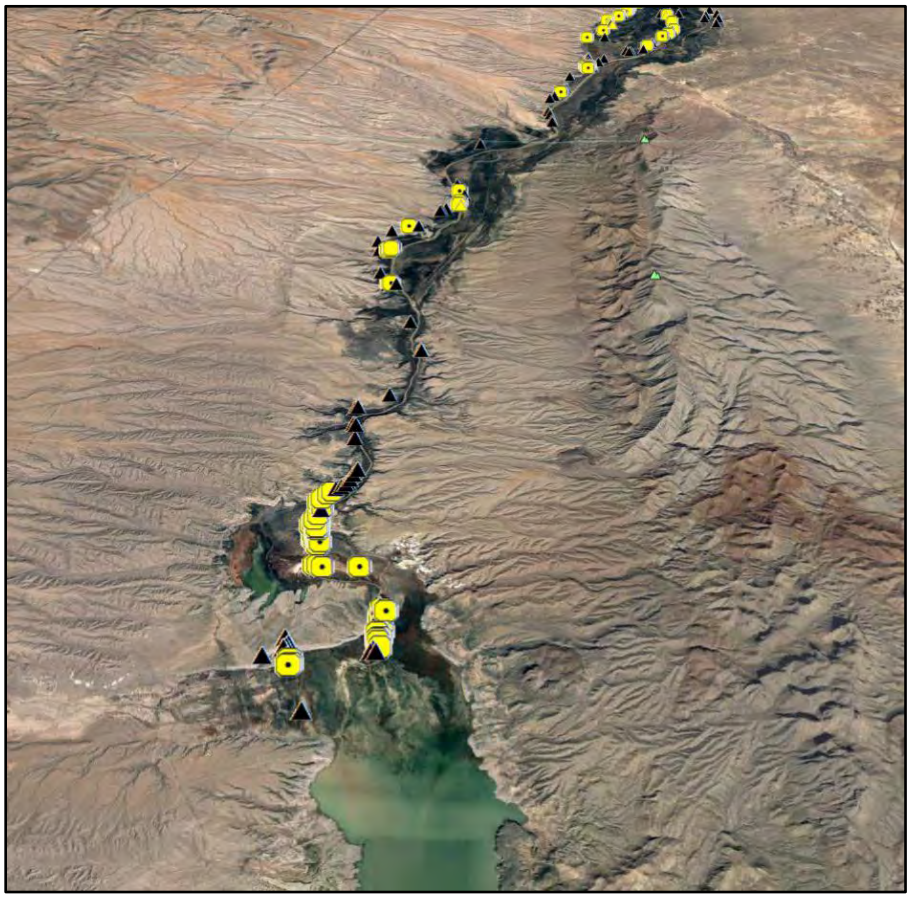
RECLAMATION

Managing Water in the West

2017 Middle Rio Grande Southwestern Willow Flycatcher Study Results

Selected Sites along the Rio Grande from Bandelier National Monument to Elephant Butte Reservoir, New Mexico



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

January 2018

Mission Statements

The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

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.

2017 Middle Rio Grande Southwestern Willow Flycatcher Study Results

Selected Sites along the Rio Grande from Bandelier National Monument to Elephant Butte Reservoir, New Mexico

Prepared for

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Executive Summary

Overview

During the summer of 2017, the Bureau of Reclamation (Reclamation) conducted surveys and nest monitoring of the Federally-listed endangered Southwestern Willow Flycatcher (SWFL). The surveys were completed in eight distinct reaches along approximately 209 river miles of the Rio Grande in New Mexico between Bandelier National Monument and Elephant Butte Reservoir. Surveys were performed to contribute to current baseline population data, monitor population trends, and determine the current distribution of SWFLs along the Middle Rio Grande and also to meet Reclamation's and the Corps of Engineers' Endangered Species Act compliance commitments. During 2017 surveys, 561 resident SWFLs were documented. These residents formed 259 pairs and established 302 territories. As in previous years, the San Marcial Reach of the Rio Grande was by far the most productive supporting 257 territories and 223 pairs. The Belen and Bosque del Apache Reaches supported 17 and 16 territories, respectively. Overall, territory numbers in the Middle Rio Grande decreased 15 percent, from 355 in 2016 to 302 in 2017.

