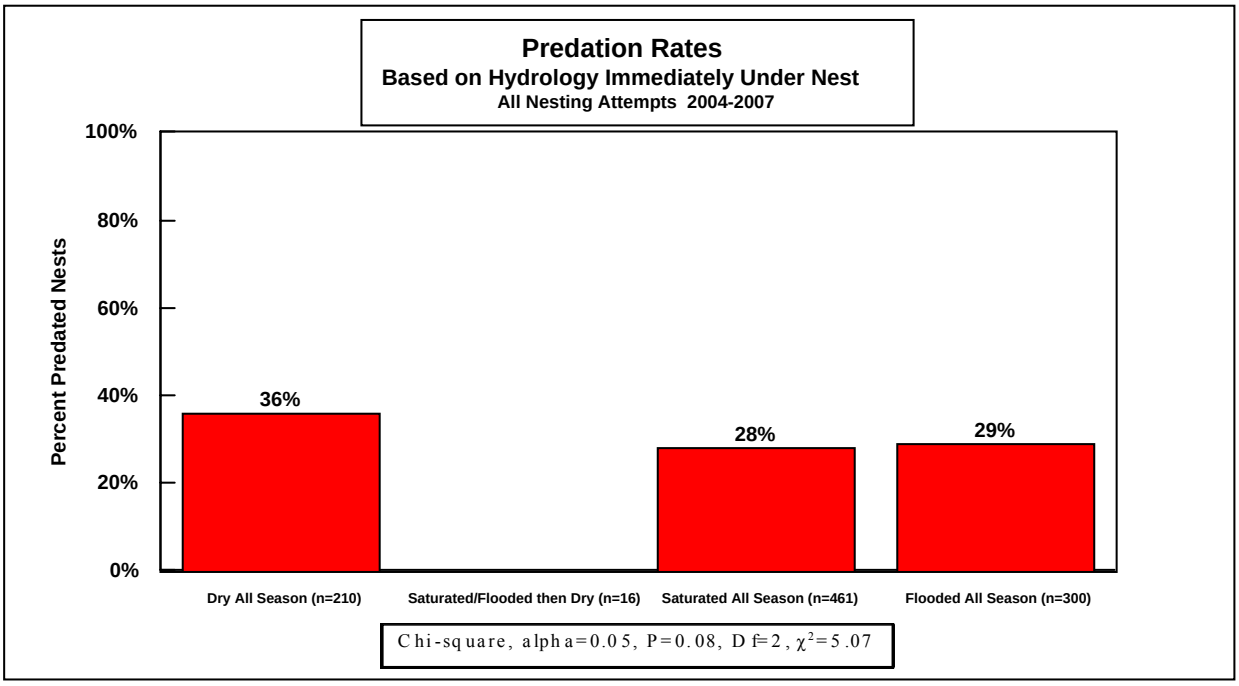

Nest Parasitism vs. Substrate
1999-2007
Percentage of Parasitized Nests
100%
80%
60%
40%
20%
0%
13%
17%
15%
Native (Salix)(n=567)
Saltcedar (n=344)
Russian olive (n=33)
Chi-square w/Yates' Correction, alpha=0.05, P=0.14, Df=2, χ^2=3.89

