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2003 SOUTHWESTERN WILLOW FLYCATCHER STUDY RESULTS

Selected Sites Along the Rio Grande From Highway 60 to Elephant Butte Reservoir

RIP-58

U.S. Department of the Interior
Bureau of Reclamation
Technical Services Center
Ecological Planning and Assessment
Denver, Colorado
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EXECUTIVE SUMMARY

Overview

During the summer of 2003, the Bureau of Reclamation (Reclamation) conducted surveys and nest monitoring of the federally endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*) (WIFL) in five distinct reaches along approximately 100 kilometers of the Middle Rio Grande between the Rio Puerco confluence and Elephant Butte Reservoir in New Mexico. Surveys were performed to contribute to current baseline data of the WIFL along the Middle Rio Grande and also to meet Reclamation's Endangered Species Act (ESA) compliance commitments. There were 186 resident WIFLs documented in 106 territories forming 80 breeding pairs. As in previous years, the San Marcial and Sevilleta reaches were most productive, containing 86 and 17 territories, respectively, and the population as a whole in the Middle Rio Grande Basin is expanding.

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 98 nests and fledging at least 127 WIFL young. The Sevilleta reach produced 12 nests and fledged at least 9 WIFL young. Overall, nest variables (success, predation, BHCO parasitism, and productivity) remained similar to 2002.

Other studies were initiated or continued in 2003. These include: (1) Neotropical migrant nest monitoring and point counts, (2) BHCO point counts, (3) livestock grazing study, (4) WIFL habitat suitability assessment, and (5) WIFL nest site vegetation quantification study. These studies are designed to provide further insight into potential threats and habitat requirements of WIFL populations.

Survey Results

Reclamation funded:
- Bosque del Apache – 3 territories
- Neil Cup – 0 territories
- San Acacia – 0 territories
- San Marcial – 86 territories

ESA Collaborative Program funded:
- Sevilleta/La Joya – 17 territories

Recommendations

1. Continue annual surveying and nest monitoring within the San Marcial and Sevilleta/La Joya reaches to determine reproduction, nest success, recruitment, and population trends of WIFLs within the Middle Rio Grande Basin.
2. Give special attention to "core concentration area" between sites LF-17/17a and the Elephant Butte delta to document expansion of WIFLs into the Elephant Butte conservation pool.
3. Survey suitable/potential habitat in various reaches (e.g., Velarde, Belen, San Acacia, Bosque del Apache NWR) every 2 to 3 years to document new occupation by resident WIFLs.
4. Continue nest monitoring and addling/removal of BHCO eggs/chicks from parasitized WIFL nests in lieu of cowbird trapping.
5. Habitat monitoring should be conducted at any restoration sites to document the effectiveness of various restoration practices.

INTRODUCTION

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) (WIFL) is an insectivorous, Neotropical migrant that nests in dense riparian or wetland vegetation in the Southwestern United States (Figure 1). WIFLs 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 WIFL 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 WIFL as an endangered species in February 1995 (FR 60:10694). The WIFL is also listed as an endangered species or species of concern by the States of New Mexico, Arizona, Utah, Colorado, and California (Sogge et. al. 1997). A recovery plan for the WIFL was finalized in August 2002. To accompany the recovery plan, a series of issue papers associated with the recovery of the endangered WIFL 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.

Field surveys are conducted to determine the distribution and abundance of the endangered WIFL 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) conducted presence/absence surveys and nest monitoring within the San Marcial reach under a contract with the U.S. Army Corps of Engineers.

The 2003 presence/absence surveys for WIFLs were conducted at selected sites along the Rio Grande from the confluence with the Rio Puerco downstream to the headwaters of Elephant Butte Reservoir (Figure 2). Surveys were conducted between May 16 and July 26, 2003. Nest searches and nest monitoring of WIFL nests were conducted in conjunction with survey efforts by permitted biologists. In addition to conducting presence/absence surveys for the WIFL, surveyors were instructed to document occurrences of five additional avian species of special concern: Yellow-billed Cuckoo *(Coccyzus americanus)*, Bell's Vireo *(Vireo bellii)*, Yellow Warbler *(Dendroica petechia)*, Summer Tanager (*Piranga rubra*), and Common Ground-dove (*Columbina passerina*).

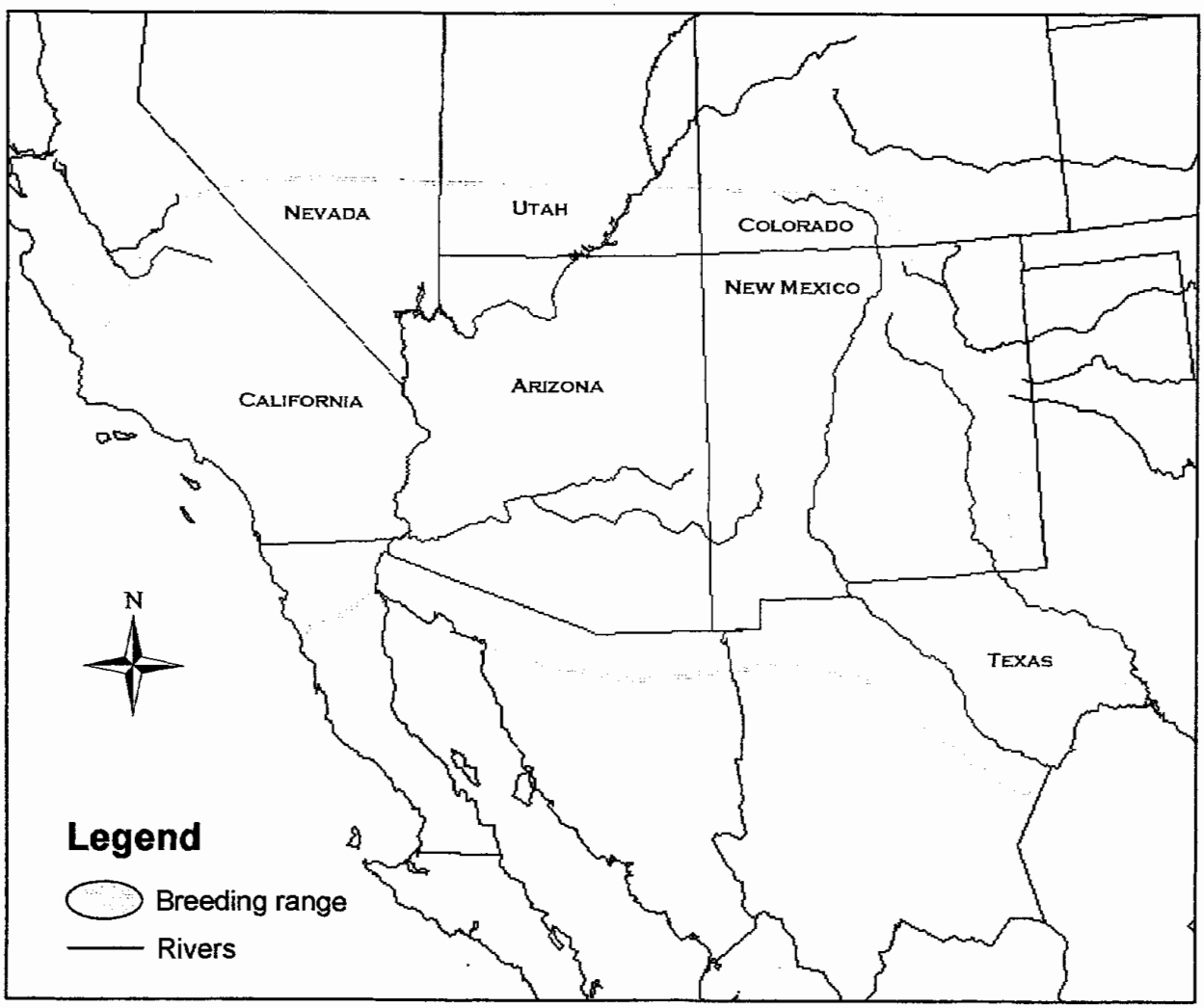

Figure 1. Breeding range of the Southwestern Willow Flycatcher (USFWS 2002).

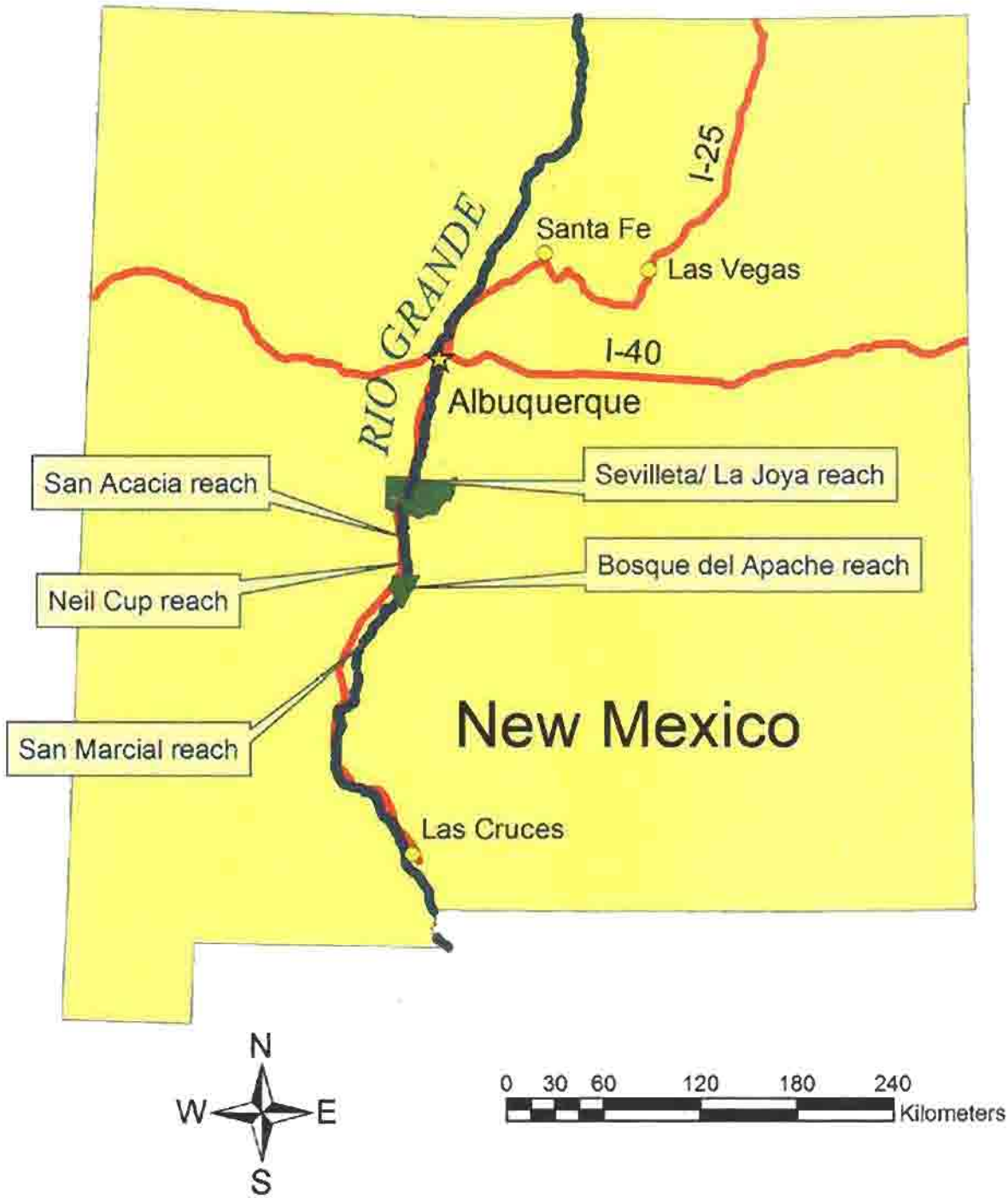

Figure 2. General locations of 2003 survey sites.

Goals and Objectives

Primary goals of the field studies performed in 2003 were:

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

Specific objectives included:

- Maintain project compliance in specific areas with five survey requirements.
- Monitor WIFL nests to determine reproductive status, population recruitment, and limiting factors.
- Assess nest site habitat characteristics.
- Provide initial assessment of general features of occupied habitat patches.
- Compare breeding success and parasitism rates between WIFL and other riparian-obligate Neotropical migrant species.
- Document occurrences of other special status avian species within project lands surveyed.
- Document occurrences of Yellow-billed Cuckoos in specific areas identified for proposed projects.

Related Studies

In addition to the presence/absence surveys and nest monitoring conducted in 2003, the following related studies were either previously conducted or continued in 2003:

- The BHCO trapping program within the San Marcial reach was discontinued at the conclusion of the 2001 season. A total of 4,739 BHCOs was trapped during the 6 years of the trapping program (1996-2001) with 1,548 trapped during the resident period. The results of this program are discussed in detail in *Cowbird Control Program: Middle Rio Grande, New Mexico, 2001* (Ahlers and Sechrist 2002) and *An Assessment of the Brown-headed Cowbird Control Program in the Middle Rio Grande, New Mexico (*Moore and Ahlers 2003).

- Using a modified Breeding Biology Research and Monitoring Database (BBIRD) protocol, 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 WIFLs 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 BHCO trapping. One of the areas supported year-round grazing, and the other did not support any livestock grazing. Preliminary 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 as a component of the *Cowbird Control Program: Middle Rio Grande, New Mexico, 2001* (Ahlers and Sechrist 2002) and in *An Assessment of the Brown-headed Cowbird Control Program in the Middle Rio Grande, New Mexico* (Moore and Ahlers 2003).

- BHCO point counts were continued to determine the distribution and abundance of BHCOs 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 1998 - 2003 data, the areas supporting the greatest mean number of BHCOs were within the Bosque del Apache National Wildlife Refuge (NWR) and Sevilleta NWR/La Joya State Wildlife Area—areas not subject to livestock grazing. Livestock grazing was present adjacent to each of these areas, however, 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. Also, BHCO densities within the trapping area were less than that of another adjacent study area that has not been subject to cowbird trapping and supports year-round livestock grazing. The methods and results of this study can also be found as a component of the *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 (1) the potential future habitat of the endangered WIFL and (2) physical disturbance to existing occupied habitats. Data from a series of established livestock exclosures, photo stations, and seasonal dietary analyses are currently being collected and processed. Study data are presented in: *Browsing Analysis of Riparian Vegetation – Elephant Butte Project Lands* (Ahlers et al. 2003).

- Development of a WIFL habitat suitability model was initiated in 1998 for the Middle Rio Grande Basin, and continues to be refined based on changes in hydrology and updated vegetation maps. Riparian vegetation in the Middle Rio Grande Basin between San Acacia Diversion Dam and Elephant Butte Reservoir had been classified using the Hink and Ohmart (1984) classification system through a cooperative effort with the U.S. Forest Service (USFS). 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. These data are currently being processed and will be used to update the current WIFL habitat model.

- A study to quantify the vegetation at known WIFL breeding sites began in 2003. Data gathered included nesting height and substrate, vegetation density, height diversity, canopy cover, and hydrology. In 2003, data were gathered at 27 nests and will be used to increase overall knowledge of the nesting and general habitat requirements of the species. Data will also provide guidelines for riparian restoration projects targeted for WIFL habitat. Preliminary data analysis was performed following the 2003 field season, and data collection will continue in 2004. For a summary of this study, see Attachment – Summary of Southwestern Willow Flycatcher Nest Vegetation Quantification Study.

For additional information on any of Reclamation's related studies, please contact Reclamation's Albuquerque Area Office, Albuquerque, New Mexico.