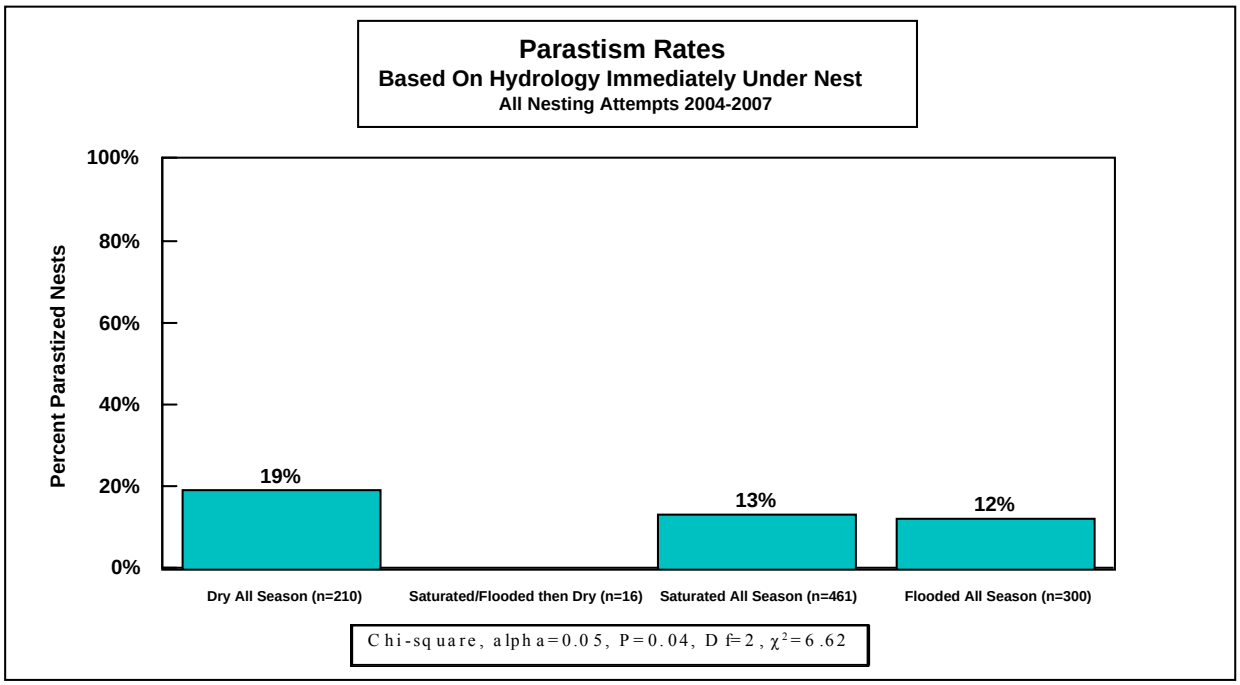

Nest Parasitism vs. Territory Dominance
1999-2007
Percentage of Parasitized Nests
100%
80%
60%
40%
20%
0%
13%
27%
22%
Native (n=764)
Exotic (n=49)
Mixed (n=135)
Chi-square w/Yates' Correction, alpha=0.05, P=0.01, Df=2, χ^2=13.29

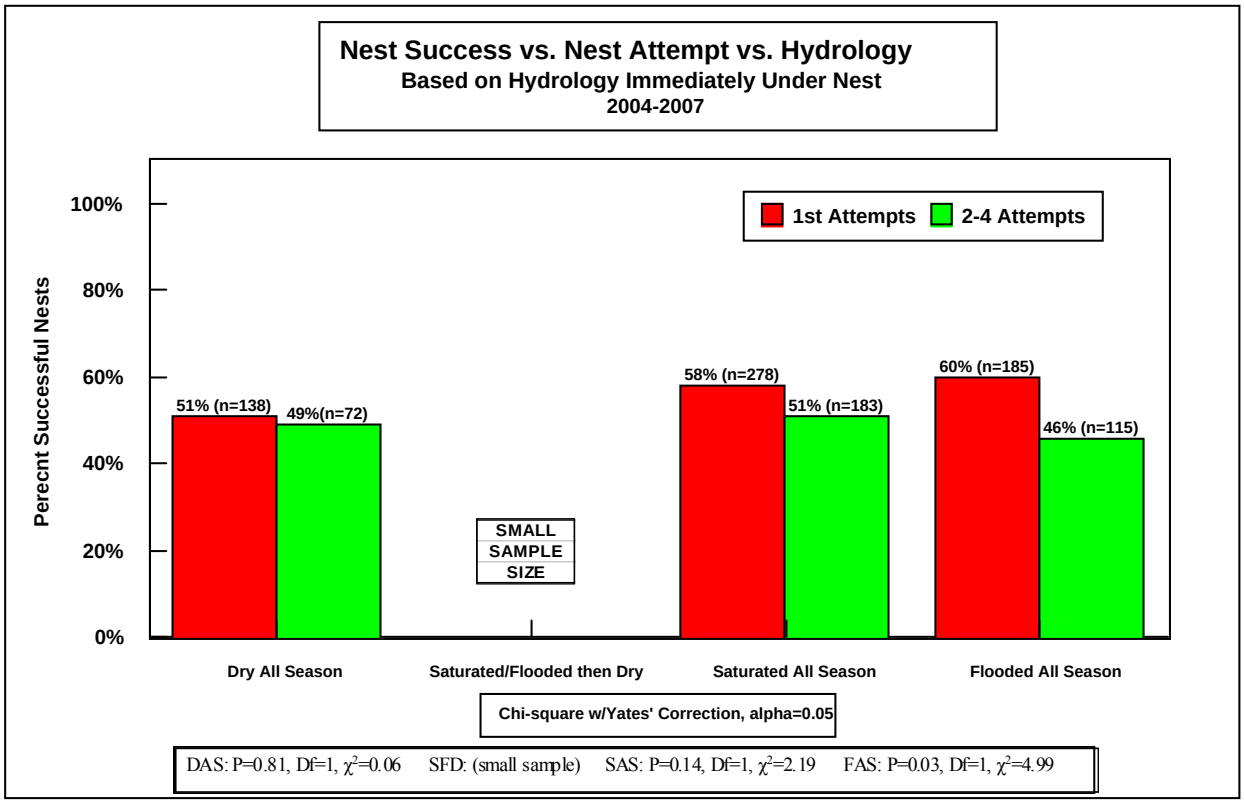

Productivity of Successful Nests based on Nest Substrate
1999-2007
Young Fledged/Nest
2.80
2.40
2.00
1.60
1.20
0.80
0.40
0.00
2.68
2.56
2.29
Salix (n=322)
Saltcedar (n=180)
Russian olive (n=21)
ANOVA, alpha=0.05, P=0.06, Df=2, F-ratio=2.83