METHODS

Study Area

Survey sites were selected based on environmental compliance mandates related to Reclamation projects and an overall desire to obtain baseline data of WIFLs in the Middle Rio Grande Basin. The 2003 survey area encompassed selected sites along the Rio Grande between the confluence with the Rio Puerco and Elephant Butte Reservoir. This stretch contained five distinct survey reaches: Sevilleta/La Joya, San Acacia, Neil Cup, Bosque del Apache, and San Marcial. The 11 sites comprising the Sevilleta/La Joya reach (SV-01 to SV-10) (Figure 3) were surveyed 3 times. The San Acacia reach (Figure 4) contained seven sites (LF-01, 02, 38, 39, 40, 41 and 42) that were surveyed five times. The Neil Cup reach (Figure 5) contained five sites (LF-07, 08, 43a, 43b, and 45) that were surveyed four times each. The Bosque del Apache reach (Figure 6) contained 13 sites (BA-01 to BA-10). Based on survey protocol, sites BA-01, BA-02, and BA-05 to BA-10 were surveyed three times, and sites BA-03N, 03S, 04N, and 04S were surveyed five times due to ongoing projects. Lastly, due to complexity and structure of habitat, sites within the San Marcial reach (Figure 7) were typically smaller than sites to the north. Forty sites (LF-09 to LF-22, LFCC-1 to LFCC-7, and DL-01 to DL-11) were each surveyed a minimum of 5 times.

Presence/Absence Surveys

All sites were surveyed in accordance with Sogge et al. (1997) and the USFWS revised protocol (USFWS 2000), using the repeated tape-playback method. Surveys were conducted a minimum of 5 days apart, generally between 0530 and 1100 by trained and permitted personnel. Survey forms were completed daily for each respective site. Survey dates are summarized in Table 1.

The first survey was conducted in late May to early June to increase the likelihood of detection, since territorial males are more vocal when establishing territories than after nesting has begun. It was anticipated that migrant WIFLs would also be detected. The second and third surveys were conducted between early June and early July to (1) confirm the establishment of territories and/or nesting, (2) detect late settling males, and (3) determine which sites remained occupied throughout the breeding season. The fourth and fifth surveys, conducted during mid-July, were initiated in 2002

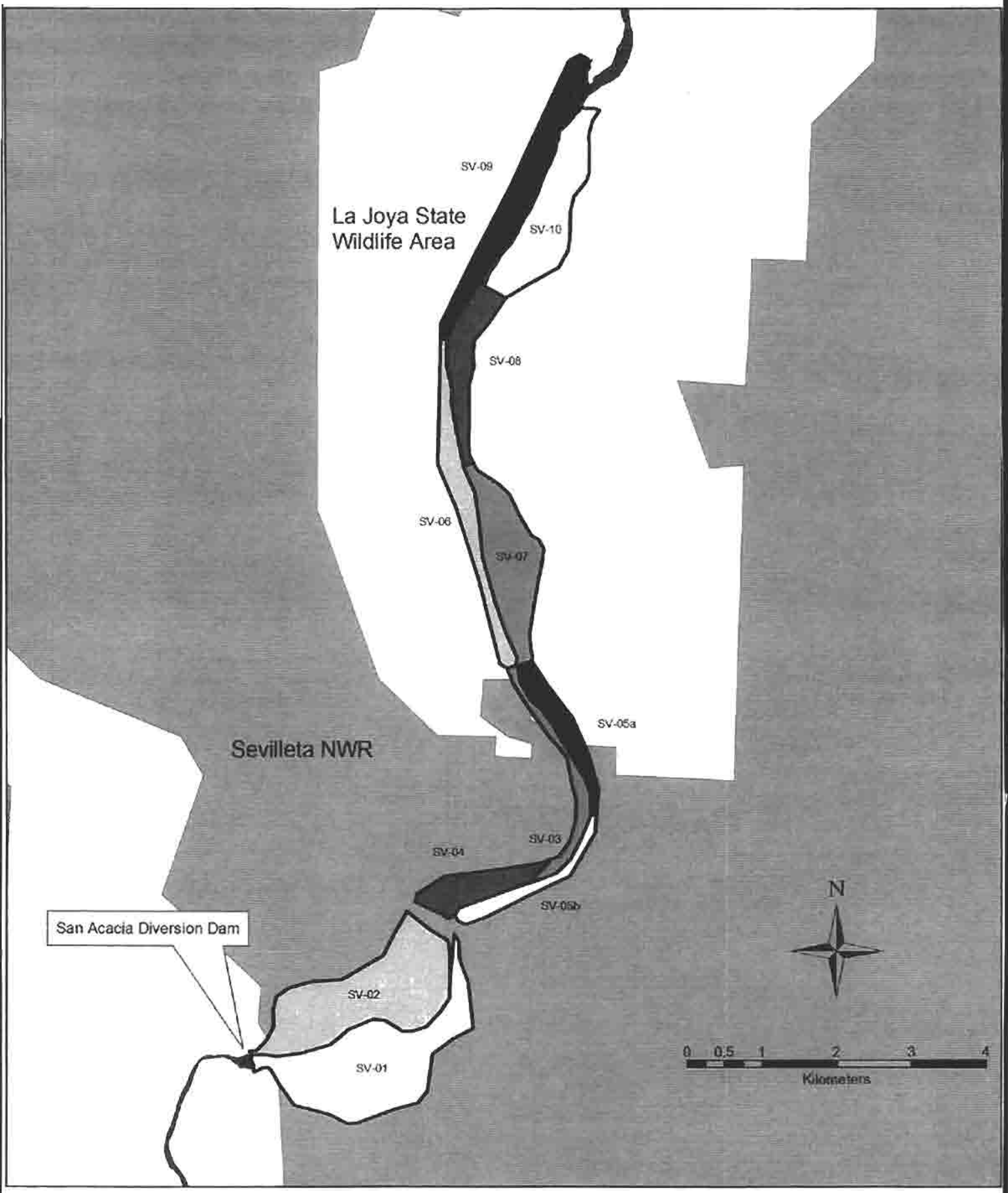

Figure 3. Overview of Sevilleta/ La Joya survey sites.

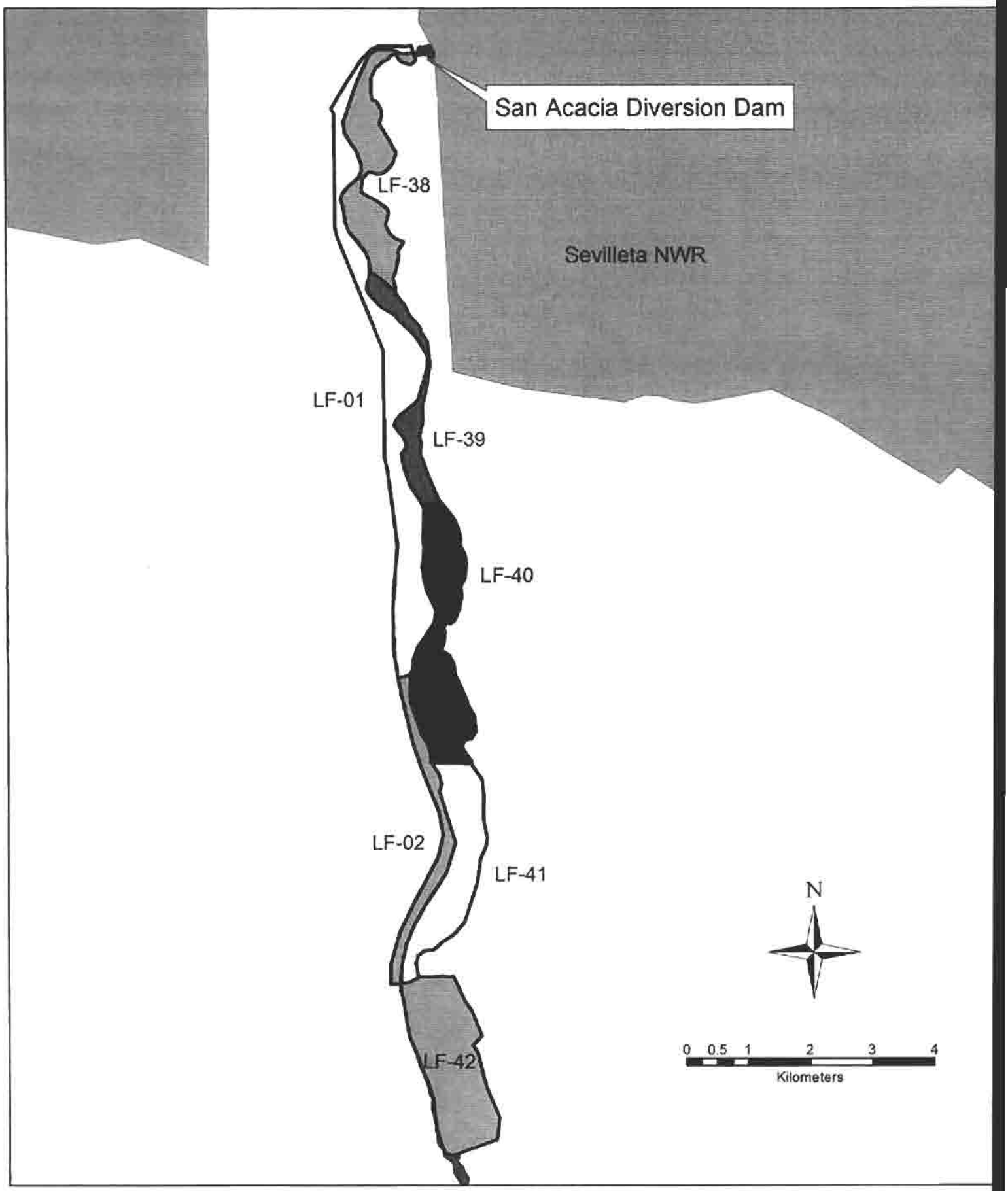

Figure 4. Overview of San Acacia survey sites.

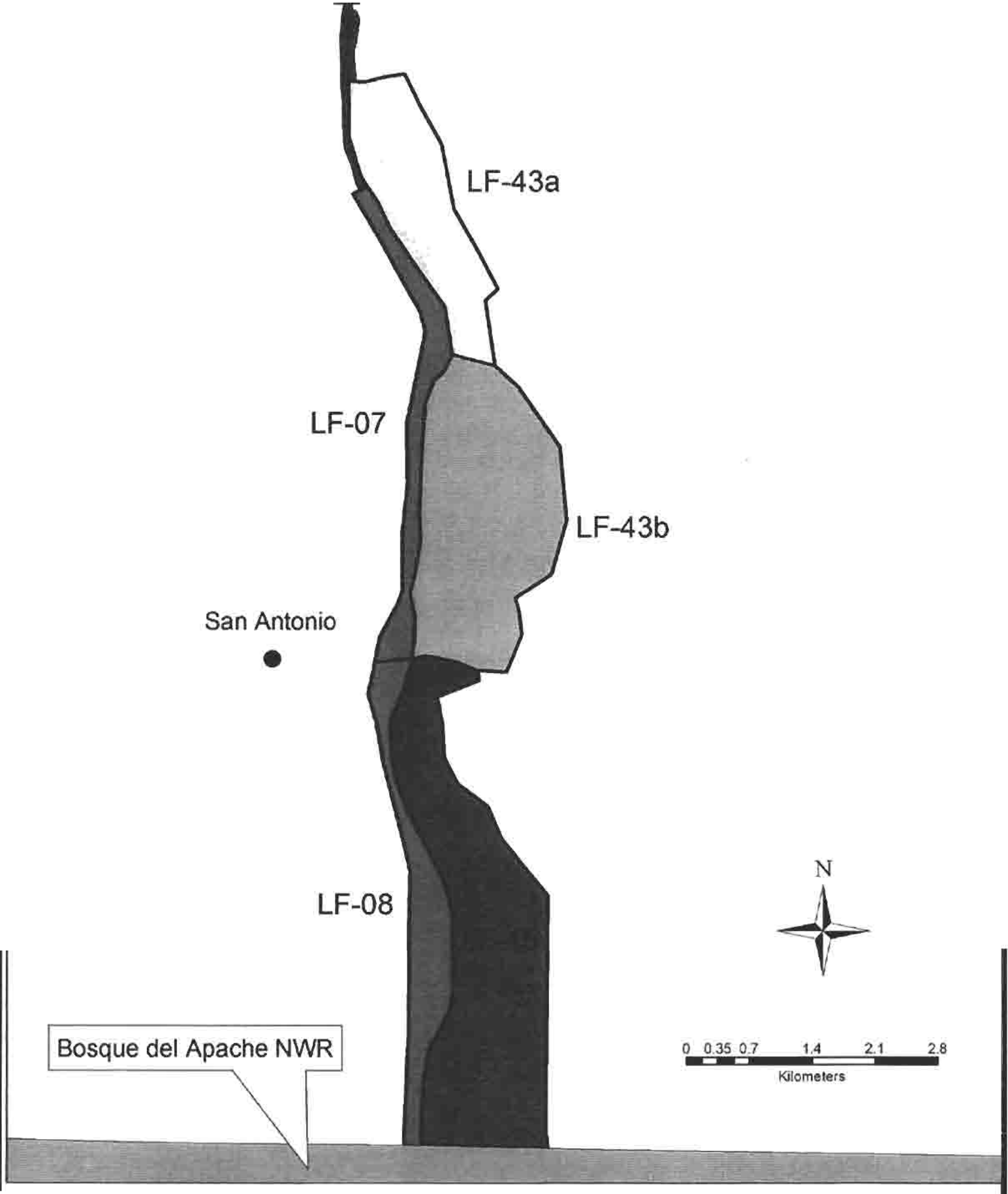

Figure 5. Overview of Neil Cup survey sites.

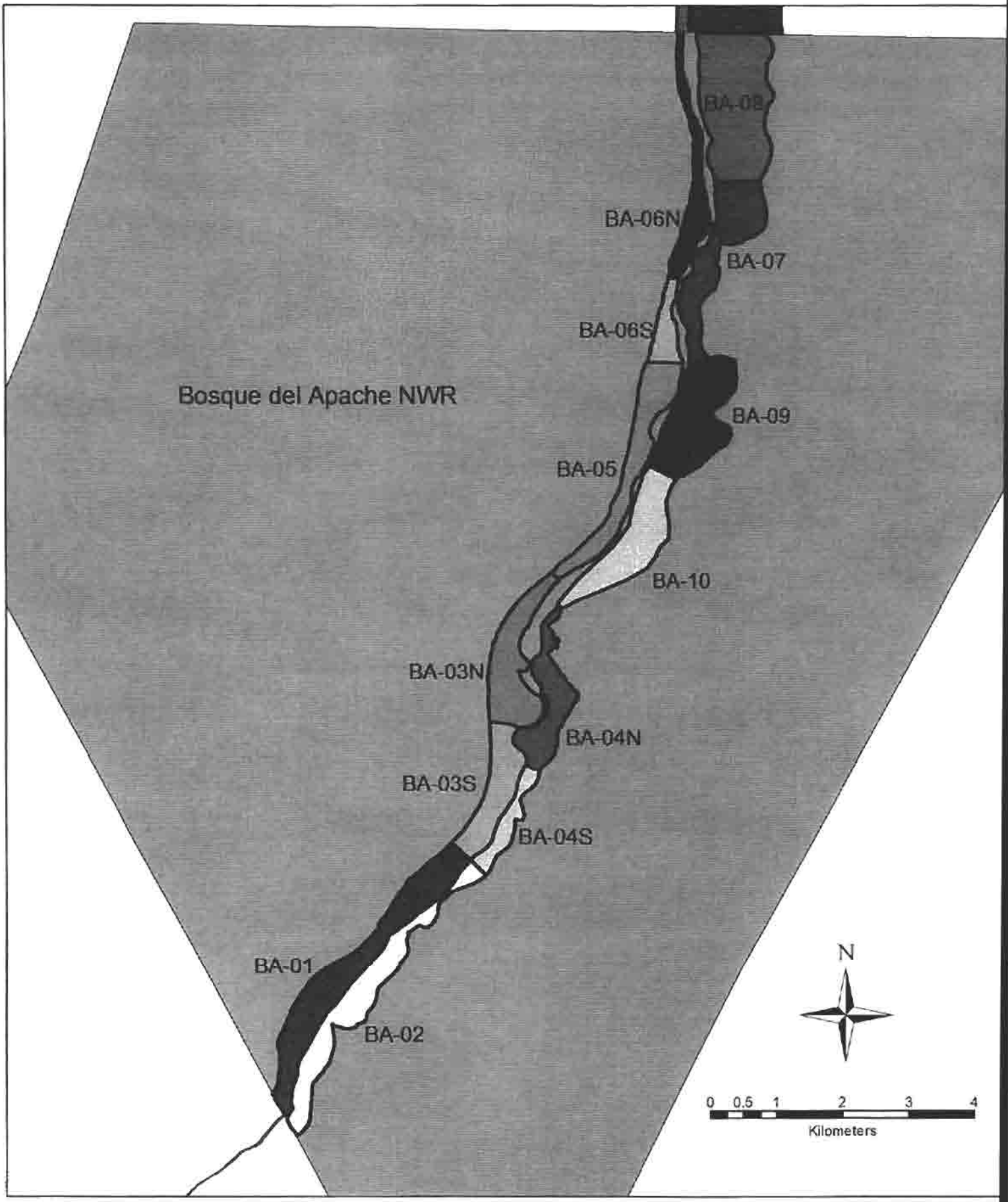

Figure 6. Overview of Bosque del Apache survey sites.