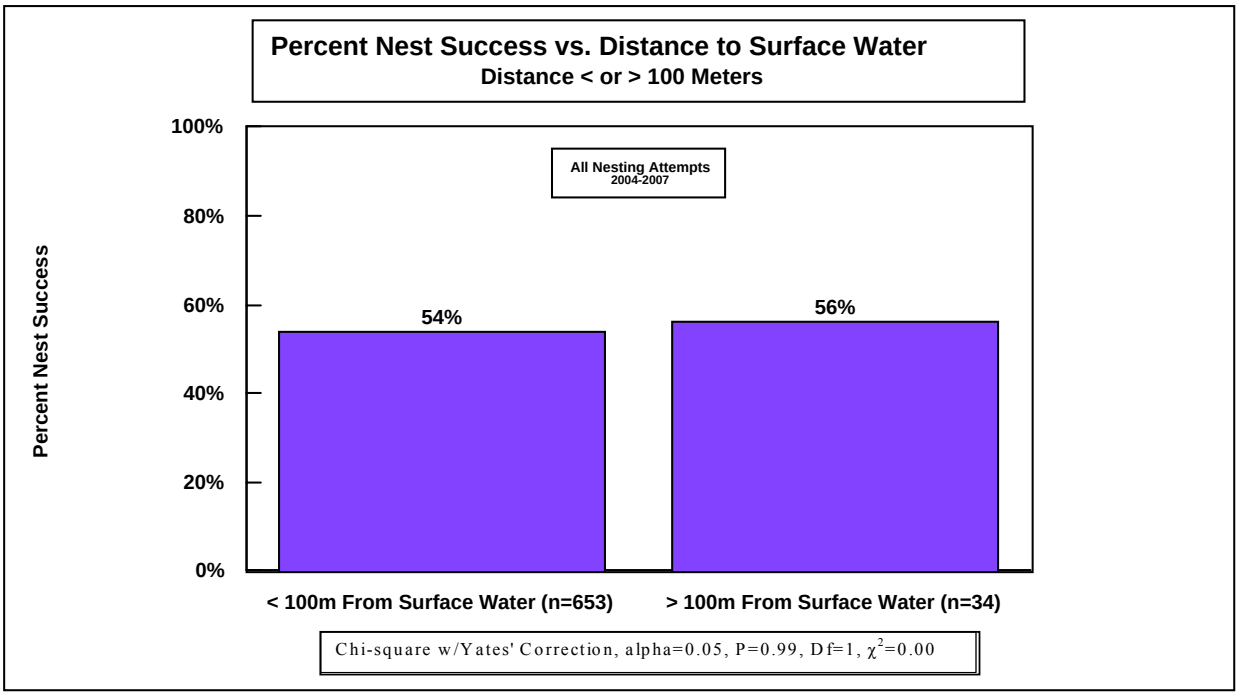

Productivity of Successful Nests based on Territory Dominance
1999-2007
Young Fledged/Nest
2.80
2.40
2.00
1.60
1.20
0.80
0.40
0.00
2.66
2.21
2.60
Native (n=434)
Exotic (n=28)
Mixed (n=63)
ANOVA, alpha=0.05, P=0.02, Df=2, F-ratio=3.79

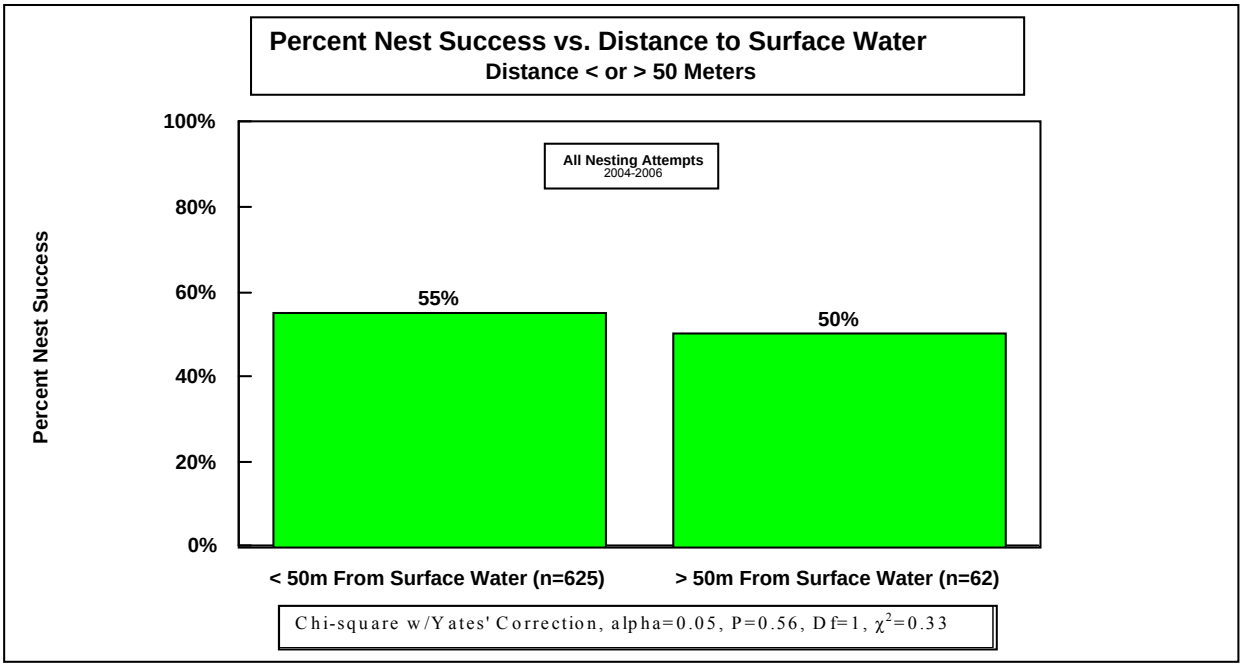

Nesting Success
Based on Hydrology Immediately Under Nest
All Nesting Attempts 2004 - 2007
Percent Nest Success
100%
80%
60%
40%
20%
0%
50%
55%
55%
Dry All Season (n=210)
Saturated/Flooded then Dry (n=16)
Saturated All Season (n=461)
Flooded All Season (n=300)
Chi-square, alpha=0.05, P=0.49, Df=2, χ2=1.42