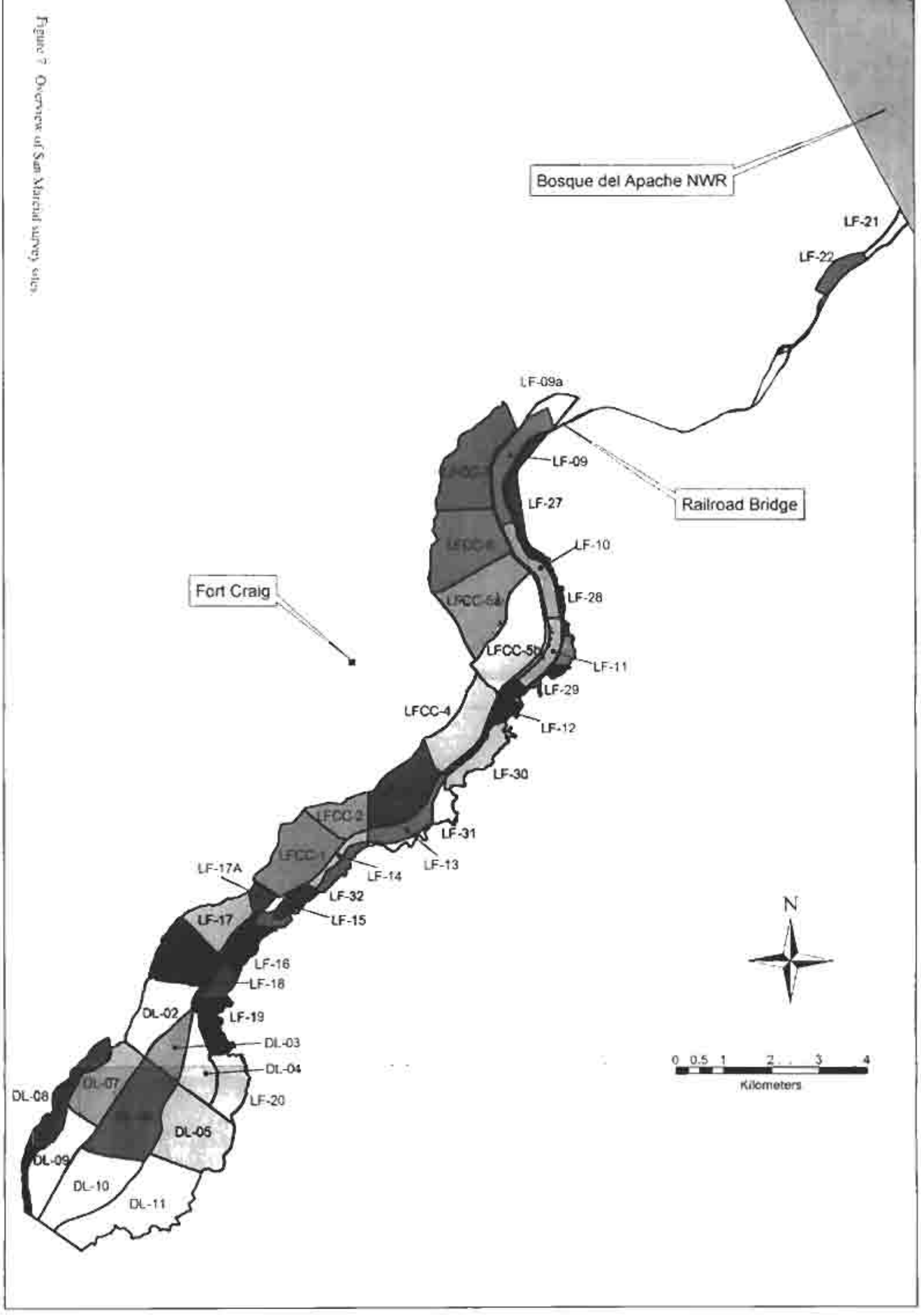

Figure 7. Overview of San Marcial survey site.

Table 1. WIFL survey schedule for the 2002 field season

Survey number	Survey period
1	May 18 – June 7
2	June 8 - June 21
3	June 22 – July 3
4	July 4 - July 16
5	July 17 - July 27

to derive a greater degree of confidence regarding the breeding status, habitat association, or presence/absence of WIFLs at the selected sites. WIFLs documented on or after June 10 were considered resident birds. Each site was surveyed as thoroughly as conditions would allow. Most sites surveyed during the 2003 season were generally accessible with dry conditions occurring during most surveys. Several of the southern sites within the San Marcial reach were subject to flooding during the 2003 breeding season, making surveys more difficult.

At the conclusion of a survey, the survey form was filled out. When WIFLs were detected, UTM coordinates were obtained, and the senior on-site biologist was notified. If pairing was confirmed or suspected, a permitted biologist initiated a nest search.

Species of Special Concern

Surveyors were also instructed to document the occurrence of other avian species of special concern within survey sites. These species included the Yellow-billed Cuckoo, Bell's vireo, Yellow Warbler, Summer Tanager, and Common Ground-dove. Every effort was made to avoid duplicate recording of these individuals, and individuals that were recorded multiple times were sorted out during data processing. When an individual was detected by either sight or sound, UTM coordinates were obtained, and a Species of Special Concern form was completed.

Nest Searches/Monitoring

Nest searches were conducted upon discovery of a breeding or suspected breeding WIFL pair by a permitted biologist and/or technicians under the direct supervision of a permitted biologist. To minimize disturbance and maximize accuracy of monitoring efforts, nest searches and monitoring were conducted using methods outlined in Martin and Geupel (1993) and the Southwestern Willow Flycatcher Nest Monitoring Protocol (Rourke et al. 1999). The nest area was located by observing diagnostic WIFL 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 WIFLs did not immediately reveal the nest locations. All suitable midstory trees and shrubs in the suspected area were carefully inspected until the characteristic small, cup-shaped nest described in

Tibbitts et al. (1994) was found. Nests were usually located within a few minutes.

At all nest sites, physical data required by the Willow Flycatcher Nest Site Data Form were collected. Nest contents were not monitored during the nest building/egg laying stages—the period when disturbance is most likely to cause adults to abandon the nest—or as the suspected fledging date approached when nestlings are likely to be force-fledged. Nests with eggs/young were examined quickly using a mirror mounted on a telescoping pole. Nesting chronology was subsequently estimated following the initial search and examination. Subsequent visits were minimized and timed so at least one inspection would be made of eggs and nestlings, and pertinent data were recorded on the Willow Flycatcher Nest Record Form.

At the conclusion of the first or early-season nesting attempts, the nesting pair was left alone for approximately a week. Then a re-nest/second brood search was performed to detect any subsequent nesting attempts. A re-nest is a nesting attempt that occurs after a failed nesting attempt, and a second brood occurs after a nest successfully fledges WIFL young.

In 2002, the practice of addling BHCO eggs from parasitized nests when necessary and possible was initiated. This was continued in 2003. WIFL eggs were never disturbed and time spent at the nest was minimized. Frequently, it was determined that, based on nesting chronology, the BHCO egg would not have a chance to hatch. In this case, nests were monitored normally to minimize disturbance.

RESULTS

Presence/Absence Surveys

During presence/absence surveys, conducted from May 16 through July 26, 206 WIFLs were documented (126 males and 80 females). Based on detections prior to June 10 and/or the birds' lack of territorial behavior, 20 were believed to have been migrants. The remaining 186 (106 males and 80 females) were believed to be resident WIFLs.

The 186 WIFLs established 106 territories and 80 pairs. Seventy-six of the pairs were confirmed by documented nesting attempts; they produced 111 nests. Four additional pairs were observed and although nesting was suspected, it could not be confirmed in any of these territories. Of the 111 confirmed nesting attempts, 54 were believed successful, 54 failed, and 3 were unknown. Successful nests include those which supported chick(s) 8 to 10 days old on the last nest visit, however, four nests that were not monitored into the late nestling stage were considered likely to have fledged young, and were thus included in the successful nest count. These nests contained nestlings aged 6 to 8 days old on the last visit of the season.

Detection results for 2003 are summarized in Table 2. WIFL detections within the Sevilleta/ La Joya, San Acacia, Neil Cup and Bosque del Apache, and San Marcial reaches are presented in Figures 8 through 11, respectively.

Table 2. Summary of WIFL detections – Middle Rio Grande – 2003

Site name	WIFLs observed[1]		Est. # of pairs	Est. # of *E. t. extimus*[2]		Est. # of territories	Nest(s) found[3]	Nest success	Comments
SV-1	1♂	0♀	0	1♂	0♀	1	N	N/A	(Only observed on 6/18/03 - 1 unpaired male)
SV-3	10♂	6♀	6	10♂	6♀	10	6	4 successful 1 failed 1 unknown	4 unpaired males
SV-9	6♂	3♀	3	6♂	3♀	6	6	6 failed	3 unpaired males
Subtotal Sevilleta/ La Joya sites	17♂	9♀	9	17♂	9♀	17	12	4 successful 7 failed 1 unknown	8 unpaired males
BA-2	3♂	1♀	1	3♂	1♀	3	1	1 successful	(2 males found only on 6/20/03)
BA-3S	1♂	0♀	0	0♂	0♀	0	N	N/A	(Assumed to be migrant - found only on 5/24/03)
Subtotal Bosque del Apache sites	4♂	1♀	1	3♂	1♀	3	1	1 successful	2 unpaired males 1 migrant
LF-1	1♂	0♀	0	0♂	0♀	0	N	N/A	(Assumed to be migrant - found only on 6/6/03)
LF-2	1♂	0♀	0	0♂	0♀	0	N	N/A	(Assumed to be migrant - found only on 5/19/03)
LF-38	1♂	0♀	0	0♂	0♀	0	N	N/A	(Assumed to be migrant - found only on 6/6/03)
LF-39	1♂	0♀	0	0♂	0♀	0	N	N/A	(Assumed to be migrant - found only on 5/28/03)
LF-40	1♂	0♀	0	0♂	0♀	0	N	N/A	(Assumed to be migrant - found only on 5/28/03)
Subtotal San Acacia sites	5♂	0♀	0	0♂	0♀	0	N	N/A	No pairs or territories 5 migrants
Subtotal Neil Cup sites	0♂	0♀	0	0♂	0♀	0	N	N/A	No WIFLs Found on any surveys
LFCC-4	2♂	0♀	0	0♂	0♀	0	N	N/A	(Assumed to be Migrants - Both WIFLs found only on 5/27/03)

Site name	WIFLs observed[1]	Est. # of pairs	Est. # of *E. t. extimus*[2]	Est. # of territories	Nest(s) found[3]	Nest success	Comments
LFCC-5b	1♂ 0♀	0	0♂ 0♀	0	N	N/A	(Assumed to be migrant - found only on 5/27/03)
LFCC-7	1♂ 0♀	0	0♂ 0♀	0	N	N/A	(Assumed to be migrant - found only on 6/5/03)
LF-10	1♂ 0♀	0	0♂ 0♀	0	N	N/A	(Assumed to be migrant - found only on 5/30/03)
LF-12	1♂ 0♀	0	0♂ 0♀	0	N	N/A	(Assumed to be migrant - found only on 5/22/03)
LF-14	3♂ 0♀	0	0♂ 0♀	0	N	N/A	(All WIFLs assumed to be migrant - found only on 5/23/03)
LF-16	1♂ 0♀	0	0♂ 0♀	0	N	N/A	(Assumed to be migrant - found only on 5/23/03)
LF-17	22♂ 21♀	21	22♂ 21♀	22	29	13 successful 16 failed	1 unpaired male
LF-17A	8♂ 8♀	8	8♂ 8♀	8	14	7 successful 7 failed	All paired
LF-18	1♂ 0♀	0	0♂ 0♀	0	N	N/A	(Assumed to be migrant - found only on 6/4/03)
LF-19	1♂ 0♀	0	0♂ 0♀	0	N	N/A	(Assumed to be migrant - found only on 6/3/03)
LF-21 (across Rio Grande)	2♂ 2♀	2	2♂ 2♀	2	2	1 successful 1 failed	WIFL pairs/nests on east side of Rio Grande from LF-21
LF-22	2♂ 1♀	1	2♂ 1♀	2	N	N/A	1 unpaired male
LF-28	2♂ 0♀	0	0♂ 0♀	0	N	N/A	(Both WIFLs assumed to be migrants - found only on 6/2/03)
DL-1	28♂ 24♀	24	28♂ 24♀	28	35	15 successful 18 failed 2 unknown	4 unpaired males
DL-2	8♂ 5♀	5	8♂ 5♀	8	5	3 successful 2 Failed	3 unpaired males

Site name	WIFLs observed[1]	Est. # of pairs	Est. # of *E. t. extimus*[2]	Est. # of territories	Nest(s) found[3]	Nest success	Comments
DL-3	10♂ 5♀	5	10♂ 5♀	10	8	7 successful 1 failed	5 unpaired males
DL-4	4♂ 3♀	3	4♂ 3♀	4	4	3 successful 1 failed	1 unpaired male
DL-7	1♂ 1♀	1	1♂ 1♀	1	1	1 failed	
DL-11	1♂ 0♀	0	1♂ 0♀	1	N	N/A	Found only on 6/12/03 - 1 unpaired male
Subtotal San Marcial sites[4]	100♂ 70♀	70	86♂ 70♀	86	98	49 successful 47 failed 2 unknown	16 unpaired males 15 migrants
Total all sites surveyed in 2003	126♂80♀	80	106♂ 80♀	106	111	54 successful 54 failed 3 unknown	20 males assumed to be migrants 26 unpaired males

(1) When a single WIFL responded to the tape playback, and there was no evidence of pairing, it was considered to be a lone male. However, it is possible that some of the 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 WIFL pair has had a successful nesting attempt (i.e., young are fledged). A re-nest commonly occurs after an unsuccessful first nesting attempt.

(4) The San Marcial reach extends from the south boundary of the Bosque del Apache NWR to the headwaters of Elephant Butte Reservoir. However, sites between the railroad bridge and the southern boundary of the Bosque NWR were not surveyed for the seventh consecutive year (with the exception of sites LF-21 and LF-22). Habitat in these unsurveyed sites has potential for habitation by resident WIFLs. These potential territories are not included in the San Marcial or total counts.