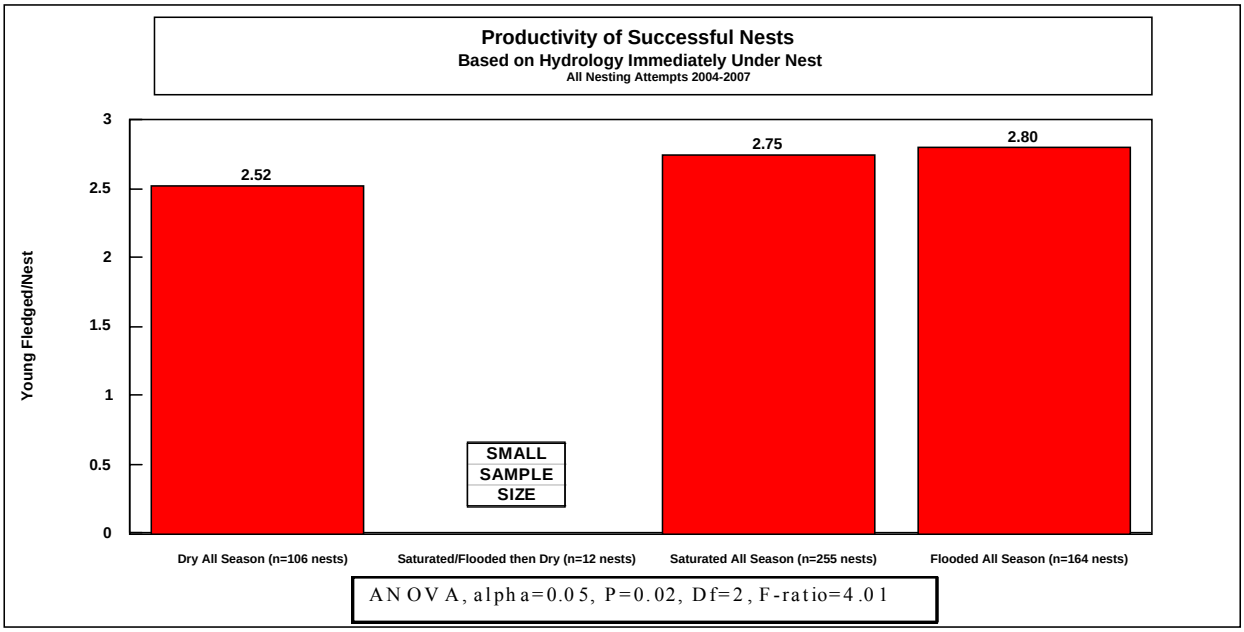

Predation Rates
Based on Hydrology Immediately Under Nest
All Nesting Attempts 2004-2007
Percent Predated Nests
100%
80%
60%
40%
20%
0%
36%
28%
29%
Dry All Season (n=210)
Saturated/Flooded then Dry (n=16)
Saturated All Season (n=461)
Flooded All Season (n=300)
Chi-square, alpha=0.05, P=0.08, Df=2, χ2=5.07