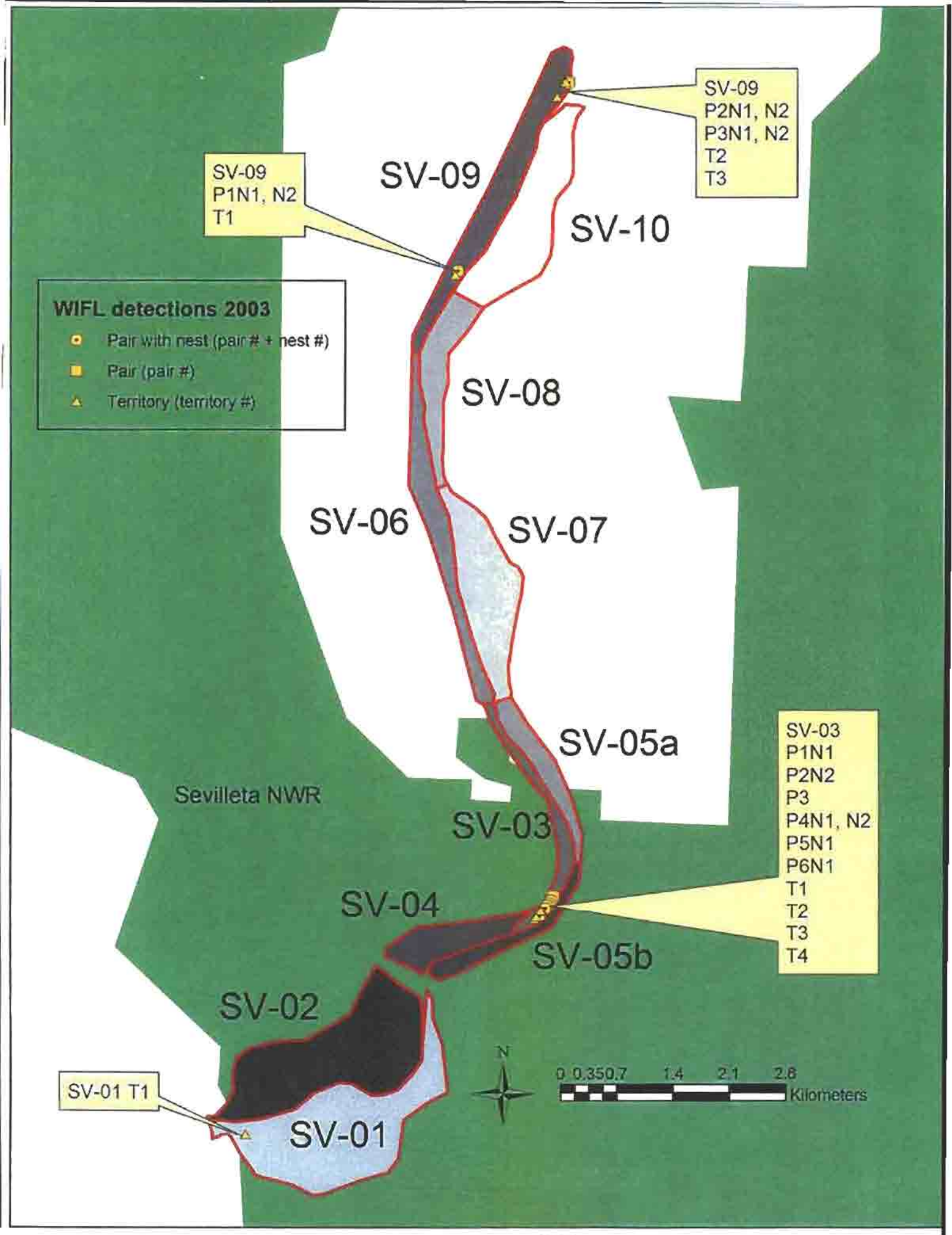

Figure 8. WIFL detections within the Sevilleta/ La Joya reach – 2003.

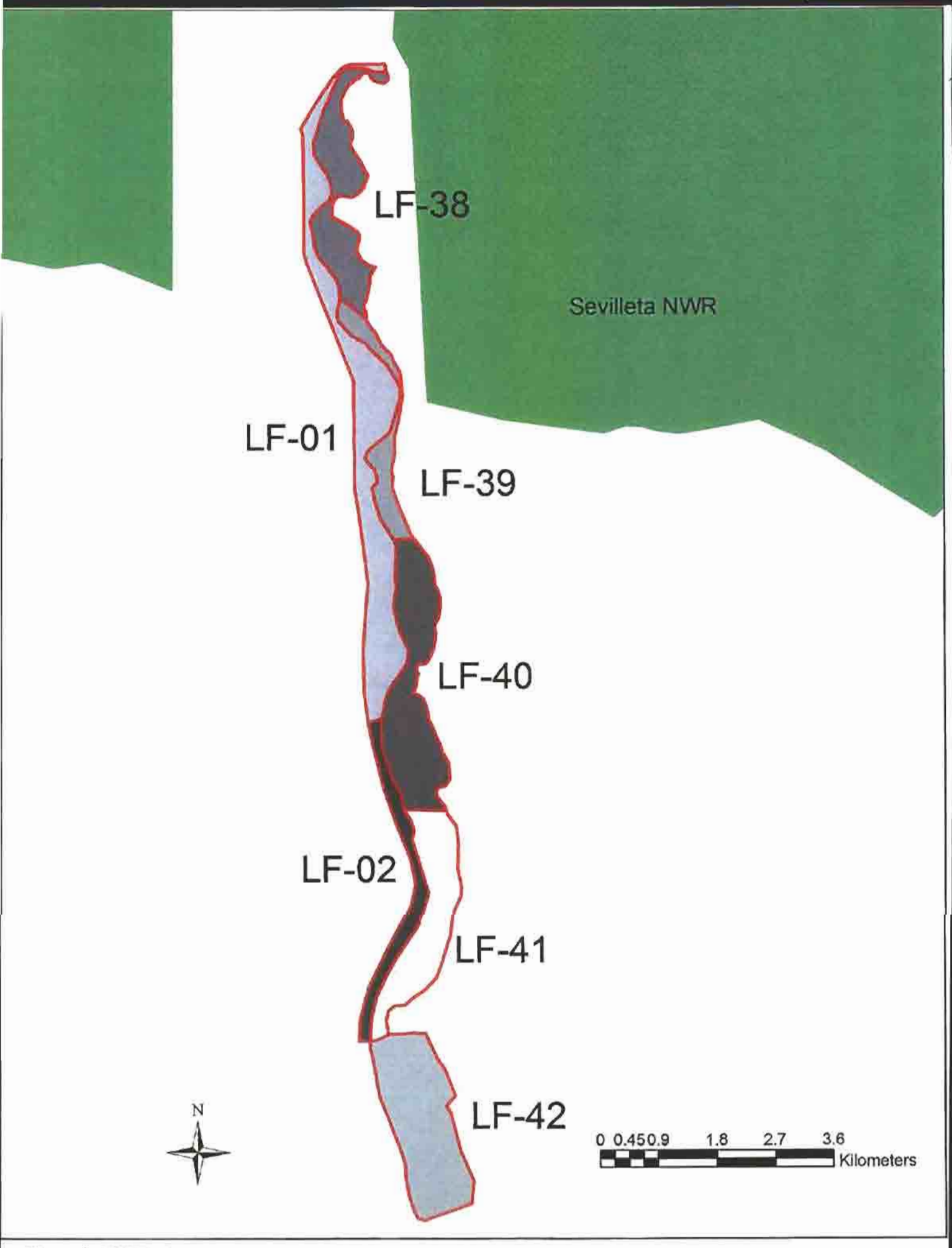

Figure 9. WIFL detections within the San Acacia reach – 2003.

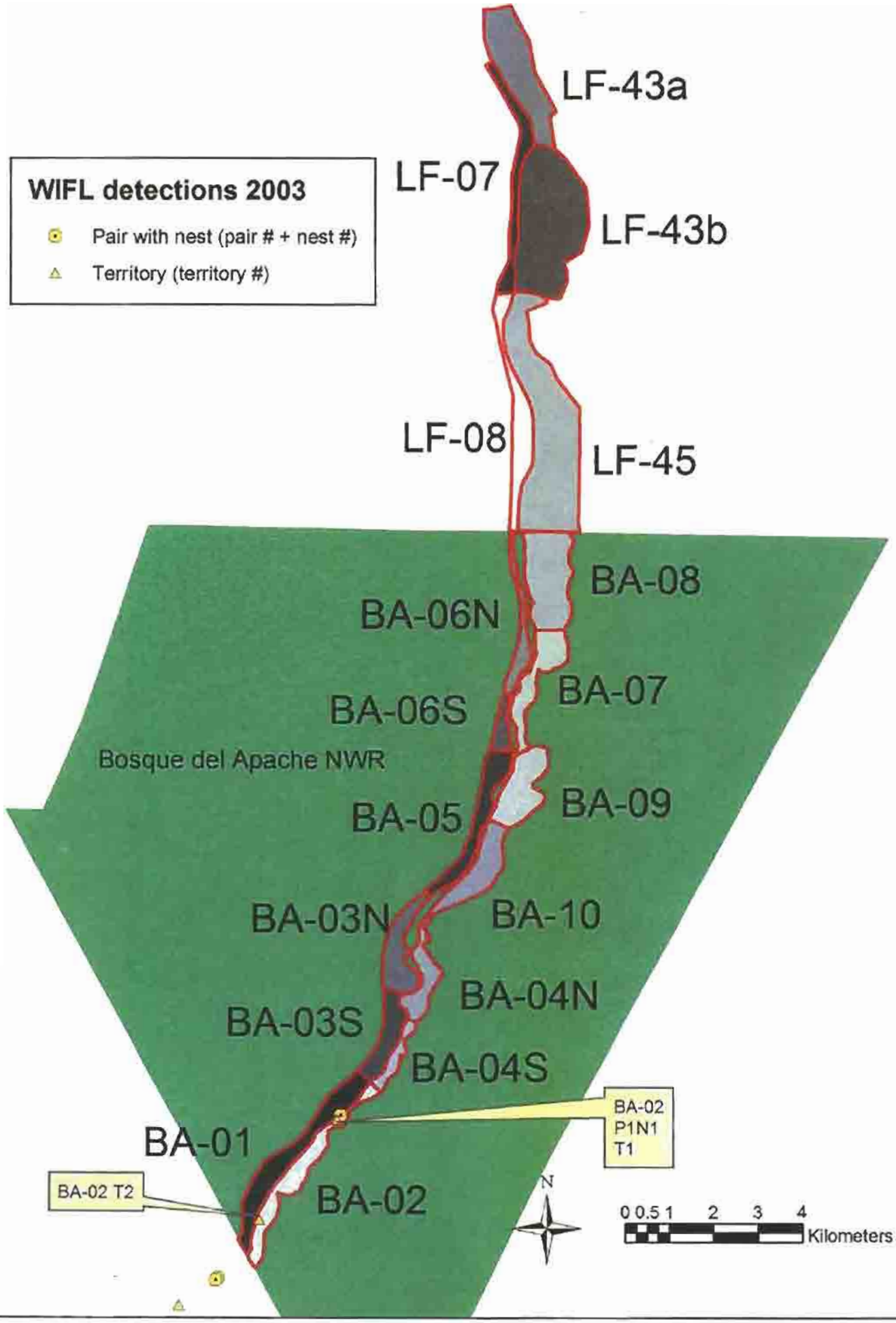

Figure 10. WIFL detections within the Neil Cup and Bosque del Apache reaches – 2003.

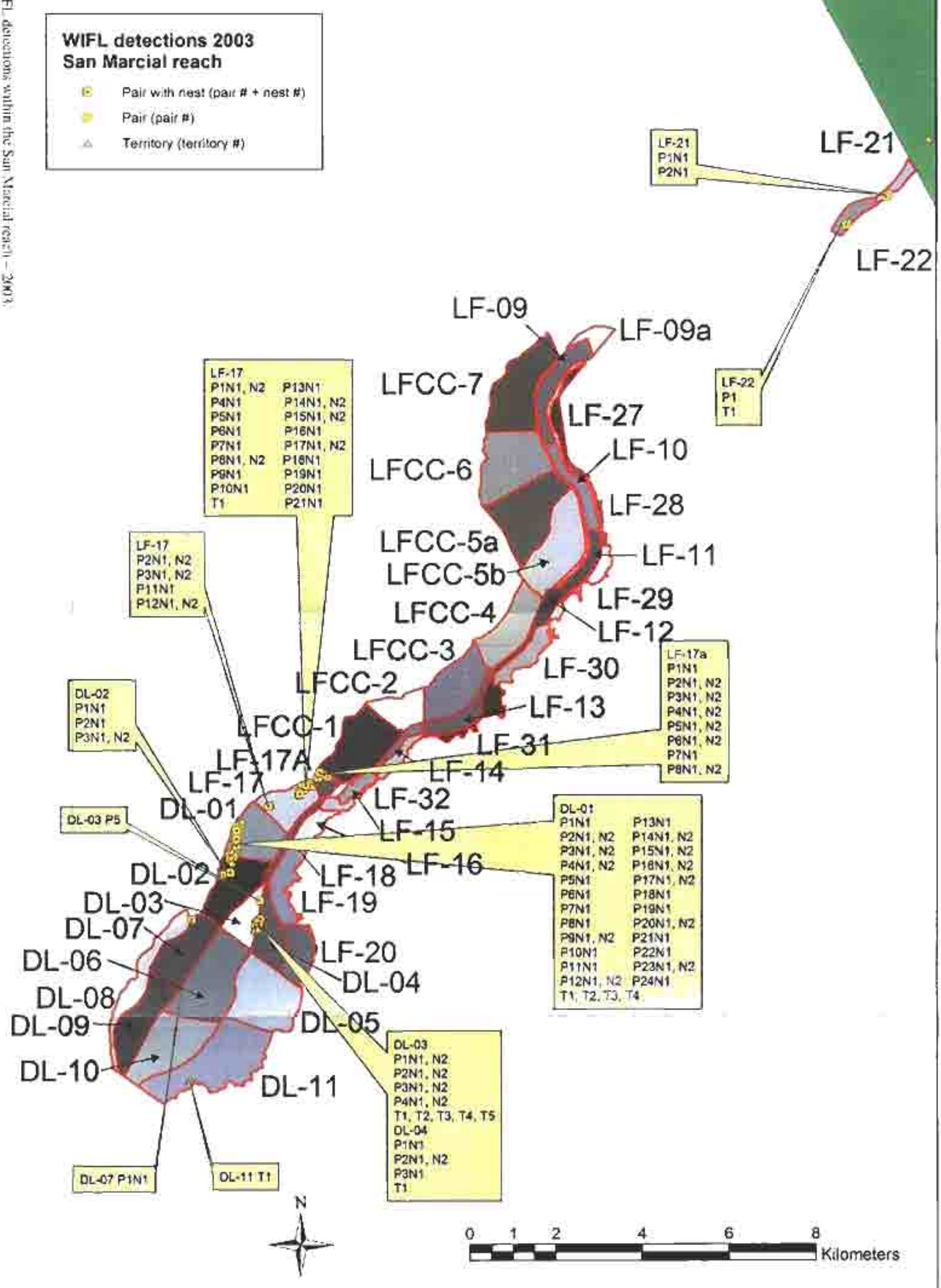

Figure 11. WIFL detections within the San Marcial reach – 2003.

During the 2003 season, four or five surveys were completed in project-related sites, which comprised approximately 74 percent of the sites surveyed. Within these 56 sites, however, no new WIFLs were documented during the fourth or fifth survey periods. The additional surveys did, however, provide greater confidence to the absence of the species in unoccupied sites.

Presence/absence survey forms and nest data forms are presented in Appendix A. Table 3 illustrates a summary of WIFL detections within the San Marcial reach from 1994 through 2003. The following section contains an overview of the 30 sites where WIFLs were detected during the 2003 season.