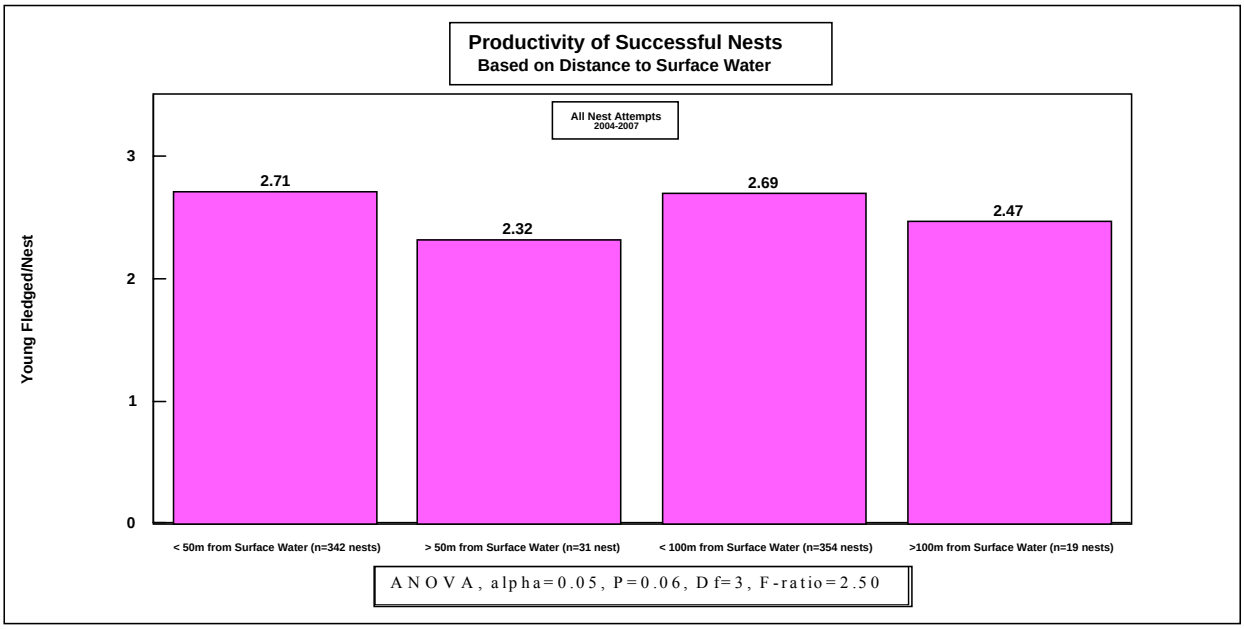

Parastism Rates
Based On Hydrology Immediately Under Nest
All Nesting Attempts 2004-2007
Percent Parastized Nests
100%
80%
60%
40%
20%
0%
19%
13%
12%
Dry All Season (n=210)
Saturated/Flooded then Dry (n=16)
Saturated All Season (n=461)
Flooded All Season (n=300)
Chi-square, alpha=0.05, P=0.04, Df=2, χ²=6.62