Table 3. Summary of Southwestern Willow Flycatcher nest monitoring (1994-2003) - downstream of railroad bridge to Elephant Butte Reservoir delta

Year	# Territories	# Pairs	# Nests found	# Nests parasitized (%)	# Nests predated (%)	# Nests abandoned (%)	Unknown success	# Successful nests (%)	Estimated total # chicks fledged	Estimated productivity (# chicks per successful nest)
1994	0	0	0	N/A	N/A	N/A	N/A	N/A	0	N/A
1995	3	0	0	N/A	N/A	N/A	N/A	N/A	0	N/A
1996	13	1	1	0	0	1 (100%)	N/A	0	0	N/A
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 (10%)*	1 (5%)	2 (10%)*	2	14 (74%)	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 (50%)	≥126	2.6

*some nests were parasitized, predated, and/or abandoned
** some pairs re-nested after failed attempt or attempted a second brood

Site BA-02 is located on the southern boundary of the Bosque del Apache NWR (UTM Zone 13 south – 3736618 N 325677 E to 3732703 N 322930 E). Habitat is dominated by a mix of native and exotic vegetation and includes coyote willow, cottonwood, and saltcedar. Some fairly high quality habitat exists and would be improved with overbank flow. The site was surveyed four times during the survey season.

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

river bars. Five surveys were performed during the 2003 survey season.

Site DL-01 is immediately south of LF-17 in the conservation pool of Elephant Butte Reservoir (UTM Zone 13 south – 3717214 N 308327 E to 3716567 N 307944 E). Due to its location, vegetation has developed extensively as reservoir levels receded. Vegetation is composed of decadent stands of saltcedar in the interior and extensive Goodding's willow stands on the western edge. Goodding's willow also exists on the eastern edge, however, the disconnection from the river caused by the levee has caused much of the willow to die out. Formal surveys were ended after the second survey period due to the known occupation of the site by breeding WIFLs. Instead, extensive nest searches/surveys were conducted by experienced/permitted (nest monitoring) biologists. Thorough "survey" results were achieved without the additional disturbance/stress of "formal" surveys.

Site DL-02 is immediately south of DL-01 in the Elephant Butte Reservoir conservation pool (UTM Zone 13 south – 3716775 N 306869 E to 3715089 N 306781 E). Habitat is very similar to DL-01 with saltcedar dominating the dry interior and natives dominating the western edge where Low Flow Conveyance Channel (LFCC) outfall water causes flooding. Along the western edge, large stands of Goodding's willow comprise highly suitable WIFL habitat along the northern half of the site, and coyote willow and saltcedar compose a larger proportion of the vegetation in the southern half. Five surveys were done in 2003.

Site DL-03 is immediately southeast of DL-02, adjacent to the Rio Grande (UTM Zone 13 south – 3716183 N 307817 E to 3714536 N 307460 E). Habitat is composed of high quality coyote and Goodding's willow on the eastern edge, adjacent to the river, and dense saltcedar throughout the rest of the site. The native habitat in this site developed when the river was realigned but, due to the embankment paralleling the new pilot channel, it receives no overbank flows. Five surveys were conducted during 2003.

Site DL-04 is located immediately southeast and across the Rio Grande from DL-03 (UTM Zone 13 south – 3716183 N 307817 E to 3714058 N 308120 E). Along the western edge, highly suitable WIFL habitat is composed of mature natives such as Goodding's willow and coyote willow. The interior of the site is composed of a mixture of mature saltcedar, Russian olive, and natives including coyote willow, Goodding's willow, and cottonwood. Habitat within this site, other than that immediately adjacent to the river, is fairly dry and decadent due to the disconnection from the active river channel. Five surveys were conducted during 2003.

Site DL-07 is located directly south of DL-02 on the east side of the LFCC outfall (UTM Zone 13 south – 3715089 N 306781 E to 3713617 N 305781 E). This site contains several patches of highly suitable WIFL habitat in the form of mature Goodding's willow and coyote willow, particularly in the northwestern end of the site along the LFCC outfall. 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. Five surveys were conducted in this site in 2003.

Site DL-11 is on the southern end of the survey reach between the active river channel and the eastern bluffs (UTM Zone 13 south – 3713039 N 306863 E to 3711391 N 304863 E). Habitat within the site is composed primarily of low growing herbaceous vegetation such as cattails, burdock, and other emergent aquatics. However, in several areas along the eastern bluffs, mid-age stands of Goodding's willow exist and provide fairly suitable WIFL habitat. Five surveys were done in this site in 2003.

Site LF-01 is immediately south of the San Acacia Diversion Dam and extends for approximately 10 km on the west side of the Rio Grande (UTM Zone 13 south – 3792031 N 326246 E to 3781899 N 326029 E). The majority of this site contains little vegetation, which is why it is so large in size. Vegetation that does occur is dominated by decadent saltcedar and gallery cottonwoods. There is also a heavy human presence, as witnessed by large amounts of roads and trash. This site was surveyed five times during the survey season.

Site LF-02 is immediately below Site LF-01 south of the San Acacia Diversion Dam and north of the Escondida Bridge on the west side of the Rio Grande (UTM Zone 13 south – 3781901 N 326072 E to 3776959 N 326013 E) (Figures 6 and 12). Like site LF-01, vegetation is very dry and sparse, being composed primarily of saltcedar and gallery cottonwoods. This site was surveyed five times.

Site LF-10 is located in the San Marcial reach of the Rio Grande approximately 2 km south of the railroad bridge on the west side of the river (UTM Zone 13 south – 3726335 N 314291 E to 3724372 N 315264 E). The site is situated between the western bank of the Rio Grande and the LFCC levee, and was surveyed five times during the 2002 season. Some fairly suitable WIFL habitat in the form of mature Goodding's willow exists, however, much of it has dried out during the recent drought and is dying. The rest of the site is composed of saltcedar and some large cottonwoods.

Site LF-12 is south of Fort Craig on the west side of the Rio Grande (UTM Zone 13 south – 3723057 N 314599 E to 3721092 N 313086 E). Habitat is dominated by a mix of saltcedar, willow, and cottonwood. This site is periodically subject to overbank flooding during periods of high riverflows. Some highly suitable habitat exists in this site, and it has been colonized by WIFLs in years past. Five surveys were performed.

Site LF-14 is immediately adjacent to the powerline right-of-way south of Fort Craig, on the west side of the Rio Grande (UTM Zone 13 south – 3719895 N 311551 E to 3718760 N 310186 E). This site receives regular overbank flooding and contains some medium quality WIFL habitat. Habitat is composed of mature Goodding's willow interspersed with decadent saltcedar and overstory cottonwoods. This site was surveyed five times during the summer of 2003.

Site LF-16 is immediately downstream of the 1830 berm on the east side of the Rio Grande (UTM Zone 13 south – 3717845 N 309119 E to 3717107 N 308476 E). This site, although obviously wet in previous years, was dry during the 2003 surveys. Vegetation consists of mature stands of Goodding's willow interspersed with cottonwoods and saltcedar. Some of the willows are dying out, apparently due to lack of water. This site was surveyed five times during the survey

season.

Site LF-17 is located in the northern end of the conservation pool of Elephant Butte Reservoir, and to the south of the breach in the LFCC (UTM Zone 13 south - 3718537 N 309459 E to 3717264 N 308401 E). Due to water provided by the LFCC outfall, standing water or saturated soil was present throughout much of the 2003 survey season. Habitat is very high quality with mature Goodding's willow dominant and occasional coyote willow, saltcedar, and cottonwoods mixed in. Habitat within this site seems to be becoming more decadent and less attractive to nesting WIFLs as time progresses and as understory trees are shaded out by large, overstory willows. Five surveys were conducted.

Site LF-17A is located immediately north of LF-17 (UTM Zone 13 south - 3718480 N 309547 E to 3717309 N 308365 E). Habitat is a mixture of cattail marshes and small islands of highly suitable cottonwood/willow habitat supported by the nearby LFCC outfall. These patches have expanded over the past several years and now provide an almost contiguous strip of mature willow habitat along the LFCC outfall. Five surveys were conducted in 2003.

Site LF-18 is located between the levee road and the Rio Grande immediately east of LF-17 on the west side of the river (UTM Zone 13 south – 3718129 N 309122 E to 3716387 N 307838 E). Habitat is composed primarily of mature Goodding's willow with little understory. There is also some mature saltcedar encroaching into the southern end. This site receives overbank flooding during high riverflows. Five surveys were performed in 2003.

Site LF-19 is located immediately east of sites DL-01, 02, 03 and 04 on the east side of the Rio Grande (UTM Zone 13 south – 3717184 N 308412 E to 3715134 N 308164 E). In high water years, and formerly when the reservoir was at a higher level, this site was flooded with up to 1 meter of water. This allowed colonization by natives such as coyote and Goodding's willow. These willows are now mature and provide fairly suitable WIFL habitat. However, there is also a significant component of saltcedar within this site, and the recent drought has caused natives within the interior to begin to die. This site was surveyed five times in 2003.

Site LF-21 is located immediately south of the southern boundary of the Bosque del Apache NWR on the west side of the Rio Grande (UTM Zone 13 south – 3732077 N 322704 E to 3731330 N 320924 E). Habitat is a mixture of native and exotic vegetation with the Goodding's willow/cottonwood community and mature saltcedar being codominant. Further from the river, decadent saltcedar becomes dominant. This site was very dry during this season and does not appear to receive frequent overbank flooding. This site was surveyed five times during the 2003 season.

Site LF-22 is approximately 2 km south of the southern boundary of the Bosque del Apache NWR on the west side of the river (UTM Zone 13 south – 3733813 N 322704 E to 3732077 N 321917 E). Vegetation is very similar to LF-21 with a mixture of native and exotic vegetation being present. Five surveys were performed.

Site LF-28 lies 2.5 km south of the railroad bridge on the east side of the Rio Grande (UTM Zone 13

south – 3728242 N 315226 E to 3725922 N 314914 E). This site is characterized by patchy vegetation dominated by a mixture of saltcedar and Goodding's willow. It receives fairly regular overbank flooding which promotes the dense growth of willows along the river channel. Native vegetation is replaced by exotic species with increasing distance from the river. This site was surveyed five times.

Site LF-38 is just downstream of the San Acacia Diversion Dam on the east side of the Rio Grande (UTM Zone 13 south – 3791852 N 326334 E to 3788462 N 325518 E). Vegetation consists of sparse Russian olive, cottonwood, and saltcedar. Density of vegetation increases near the river. Five surveys were conducted during the 2003 survey season.

Site LF-39 is 3.6 km downstream of the San Acacia Diversion Dam on the east side of the Rio Grande, immediately south of LF-38 (UTM Zone 13 south – 3788462 N 325518 E to 3784720 N 326690 E). Vegetation is similar to that in LF-38. The majority of vegetation is exotic and very sparse. There are a few river bars that are beginning to be colonized by native species. This site was surveyed five times in 2003.

Site LF-40 is between Escondida and San Acacia on the east side of the Rio Grande (UTM Zone 13 south – 3784709 N 326684 E to 3780535 N 326784 E). Habitat is best near the river and consists of dense Russian olive, mesquite, and coyote willow. Away from the river, vegetation is dominated by sparse saltcedar and overstory cottonwoods. The north end is typical of upland desert with minimal vegetation. This site was surveyed five times during the 2003 survey season.

Site LFCC-4 is immediately south of the Fort Craig road on the west side of the LFCC (UTM Zone 13 south – 3722780 N 314202 E to 3721833 N 312633 E). Habitat is dominated by saltcedar, especially on the southwestern end. Adjacent to the Fort Craig road and the LFCC, there are large patches of overstory cottonwoods and some small willow patches. This site was surveyed five times.

Site LFCC-5b is between Fort Craig and San Marcial on the west side of the LFCC (UTM Zone 13 south – 3723833 N 314088 E to 3722950 N 313976 E). Approximately one-half of this site is dead, flooded saltcedar. The other half is a mixture of decadent saltcedar, willows, and overstory cottonwoods. Much of the area is inaccessible due to flooding. Five surveys were performed during the 2003 survey season.

Site LFCC-7 is immediately south of San Marcial on the west side of the LFCC (UTM Zone 13 south – 3728915 N 314406 E to 3726799 N 314060 E). Habitat is dominated by dry, decadent saltcedar. On the eastern edge there is a large strip of cottonwood gallery. Five surveys were performed.

Site SV-01 is just upstream of the San Acacia Diversion Dam on the east side of the Rio Grande (UTM Zone 13 south – 3793827 N 329038 E to 3791871 N 326578 E). Near the river, the site is composed of patches of dense coyote willow, Russian olive, saltcedar, and cottonwoods interspersed with sparse patches of understory saltcedar and willow. Away from the river, the southern end is primarily dry, dense saltcedar, while the northern end is very sparse and contains little vegetation. This site was surveyed three times during the 2003 survey season.

Site SV-03 is approximately 5 km upstream of the San Acacia Diversion Dam on the west side of the river (UTM Zone 13 south – 3797168 N 329735 E to 3794589 N 330316 E). Habitat is composed almost entirely of very dense saltcedar interspersed with Russian olive and gallery cottonwoods. It is very dry and receives infrequent overbank flooding. Historically, this site has been occupied by breeding WIFLs and was surveyed three times during 2003.

Site SV-09 is approximately 8 km south of Highway 60 on the west side of the river (UTM Zone 13 south – 3805248 N 330803 E to 3801553 N 328843 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. This site has historically held resident WIFLs and was surveyed three times during the 2003 survey season.

Species of Special Concern

Results for the Sevilleta/ La Joya reach are presented in Figure 12, the San Acacia reach is presented in Figure 13, the Neil Cup reach is presented in Figure 14, the Bosque del Apache reach is presented in Figure 15, and the San Marcial reach is presented in Figure 16. These maps show that the Summer Tanager is the most abundant of the special-concern species and is distributed evenly throughout the study area. Bell's Vireo and Yellow-billed Cuckoo were fairly abundant, with 51 and 59 detections, respectively. These two species were concentrated in areas of primarily native habitat in the southern half of the study area. The species occurring in the lowest abundance was Yellow Warbler. Only nine detections were recorded and these occurred primarily within the San Marcial reach. No Common Ground-doves were detected during the 2003 season.