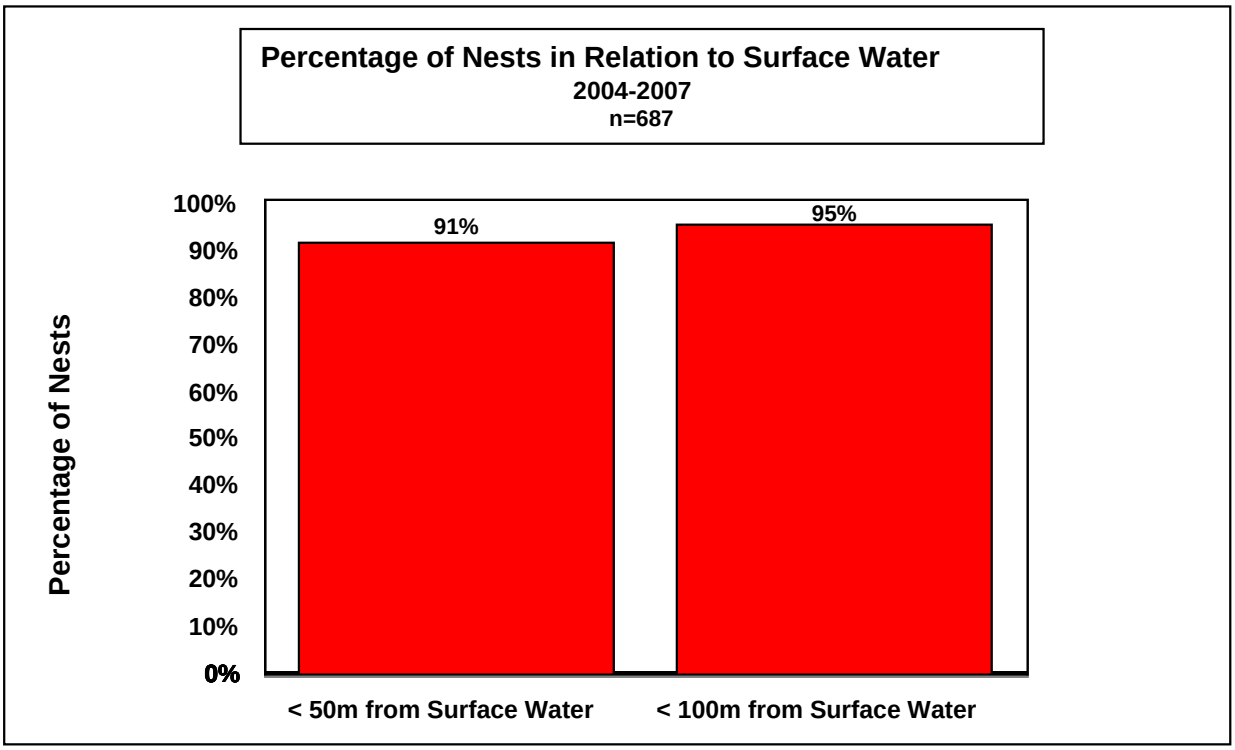

Nest Success vs. Nest Attempt vs. Hydrology
Based on Hydrology Immediately Under Nest
2004-2007
1st Attempts
2-4 Attempts
Perecnt Successful Nests
100%
80%
60%
40%
20%
0%
51% (n=138)
49%(n=72)
SMALL SAMPLE SIZE
58% (n=278)
51% (n=183)
60% (n=185)
46% (n=115)
Dry All Season
Saturated/Flooded then Dry
Saturated All Season
Flooded All Season
Chi-square w/Yates' Correction, alpha=0.05
DAS: P=0.81, Df=1, χ²=0.06 SFD: (small sample) SAS: P=0.14, Df=1, χ²=2.19 FAS: P=0.03, Df=1, χ²=4.99


Percent Nest Success vs. Distance to Surface Water
Distance < or > 100 Meters
All Nesting Attempts
2004-2007
Percent Nest Success
100%
80%
60%
40%
20%
0%
54%
56%
< 100m From Surface Water (n=653)
> 100m From Surface Water (n=34)
Chi-square w/Yates' Correction, alpha=0.05, P=0.99, Df=1, χ^2=0.00


Percent Nest Success vs. Distance to Surface Water
Distance < or > 50 Meters
All Nesting Attempts
2004-2006
Percent Nest Success
100%
80%
60%
40%
20%
0%
55%
50%
< 50m From Surface Water (n=625)
> 50m From Surface Water (n=62)
Chi-square w/Yates' Correction, alpha=0.05, P=0.56, Df=1, χ^2=0.33


Productivity of Successful Nests
Based on Hydrology Immediately Under Nest
All Nesting Attempts 2004-2007
Young Fledged/Nest
3
2.5
2
1.5
1
0.5
0
2.52
2.75
2.80
SMALL SAMPLE SIZE
Dry All Season (n=106 nests)
Saturated/Flooded then Dry (n=12 nests)
Saturated All Season (n=255 nests)
Flooded All Season (n=164 nests)
ANOVA, alpha=0.05, P=0.02, Df=2, F-ratio=4.01


Productivity of Successful Nests
Based on Distance to Surface Water
All Nest Attempts 2004-2007
Young Fledged/Nest
3
2
1
0
2.71
2.32
2.69
2.47
< 50m from Surface Water (n=342 nests)
> 50m from Surface Water (n=31 nest)
< 100m from Surface Water (n=354 nests)
>100m from Surface Water (n=19 nests)
ANOVA, alpha=0.05, P=0.06, Df=3, F-ratio=2.50


Percentage of Nests in Relation to Surface Water
2004-2007
n=687
Percentage of Nests
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
91%
95%
< 50m from Surface Water
< 100m from Surface Water