Nest Searches/Monitoring

In 2003, a total of 111 nests were monitored by Reclamation personnel in the Middle Rio Grande. Of these, 54 were successful, 54 failed, and 3 were unknown. Eighteen nests were parasitized, and BHCO eggs were addled and replaced in 7 of them. Of those 18 nests, three were predated, two were abandoned, and two fledged WIFL young (one, after cowbird egg hatched and cowbird nestling was removed). Of the other 11 parasitized nests, in which BHCO egg manipulation was either impossible or not warranted, 4 were predated, 4 were abandoned, 1 fledged WIFL young, and 1 contained 2 starved WIFL nestlings and 1 healthy cowbird chick upon discovery. The following is a reach-by-reach and site-by-site summary of the WIFL nest monitoring efforts of 2003:

Sevilleta/ La Joya reach

WIFLs were first discovered in this reach during the 1999 WIFL breeding season. Unlike the native plant-dominated habitats which supported most other WIFL territories, this reach is dominated by exotic species (saltcedar and Russian olive). This reach supported 17 territories and 9 WIFL pairs during the 2003 season. Twelve nests were discovered; 4 were re-nests. Four nests were successful, seven failed, and the fate of one was unknown. At least nine young are

Legend

Species of Concern - Sevilleta/ La Joya reach

Species

- Bell's Vireo
- Summer Tanager
- Yellow-billed Cuckoo
- Yellow Warbler

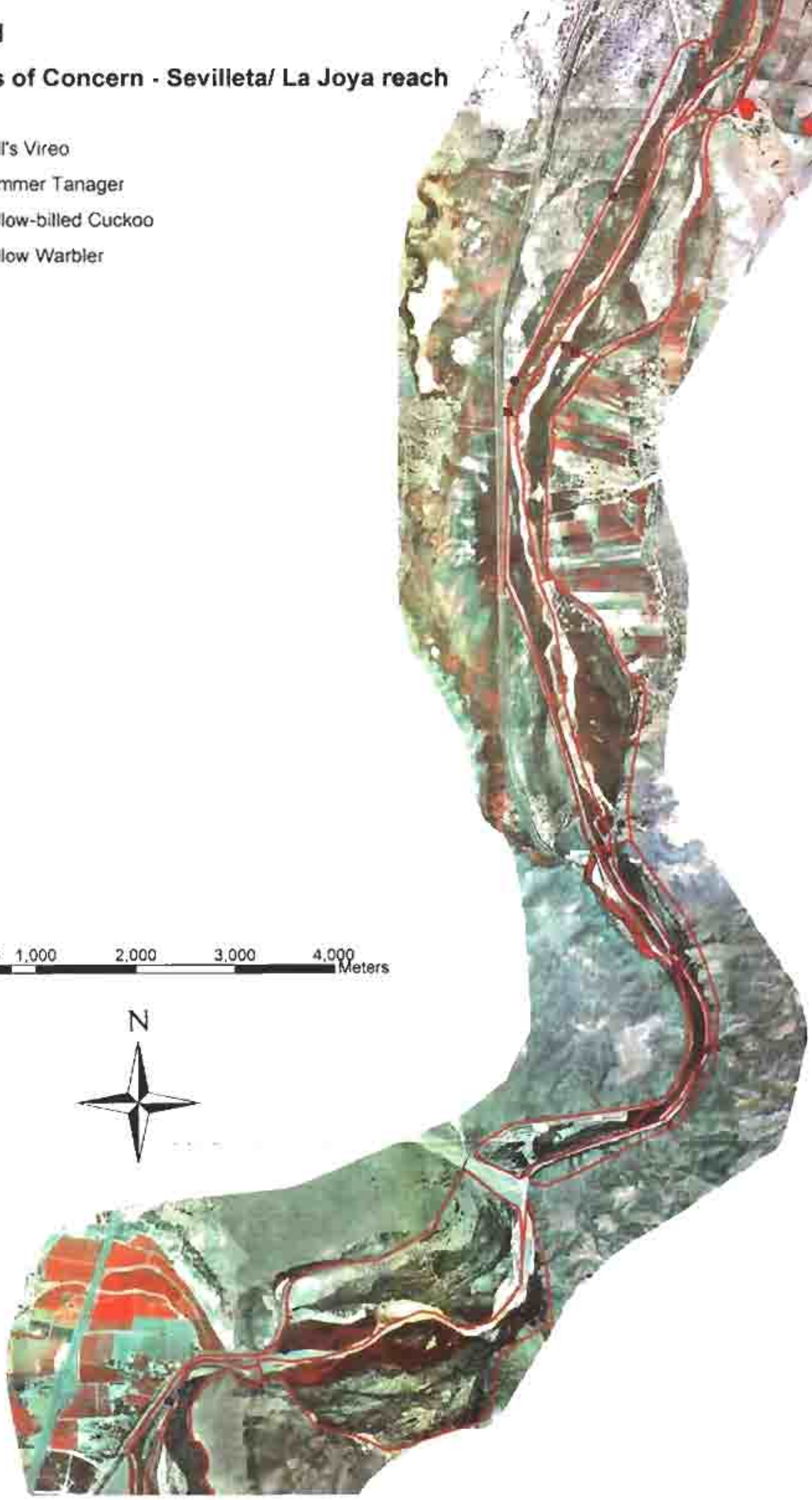

Figure 12. Species of concern occurrences – Sevilleta/ La Joya - 2003.

Legend

Species of Concern - San Acacia reach

Species

- Bell's Vireo
- Summer Tanager
- Yellow-billed Cuckoo
- Yellow Warbler

0 625 1,250 2,500 3,750 5,000 Meters

N

Figure 13. Species of concern occurrences – San Acacia reach – 2003.

Figure 14 Species of concern occurrences - Neil Cup reach - 2003

Legend

Species of Concern - Neil Cup reach

Species

- Bell's Vireo
- Summer Tanager
- Yellow-billed Cuckoo
- Yellow Warbler

0 230460 920 1,380 1,840 Meters

N

Legend

Species of Concern - Bosque del Apache reach

Species

- Bell's Vireo
- Summer Tanager
- Yellow-billed Cuckoo
- Yellow Warbler

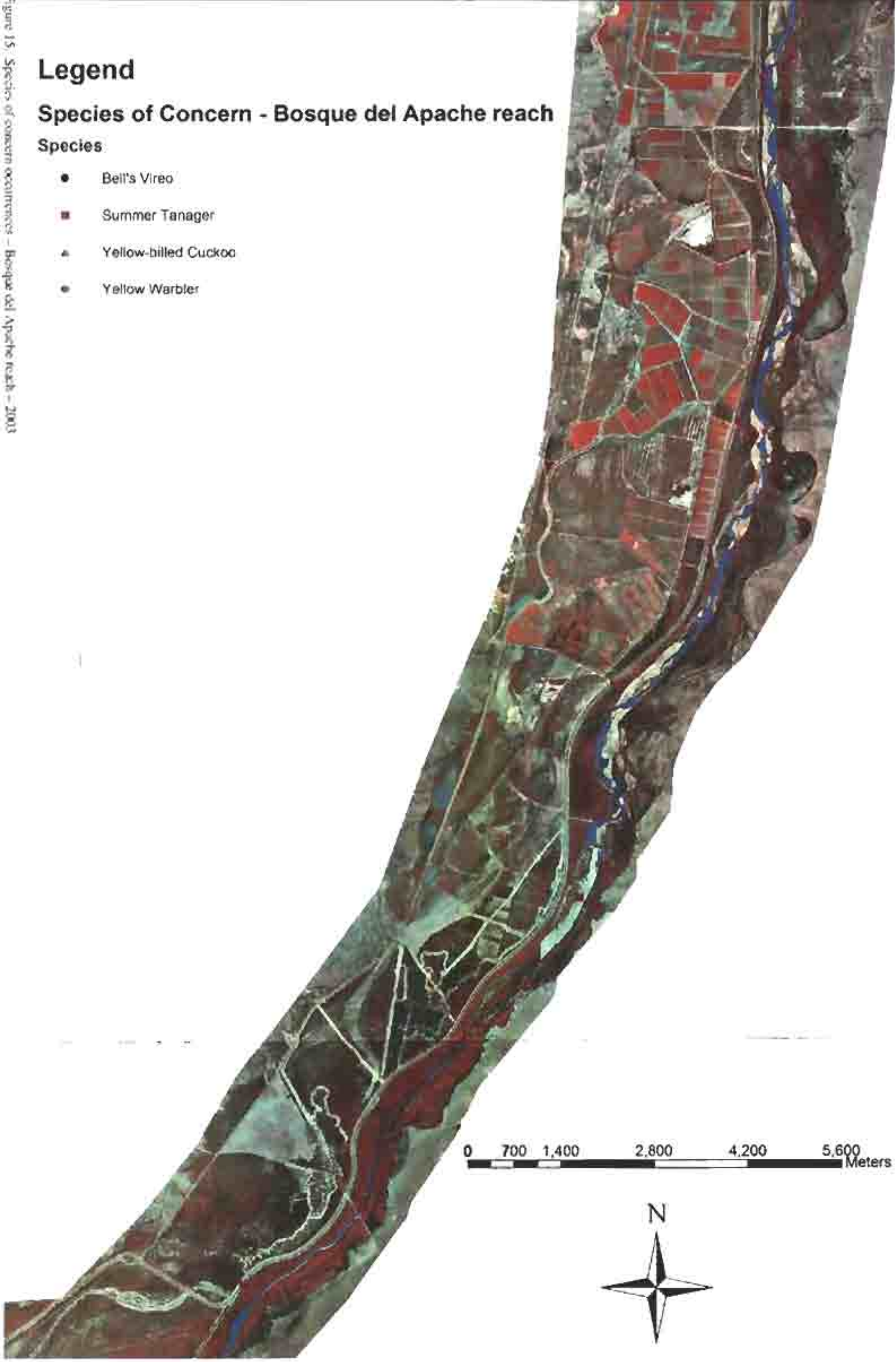

Figure 15. Species of concern occurrences – Bosque del Apache reach – 2003

Legend

Species of Concern - San Marcial reach

Species

- Bell's Vireo
- Summer Tanager
- Yellow-billed Cuckoo
- Yellow Warbler

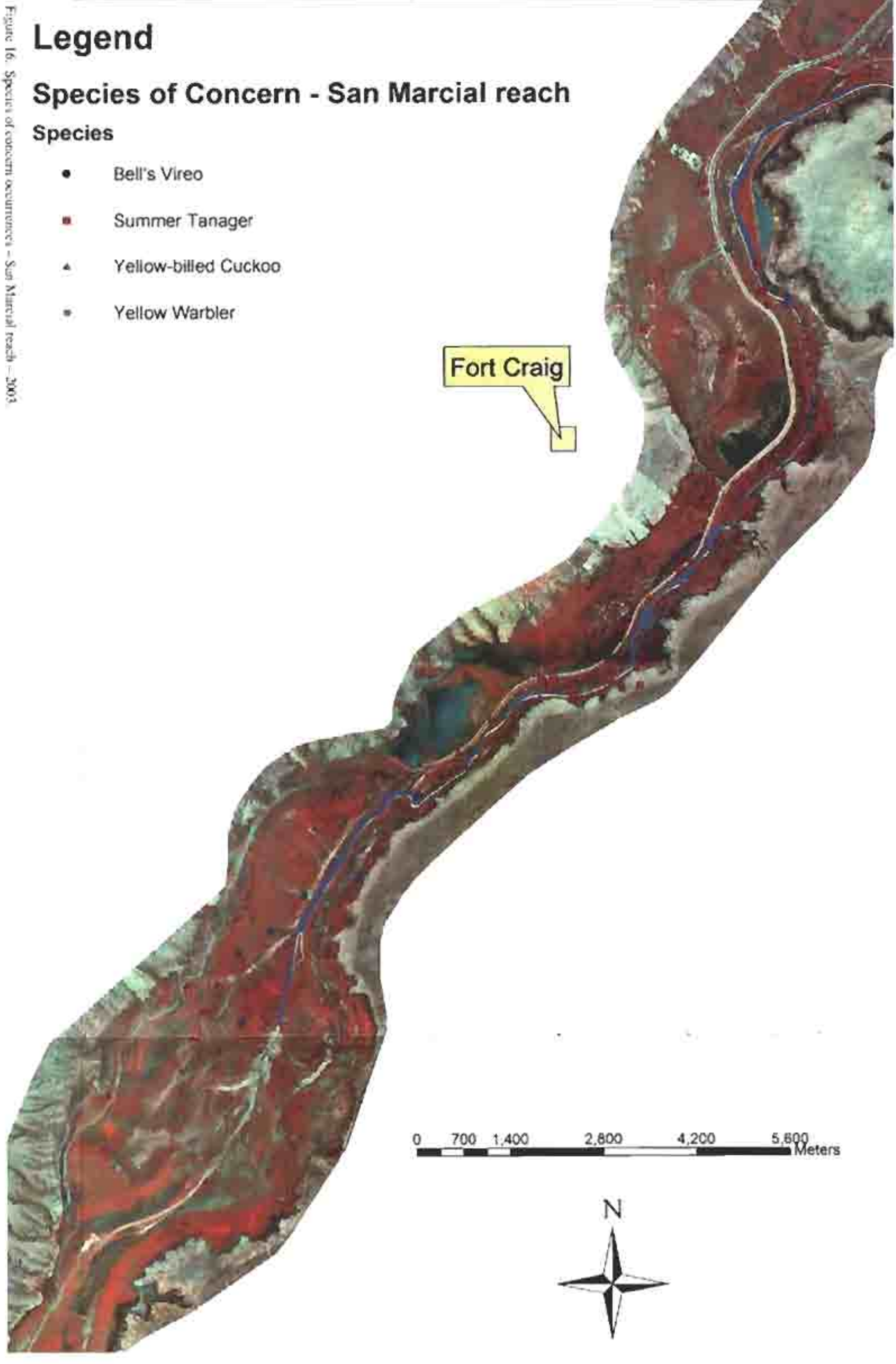

Figure 16. Species of concern occurrences – San Marcial reach – 2003

believed to have successfully fledged from these nests. Only one nest was parasitized, and it was subsequently abandoned. See Appendix A for detailed nest site and nest monitoring data forms. The following is a site-by-site breakdown of all WIFL nesting in this reach during 2003:

SV-03 - Six pairs produced six nests during the 2003 breeding season. One pair never nested (or the nest was never discovered), and one pair re-nested. Four of the nests were assumed to be successful, one was predated, and the fate of one nest was unknown (the re-nest). None were parasitized. At least nine young were assumed to have fledged from this site. The earliest estimated hatch date was June 28, and the latest estimated fledge date was August 10.

SV-09 – Three pairs produced six nests in this site during the 2003 breeding season, including three re-nests. All six nests failed; five were predated and one was abandoned after being parasitized. The earliest estimated hatch date was July 5.

San Acacia reach

No nesting WIFLs were documented.

Neil Cup reach

No nesting WIFLs were documented.

Bosque del Apache reach

One nesting pair of WIFLs was documented in site **BA-02**. The nest was successful and fledged one WIFL after two eggs were predated. The hatching date was estimated as July 8, and the one nestling fledged approximately July 19.

San Marcial reach

A total of 70 pairs and 98 nests were found, including 19 re-nests and 12 second broods. Fledglings were confirmed for 14 nests, another 35 were assumed to have been successful, 46 failed for various reasons, and the fate of 3 was unknown. Of those that failed, 33 were predated, 11 were abandoned (usually due to parasitism), and 2 failed directly due to cowbird parasitism (1 contained a healthy cowbird chick and 2 starved WIFL nestlings when discovered, the other contained only a BHCO chick).

Seventeen nests were parasitized (Table 4 summarizes results of parasitized nests). Of those, six were accessible enough and timed right to mandate addling (three subsequently predated, two fledged – one after the BHCO chick hatched and was removed from the nest), four were predated, four were abandoned, one fledged a BHCO chick but no WIFLs, one contained a healthy BHCO nestling and two dead WIFL nestlings upon discovery, and one successfully fledged WIFLs. At least 129 young were assumed to have fledged within this reach. See

Table 4. Summary of parasitized WIFL nests in the Middle Rio Grande – 2003.

Fate of nest	Number of nests
Predated	4
Abandoned	4
BHCO egg addled – nest predated	3
BHCO egg addled – fledged WIFLs	2
BHCO egg addled - abandoned	1
Fledged BHCO – no WIFLs	1
BHCO chick w/ starved WIFLs	1
Fledged WIFLs	1

Appendix A for detailed nest site and nest monitoring data forms. The following is a site-by-site breakdown of nest monitoring efforts for each of the survey sites found in the San Marcial reach during the 2002 WIFL breeding season.

DL-01 – This site contained 24 nesting pairs that produced 35 nests, including 8 re-nests and 3 second broods. Fledglings were confirmed for 1 nest, another 14 were assumed to be successful, 18 failed, and 2 were unknown. Fourteen of the failed nests were due to predation, 3 failed due to parasitism, and 1 was abandoned. Six of the re-nests and none of the second broods were successful. Five nests were parasitized. BHCO eggs were addled and replaced in two of them, both of which were predated. Of the other three, two were abandoned, and one contained a 7- to 8-day-old BHCO chick. At least 41 WIFLs were assumed to have fledged from this site. The earliest estimated hatching date was June 16 and the latest fledging date was approximately August 10.

DL-02 – This site contained five WIFL pairs that produced five nests. One pair never produced a nest (or the nest was never found) and one re-nest was documented. Fledglings were confirmed for one nest, two more (including the re-nest) were assumed to have fledged, and two failed (one was predated, one was abandoned). No nests were parasitized and this site fledged at least nine WIFLs. The earliest hatching date was June 24, and the latest estimated fledging date was August 10.

DL-03 – This site contained five WIFL pairs that produced eight nests, including four second broods (one pair never produced a nest). Fledglings were confirmed for three nests, another four were assumed to be successful, and one failed due to predation. Three of the four second broods were successful. Two nests were parasitized. A BHCO egg was addled and replaced in one nest, and the BHCO still proceeded to hatch and was removed. The other parasitized nest was parasitized late into incubation and the BHCO egg never hatched. Both nests went on to fledge WIFLs. The earliest hatching date was June 24, and the latest assumed fledging date was August 12. Fourteen WIFL chicks were assumed to have fledged out of this site.

DL-04 – This site contained three nesting pairs that produced four nests, including one re-nest. Fledglings were confirmed for one nest, two others were assumed to have fledged successfully, and the fourth was predated. One nest was parasitized, the egg was addled and replaced, and the nest went on to fledge at least one WIFL chick. Overall, the site fledged a total of six WIFLs. The earliest hatching date was July 2, and the latest estimated fledging date was August 11.

DL-07 – This site contained one WIFL pair that produced one nest. The nest was parasitized with one BHCO egg, which was addled and replaced, and then the nest was predated. No re-nest was found.

LF-17 – This site contained 29 nests from 21 WIFL pairs, including 3 second broods and 5 re-nests. Fledged WIFLs were confirmed for 5 nests, another 9 nests were assumed to be successful, 14 failed, and 1 was unknown. Of those that failed, seven were due to predation and seven were abandoned. One of the three second broods was successful, and one of the five re-nests was successful. Eight nests were parasitized. A BHCO egg was addled and replaced in one and subsequently abandoned. Of the others, two were abandoned, three were predated, one was abandoned after being parasitized and predated, and one contained a live BHCO nestling and two apparently starved WIFL nestlings. The earliest hatching date was June 9, and the latest estimated fledge date was July 31. At least 35 WIFL chicks were assumed to have fledged from this site.

LF-17a – This site contained 14 WIFL nests from 8 pairs, including 4 re-nests and 2 second broods. Fledglings were confirmed for three nests, three more were assumed to have fledged, and eight nests failed. Failure was due to predation (seven) and abandonment (one). Three of the re-nests fledged and one was predated. One of the second broods was predated and the other was abandoned. None of the nests were parasitized. The earliest hatch date for a nest was June 18, and the latest estimated fledge date was August 12. At least 21 WIFL chicks were assumed to have fledged from this site.

LF-21 – This site did not contain any nesting pairs. However while surveying it, territories were discovered across the river. Upon territory confirmation, two nesting pairs were discovered. These pairs produced two nests—one fledged 3 WIFLs and the other was predated. Neither was parasitized and no re-nests or second broods were documented. The successful nest hatched on July 6 and fledged on approximately July 18.

LF-22 – One pair was documented in this site, however, nesting could not be confirmed.

DISCUSSION

Presence/Absence Surveys

Sevilleta/ La Joya reach

WIFLs in the Sevilleta/ La Joya reach were first documented in 1999, and territory numbers have steadily increased since then (Table 5). During the 2003 season, the entire reach was again surveyed (with the exception of sites north of the Rio Puerco). Seventeen territories, 9 pairs, and 12 nests were found. The number of unpaired males (eight) seems to suggest that this local population is limited not by habitat, but by the lack of females for pairing. These demographics also suggest an increasing population. The fact that this population has not only persisted but expanded is of significant interest due to the type of habitat within this reach. Decadent saltcedar and Russian olive dominate the majority of sites in this reach. Overbank flooding is very rare, especially in times of drought. However, the proximity to water, density and vertical stratification of vegetation, and scattered patches of native vegetation seem to make certain sites—SV-03 and SV-09 in particular—attractive to breeding WIFLs.

Table 5. Reach-by-reach summary of WIFL territories in lands within the active floodplain of the Rio Grande surveyed by Reclamation between 1995 and 2003.

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sevilleta/La Joya	n/a	n/a	n/a	n/a	4	8	11	13	17
San Acacia	n/a	0	0	0	0	0	0	4	0
Bosque del Apache	0	0	0	0	0	0	0	3	3
San Marcial*	3	13	10	11	12	23	25	60	82

* In this table, San Marcial reach includes all sites downstream of the railroad bridge and some sites outside of the active floodplain.
n/a = not surveyed

San Acacia reach

Quality WIFL habitat within this reach is very limited and composed of small patches of native vegetation along the river channel. Furthermore, this site rarely receives overbank flooding. Resident WIFLs were documented in the San Acacia reach for the first time in 2002. Four territories were located, and it is likely that a majority of those were late migrants treated as residents. In 2003, no territories were discovered in this reach, further proving the point that, in 2002, WIFLs found during the resident period were either young males defending new territories in marginal habitat or, more likely, late migrants.

Bosque del Apache reach

During 2002, flood plain habitat within the Bosque del Apache NWR along the Rio Grande River was surveyed in its entirety for the first time. A total of 20 WIFLs, including 3 resident territories, were documented. No pairing activity was observed. The floodplain was again surveyed in 2003 and three territories were documented again, although in different locations than in 2002. All three territories were detected on June 20, however, the only territory to persist through the breeding season was that of a nesting pair. The other territories appear to be lone males exploring new habitat, which could indicate that birds from source populations in San Marcial or elsewhere may be emigrating to new areas in search of suitable habitat.

San Marcial reach

In the San Marcial reach, WIFL surveys and nest monitoring have not been conducted on lands north of the railroad bridge since 1996, with the exception of two sites in 2002 and 2003. In 1994 and 1995, the area immediately upstream from the railroad bridge supported 5 and 11 WIFL territories, respectively; 5 and 7 of these territories contained WIFL pairs in an area referred to as the Condo site (NMNHP 1994, NMNHP 1996). In 2002 and 2003, three and four territories were documented in two sites upstream of the railroad bridge, respectively. Although surveys were conducted downstream from the railroad bridge to the delta of Elephant Butte Reservoir in 1994 and 1995, only three unpaired males were detected during the 1995 breeding season (Ahlers and White 1996), and none were detected during the 1994 breeding season (NMNHP 1994). Since 1995, WIFL territories and available habitat below the railroad bridge have increased greatly (Tables 3 and 5). Territories are located almost exclusively within the high quality native habitat between sites LF-17a and DL-03, where the combination of hydrology and vegetation provide optimal habitat. It is likely that, as habitat continues to mature within the delta of Elephant Butte Reservoir as the reservoir pool recedes, this population will continue to expand. On the other hand, sites such as LF-27, that formerly supported WIFL territories but no longer do, may now be less attractive to WIFLs due to a lack of overbank flooding and the proximity of higher quality habitat in the delta area. A combination of less water and aging vegetation has caused these sites to lose the vertical stratification and density that is characteristic of high quality WIFL habitat. This situation appears to have caused the WIFLs to move to more suitable areas.

Nest Searches/Monitoring

Sevilleta/ La Joya reach

As previously mentioned, WIFLs were first documented in this reach in 1999, and it was first surveyed in its entirety during the 2000 season. Three, 6, 9, and 13 nests were documented during the 1999, 2000, 2001, and 2002 breeding seasons, respectively (Table 6). In 2003, a total of 12 nests were documented, which could suggest that the population is stabilizing. However, since there were also seven unpaired resident males between sites SV-03 and SV-09, this population may still be increasing, either from immigration from other source populations or

from local recruitment.

Table 6. Reach-by-reach summary of WIFL nests in lands surveyed by Reclamation between 1995 and 2003.

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sevilleta/La Joya	n/a	n/a	n/a	n/a	3	6	9	13	12
San Acacia	n/a	0	0	0	0	0	0	0	0
Bosque del Apache	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	1
San Marcial*	0	1	2	2	5	19	36	66	96

* In this table, San Marcial reach includes all sites downstream of the railroad bridge
n/a = not surveyed

The fact that most nesting territories in this reach are characterized by exotic or mixed native and exotic vegetation, as opposed to the native vegetation characterizing most other nesting territories in the Middle Rio Grande, presents an interesting opportunity for data analysis (see **Middle Rio Grande as a whole** section). These data are currently being collected and will be analyzed and presented in the forthcoming WIFL nest vegetation quantification study.

San Acacia reach

No nesting attempts were documented in 2003.

Bosque del Apache reach

The fact that a nesting WIFL pair and two lone male territories were documented within the active floodplain in 2003 may suggest several things about this population. It could mean that WIFLs are immigrating from adjacent source populations and beginning to colonize newly discovered habitat. Conversely, with survey data only dating back to 2002, it is difficult to determine if the opposite is not true. These few territories could be the remnants of a decreasing population. Additional years of survey and nest monitoring data are needed to ascertain the status of this population.

San Marcial reach

In the 2003 survey season, 98 WIFL nests were documented, including 2 sites north of the railroad bridge. This is a significant increase over 2002 and shows a dramatic increase over the past 6 years (Tables 3 and 5).

During the 2000 season, an apparent concentration of breeding WIFLs developed within the LF-17 and LF-17a sites. This concentration of WIFLs 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. As the reservoir receded and native vegetation became established, the population of WIFLs expanded downstream to encompass the

entire area from LF-17a and LF-17 to DL-03 and DL-04. This large patch of high quality breeding habitat may allow nesting WIFLs to escape predation and parasitism, allowing the birds to increase their population over the last four breeding seasons.

In 1995, four of six (66 %) WIFL 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 %) downstream from the railroad bridge were parasitized. In addition, cattle were removed from project lands below the railroad bridge during the WIFL breeding season from 1997 through 2003. The removal of cattle during the WIFL breeding season was initiated to reduce the potential for brood parasitism by BHCOs that were assumed to associate with cattle, and to limit physical disturbance to the occupied WIFL sites. Based on available data (Ahlers and Tisdale-Hein 2000), it is assumed that cattle may concentrate local BHCO populations, but may not actually increase localized BHCO populations in the Middle Rio Grande Basin. In 2002 and 2003, no cowbird trapping was done, and the parasitism rate among San Marcial WIFL nests increased to 16 and 18 %, respectively. This would seem to imply that cowbird trapping is effective at reducing parasitism rates. However, a riparian obligate nest monitoring study initiated in 1999 and continued through 2003 indicates that there was no statistical difference in nesting success rates between trapped and untrapped locations. With many variables involved, including hydrology, vegetation characteristics, predator abundance, and the overall dynamism of the Rio Grande floodplain, it is difficult to say what is responsible for the variation in BHCO parasitism and success rates between years. However, the WIFL 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 is justified.

Overall, during the 1999 to 2003 breeding seasons, 225 nests have been discovered in this reach, making it the second most productive WIFL breeding area in New Mexico and the largest source population in the Middle Rio Grande Basin. This holds special implications for the population as a whole. Strict and careful nest monitoring of this population needs to be done to detect and potentially counteract any significant increases in nest failure, cowbird parasitism, or any other variable detrimental to the survival of this population.

Middle Rio Grande as a whole

Over the past 5 years, a total of 267 WIFL nests have been monitored along the Middle Rio Grande. Table 7 provides details of habitat comparisons for WIFLs nesting along the Middle Rio Grande between 1999 and 2003. Statistical comparisons between categories were made using a Chi-square test with Yate's correction ($\alpha = 0.05$). The following comparisons were considered: Between 1999 and 2003, 25 nests (9.4%) were in saltcedar-dominated territories, 212 (79.4%) were in *Salix*-dominated territories, and 30 (11.2%) were in mixed-dominance territories. Saltcedar- and *Salix*-dominated territories are defined as >90% saltcedar or ***Salix***, respectively. Mixed-dominance occurs when a dominant vegetation type is not obvious. In considering nest success for these situations, WIFL nests in *Salix*-dominated (59.1%, n = 208) areas were no more successful than those placed in saltcedar-dominated (66.7%, n = 24) areas ($\chi^2 = 0.24$, df = 1, p = 0.622).

Table 7. Habitat comparison of WIFL nesting within the Middle Rio Grande – 1999 to 2003

Territory Vegetation Type		
Number of nests in saltcedar dominated territories	25	9.4% of total
Number of nests in *Salix* sp. dominated territories	212	79.4% of total
Number of nests in mixed dominance territories	30	11.2% of total
Nest Substrate Species		
Number of nests in *Salix* sp. substrate	150	56.2% of total
Number of nests in saltcedar substrate	106	39.7% of total
Number of nests in Russian olive substrate	11	4.1% of total
Nest Substrate/Territory Vegetation Combination		
Number of nests in saltcedar substrate within *Salix* sp. dominated territories	66	(31.1% of 212 nests)
Number of nests in *Salix* sp. substrate within saltcedar or mixed dominated territories	4	(7.3% of 55 nests)
Nest Success Per Nest Substrate Species		
Percentage of successful nests in *Salix* sp. substrate	59.2%	(87 out of 147 nests successful)
Percentage of successful nests in saltcedar substrate	59.2%	(61 out of 103 nests successful)
Percentage of successful nests in Russian olive substrate.	54.5%	(6 out of 11 nests successful)
Nest Success Per Territory Vegetation Type		
Percentage of successful nests in *Salix* sp. dominated territories	59.1%	(123 out of 208 nests successful)
Percentage of successful nests in saltcedar dominated territories	66.7%	(16 out of 24 nests successful)
Percentage of successful nests in mixed dominance territories	44.8%	(13 out of 29 nests successful)
Cowbird Parasitism Per Nest Substrate Species		
Percentage of nests parasitized in *Salix* sp. substrate	11.6%	(17 out of 147 nests parasitized)
Percentage of nests parasitized in saltcedar substrate	19.2%	(19 out of 99 nests parasitized)
Percentage of nests parasitized in Russian olive substrate	18.2%	(2 out of 11 nests parasitized)
Cowbird Parasitism Per Territory Vegetation Type		
Percentage of nests parasitized in *Salix* sp. dominated territories	12.0%	(25 out of 208 nests parasitized)
Percentage of nests parasitized in saltcedar dominated territories	25.0%	(6 out of 24 nests parasitized)
Percentage of nests parasitized in mixed dominance territories	24.1%	(7 out of 29 nests parasitized)
Productivity Per Territory Vegetation Type		
Productivity[1] of all nests (n=208) found in *Salix* sp. dominated territories	1.52/nest	(316 young from 208 nests)
Productivity of all nests (n=24) found in saltcedar dominated territories	1.50/nest	(36 young from 24 nests)
Productivity of all nests (n=29) found in mixed dominance territories	1.00/nest	(29 young from 29 nests)
Productivity Per Nest Substrate Species		
Productivity of all nests (n=147) found in *Salix* sp. substrate	1.54/nest	(226 young from 147 nests)
Productivity of all nests (n=103) found in saltcedar substrate	1.36/nest	(140 young from 103 nests)
Productivity of all nests (n=11) found in Russian olive substrate	1.09/nest	(12 young from 11 nests)
Productivity Compared to Nest Substrate Species and Territory Vegetation Type		
Productivity of nests in *Salix* substrate within *Salix* sp. dominated territories	1.55/nest	(222 young from 143 nests)
Productivity of nests in saltcedar substrate within *Salix* sp. dominated territories	1.45/nest	(94 young from 65 nests)
Productivity of nests in saltcedar substrate within saltcedar dominated territories	1.50/nest	(36 young from 24 nests)
Total WIFL nests monitored	**267**	

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

Nests located in saltcedar-dominated (25.0%, n = 24) territories were found to be parasitized at rates similar to those located in *Salix*-dominated (12.0%, n = 208) areas ($\chi^2 = 2.11$, df = 1, p = 0.146). Productivity of nests, defined as number of birds fledged per successful nest, in *Salix*-dominated habitats was slightly greater (1.52 fledged birds/nest) than nests located in mixed-dominance territories (1.0 fledged birds/nest) and approximately equal to those in saltcedar-dominated habitats (1.5 fledged birds/nest). Therefore, WIFLs appear to select native-dominated habitat when available, however WIFL nest success can be comparable between saltcedar and *Salix* habitats.

Nest substrate is defined as the species of tree where a WIFL nest is physically located. Though 79.4% of WIFL nests over the past five years were found in *Salix*-dominated areas, 39.7% of all nests and 31.1% of nests in *Salix*-dominated habitats were physically located in a saltcedar. Again, nest success is similar in three substrate categories: 59.2% (*Salix*), 59.2% (saltcedar), and 54.5% (*Russian olive*). No statistically significant difference was found to exist between nest success in saltcedar and *Salix* substrates ($\chi^2 = 0.00$, df = 1, p = 1.00). Additionally, parasitism rates between nests placed in *Salix* (11.2%) and nests located in saltcedar (19.2%) were similar ($\chi^2 = 2.18$, df = 1, p = 0.140). Productivity of WIFL nests in *Salix* (1.54 fledged birds/nest) was slightly greater than those located in saltcedar (1.36 fledged birds/nest).

When comparing 4 years of nesting data from the two primary nesting reaches within the Middle Rio Grande, one factor becomes apparent. The rate of parasitism within the Sevilleta/ La Joya reach (24.4 percent, n=41) is greater than that experienced by nesting WIFLs within the San Marcial reach (13.3 percent, n=226). Nest data for other riparian-obligate Neotropical songbirds were not collected within the Sevilleta/La Joya reach for comparison to WIFL nest data.

However, the mean number of female cowbirds detected along established point count transects was collected and can be compared within the adjacent reaches of the Rio Grande River. Either-sex cowbird densities and female cowbird densities between 1999 and 2002 were 3 to 3.5 times greater within the Sevilleta/La Joya reach than within the San Marcial reach. The Sevilleta/La Joya reach supported the greatest density of female cowbirds compared to all other monitored reaches within the Middle Rio Grande and this could be responsible for the increased parasitism rate.

Lastly, in coordination with the USFWS, addling or removal of BHCO eggs from parasitized WIFL nests is a practice that was begun in 2002 and continued in 2003. Of the 32 WIFL nests parasitized in 2002 and 2003, BHCO eggs were addled or removed from 15, 4 of which successfully fledged WIFL young (27% success). Parasitized nests over the past six seasons in the Middle Rio Grande that were unaltered were not as successful. Of 27 parasitized nests monitored, 23 failed, 3 successfully fledged young, and 1 BHCO egg was built over by the adult WIFLs and subsequently fledged young—a 15 percent success rate. Thus, even with the increase in disturbance to the nest, addling or removing BHCO eggs is a practice that seems to give the WIFLs a greater chance of fledging young from parasitized nests.

RECOMMENDATIONS

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

1. Annual surveys of WIFL population concentrations, and
2. Periodic surveys of potential/unoccupied suitable habitat or restoration sites.

Annual Surveys

- Presence/absence surveys should continue in the occupied reaches of the Middle Rio Grande, such as the Sevilleta/La Joya and San Marcial reaches, to monitor the status of the WIFL population. These surveys will provide data regarding population trends and colonization of new sites adjacent to occupied sites.
- Presence/absence surveys should also continue in project-related areas where ESA compliance mandates.
- Nest monitoring should also continue in areas where pairing activity is documented. 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 WIFL nests should continue, provided it can be done with minimal disturbance to the nest and the adult WIFLs.
- Further data need to be gathered regarding the microhabitat characteristics that make various sites attractive or unattractive to nesting WIFLs. In particular, sites where WIFL populations are declining should be studied to determine the factors limiting successful recruitment and sites whose populations are stable or increasing should be studied to determine the habitat characteristics that make these areas productive.
- Efforts should be made to access areas previously unsurveyed in order to get a grasp on the total population of WIFLs within occupied reaches.
- Lastly, where possible in relation to Reclamation projects, habitat modification and water management should be implemented in areas where populations are declining to attempt to bring the habitat back to its former productive state.

Periodic Surveys

- Periodic surveys (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 WIFLs are documented, nest searching and monitoring should be conducted.
- 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 WIFL.
- Assess habitat features at nest sites and occupied patches—both at territory and macroscale level—to determine components characteristic of WIFL breeding areas where populations are expanding, remaining stable, or becoming extirpated.

CONCLUSION

Presence/absence data will be beneficial when establishing a realistic long-term monitoring plan and will aid in better understanding of the species' distribution, abundance, and potential threats. 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 Recovery Unit extends from just upstream of the Isleta Pueblo to Elephant Butte Dam. The recovery goal for this reach is 100 WIFL territories. In the 2003 survey, 106 territories were documented: 17 in the Sevilleta/La Joya reach, 3 in the Bosque del Apache reach, and 86 in the San Marcial reach. Thus, even without considering the territories occurring on the Isleta Pueblo (14 documented in 2000; NMNHP 2000) and potentially occurring in unsurveyed areas between the San Marcial railroad bridge and the Bosque del Apache NWR, the recovery goal for the Middle Rio Grande Recovery Unit has already been achieved.

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ATTACHMENT

WIFL HABITAT DATA COLLECTION AND ANALYSIS FOR SITES IN THE ELEPHANT BUTTE RESERVOIR DELTA

WIFL HABITAT DATA COLLECTION AND ANALYSIS FOR SITES IN THE ELEPHANT BUTTE RESERVOIR DELTA

Methods

Vegetation and habitat data were collected at 27 nest sites in the Elephant Butte delta area from late August to early October 2003. Methods were adapted from BBIRD protocol (Martin et al. 1997), similar studies conducted by the New Mexico Natural Heritage Program along the Rio Grande (Mehlman et al. 1995), Ahlers and White (1997), Stoleson and Finch (1999), and University of New Mexico (Peter Stacey, personal communication). During the process to determine methods to be used, we consulted with an interagency work group in August 2003 consisting of biologists from Reclamation, U.S. Fish and Wildlife Service, New Mexico Natural Heritage Program, and University of New Mexico (UNM). At this meeting we added elements suggested by Peter Stacey (UNM) which involved the use of plots within each territory and at random distances outside the territories.

At 27 selected nest locations for the modified BBIRD method, measurements were made within a circular, 8-meter radius plot centered below the nest. Within the inner 4-meter radius subplot, shrub stem density at breast height, species composition, and percentage of dead stems were measured. In cases with exceptional stem densities, shrub stems where measured in a 2-meter radius subplot. Within the entire 8-meter subplot, tree stem density and species composition were measured. Shrub stems were defined as having a diameter at breast height (dbh) of less than 10 cm; tree stems had a dbh of 10 cm or more. A measure of vertical foliage was obtained by recording vegetation touches at 1-meter intervals along a vertical rod placed at the nest and at 4- and 8-meter intervals from the nest along four cardinal directions. We also recorded canopy height at these "touch-pole" locations.

At each nest a variety of other measurements were taken or compiled from previously recorded data sheets from biologists conducting nest monitoring earlier in the breeding season. Such data included nest substrate species, nest substrate height, nest substrate dbh, distance to substrate edge, distance to clump edge, distance to riparian edge, soil moisture, distance to water, distance to road, as well as several other parameters.

For the UNM method, measurements were taken in four, 5-meter diameter plots (one at the nest and three located 15 meters from the nest at 0, 120, and 240 degrees from magnetic north). Vegetation density was estimated by measuring distances to the nearest shrub and canopy plants in each of four plot quadrants. Foliage cover for each plant species, canopy layer, and overall cover were obtained by visually estimating the percent volume for foliage within three height categories above the plot (0-3 m, 3-6 m, and >6 m) based on a modified Daubenmire ranking of 1 to 6. These measurements were repeated in similar plots centered at a random point at a distance between 50 and 100 meters from each nest site.

Results and Discussion

The pooled mean values as well as ranges for most of the vegetation parameters from all the 4- and 8-meter nest centered plots (based on modified BBIRD protocol) are summarized in Table 1. Overall, both shrub and tree stem composition was dominated by Goodding's willow (*Salix*

Table 1. Summary of vegetation parameters measured in BBIRD type circular plot centered on nest.

Parameter	Mean (sd)	Range
Shrub Stem Density (<10cm dbh)	16.38/m^2 (8.38)	3.86 - 38.68 m^2
Gooding's willow shrub composition (<10cm dbh)	57.5% (28.0)	6.2- 100%
Saltcedar shrub composition (<10cm dbh)	17.4% ((19.4)	0 – 56.2%
Coyote willow shrub composition (<10cm dbh)	24.7% (22.5)	0-81.5%
Dead stems	70.6% (17.8)	21.0 – 98.6%
Tree Stem Density (>10cm)	709.2/ha (547.2)	50 – 1,591/ha
Tree willow composition (>10cm)	99.5%	75 – 100%
Cottonwood composition (>10cm)	0.5%	0 – 25%
Canopy Height	8.76m (1.56)	6.0 – 10.8 m

gooddingii) which ranged from 6.2 to 100 % in plots and had an overall mean value of 57.5 %. However, some plots had up to 81.5 % coyote willow (*Salix exigua*) stems and one plot had 56.2 percent saltcedar (*Tamarix sp.*) stems. Cottonwood (*Populus deltoides*) was a minor element of the tree component in our plots with only an overall mean value of 0.5%; one plot, however, had 25 % cottonwood tree stems.

The plots had a high amount of dead shrub stems which reflect the thinning of understory vegetation as plants matured. Overall there was a mean value of about 76 % dead stems which ranged from 21.0 to 98.6 % for the 4-meter plots centered on nests. Tree willow had an overall mean of 79.1 % dead stems; coyote willow 57.8 %; saltcedar 27.7 %. The mean canopy height was 8.76 m which ranged from 6.0 m to 10.8 m per plot.

Foliage height diversity measured with the "touch pole" at one meter intervals is shown graphically in Figure 1. This shows that mean foliage density appears to be higher at the 2- to 6-meter zone directly above the nest compared to foliage density at 4- and 8-m horizontal distances away from the nest. This suggests that WIFLs may be selecting nest sites that have a denser canopy at or directly above the nest (mean nest height was approximately 2.9m).

The pooled mean values as well as ranges for vegetation parameters from the UNM-methodology nest and random plots are compared in Table 2. The median density of individual shrubs was statistically greater (P >0.028, W=19,684) in the random plots compared with the plots within 5 m of the nest. However, median density of plants comprising the mid-canopy (small trees) was greater (P <0.001, W=27,910) in the nest plots. Likewise, the mean cover value of foliage in the 3- to 6 meter interval was statistically less (P <0.001, t=4.02) in the random plots. There was no statistical difference detected in heights and crown widths of plants of the shrub and mid-canopy layer.

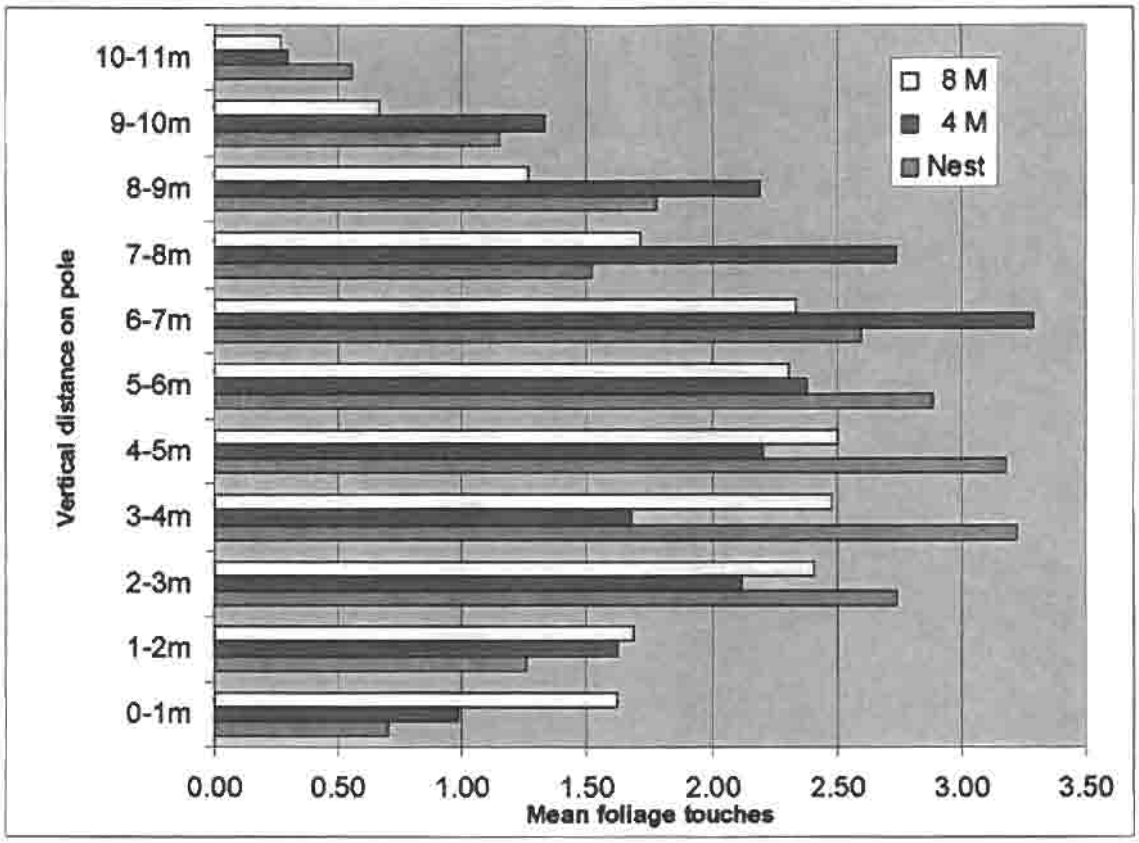

Figure 1. Comparisons of mean vertical foliage density indices in canopy at nests and at 4- and 8-m distances from nests measured with a "touch pole" at 1m vertical intervals.

Table 2. Summary of nest and non-nest plot from UNM methodology.

Vegetation parameter	Nest site	Random site
Shrub Canopy Layer (sd)		
Mean Plant Distance	2.00 m (1.45)	1.69 m (1.34)
Mean Plant Density	2,488/ha	3,481/ha
Mean Plant Height	2.47 m (0.84)	2.51 (0.77)
Mean Plant Crown Width	0.67 m (0.40)	0.62 m (0.36)
Mid-Canopy Layer (sd)		
Mean Plant Distance	2.93 m (4.75)	3.29 m (1.66)
Mean Plant Density	1,167/ha	923/ha
Mean Plant Height	7.97 m (1.36)	7.74 (1.24)
Mean Plant Crown Width	4.10 m (1.39)	4.30 (1.42)
Mean Cover Value (sd)*		
0 – 3 m	2.83 (0.84)	2.70 (1.00)
3 – 6 m	2.31 (0.71)	1.90 (0.76)
>6 m	1.41 (0.57)	1.08 (0.28)

* Values based on a modified Daubenmire ranking of 1 to 6: 0 = 0%; 1 = 1-10%; 2 = 11-25%; 3 = 26-50%; 4 = 51-75%; 5 = 76-90%; 6 = >90%

Nest-centered data collected for both methods are summarized in Table 3. Nest height ranged from 1.49 to 4.5 m and averaged 2.88 m. Approximately 67 % of the 27 nests were placed in

Goodding's willow; 18 % in saltcedar; and 15 % in coyote willow. During the nest initiation period, the distance to surface water ranged from 0 to 240m averaging 31m Of the 27 nests evaluated, 16 (59%) were in flooded areas and 23 (85%) were within 50 m of surface water during the nest initiation period.

Table 3. Summary of other nest-centered data.

Parameter	Mean (sd) n=27	Range
Nest height	2.88 m (2.31)	1.49 – 4.50 m
Nest substrate height	5.38 m (3.29)	2.8 – 10.0 m
Nest substrate dbh	4.10 cm (3.29)	1.2 – 12.0 cm
Distance to substrate edge	0.44 m (0.73)	0 – 3.4 m
Distance to clump edge	27.67 m (25.81)	8 – 110 m
Distance to riparian edge	46.37 m (53.78)	8 – 200 m
Distance to water (early season)	30.74 m (65.74)	0 – 240 m
Distance to channel	105.70 m (75.63)	10 – 240 m
Distance to road	700.67 m (367.15)	8 – 1300 m
Substrate species	**Percent**	
Goodding's willow	66.7%	
Coyote willow	14.8%	
Saltcedar	18.5%	

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