Time permitting, nest monitoring was conducted at all sites where nesting pairs were detected. Nests were monitored for success rates, productivity, predation, abandonment and Brown-headed Cowbird parasitism. The San Marcial Reach again proved most productive, producing 298 nests and fledging 158 SWFL young. The Belen Reach produced 27 nests and 21 fledgling SWFLs. Overall nesting success was 26 percent.

Survey Results

Reclamation Albuquerque Area Office funded reaches:
San Marcial – 257 territories

Corps of Engineers funded reaches:
Frijoles – 0 territories
Escondida – 8 territories

Middle Rio Grande Endangered Species Collaborative Program funded (cooperatively by Reclamation and Corps of Engineers) reaches:
Belen – 17 territories
Bosque del Apache (active floodplain) – 16 territories
Sevilleta/La Joya – 4 territories
Tiffany – 0 territories
San Acacia – 0 territories

Introduction

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*; hereafter referred to as SWFL) is a State-listed and Federally-listed endangered subspecies of the Willow Flycatcher (*Empidonax traillii*) or WIFL. It is an insectivorous, Neotropical migrant that nests in dense riparian or wetland vegetation in the Southwestern United States (Figure 1). SWFLs typically arrive at their Middle Rio Grande breeding sites by mid-May and continue to arrive through early June. They depart for wintering areas in Mexico, Central America, and northern South America between late July and mid-August (Sogge, Ahlers and Sferra 2010, USFWS 2002).

Due to declining populations and habitat loss, the U.S. Fish and Wildlife Service (USFWS) officially listed the SWFL as endangered in February 1995 (USFWS 1995). Subsequent studies conducted during the late-1990s and early 2000s and detailed in the SWFL Recovery Plan (USFWS 2002) confirmed the population declines. The SWFL is also listed as endangered or a species of concern by the states of Arizona, California, Colorado, Nevada, New Mexico, Texas, and Utah (Sogge, Ahlers and Sferra 2010, 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 was prepared by the USFWS Recovery Team. These papers addressed current issues and recommended management alternatives in regard to livestock grazing; water management; exotic vegetation; habitat restoration; fire management; recreational impacts; and parasitism by Brown-headed Cowbirds (*Molothrus ater*) hereafter referred to as BHCO or cowbird (USFWS 2002).

In October 2005, the USFWS designated critical habitat for the SWFL along the Middle Rio Grande in three distinct segments, separated by the Sevilleta and Bosque del Apache National Wildlife Refuges (NWR) which were excluded from the designation. The designated reaches include "from the southern boundary of the Isleta Pueblo for 44.2 miles [71.1 kilometers (km)] to the northern boundary of the Sevilleta NWR. The Middle Rio Grande segment extends for 27.3 miles (43.9 km) 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 (20.1 km) 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. In August of 2011 the USFWS proposed a revised critical habitat designation and the final rule was issued in January of 2013. Changes to the critical habitat maps include adding the Sevilleta and Bosque del Apache NWRs and a portion of the Elephant Butte Reservoir pool to the designation.

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

Presence/absence surveys, based on established survey protocols (Sogge, Ahlers and Sferra 2010), were 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 (Corps). The 2017 presence/absence surveys for SWFLs were conducted at selected sites along the Rio Grande between Bandelier National Monument and Elephant Butte Reservoir (Figure 2). Surveys were performed between May 16 and July 21, 2017.

Note: the length of the survey site reaches from north to south along the Rio Grande are exact, whereas the width from west to east is exaggerated for viewing purposes. Most survey sites are within 1 mile (east or west) of the Rio Grande. Gray shading in caption boxes represents reaches funded by BOR Albuquerque Area Office, yellow shading Middle Rio Grande Endangered Species Collaborative Program (Corps), and red shading U.S. Army Corps of Engineers.

Figure 2. General locations of 2017 survey sites.

Nest searches and monitoring of SWFL nests were conducted by permitted biologists in conjunction with surveys.

Goals and Objectives

The primary goals of the field studies performed in 2017 were to:

- Contribute to current baseline data regarding the population status, distribution, and habitat requirements of the SWFL in the Middle Rio Grande.
- Meet Reclamation's and Corps' Endangered Species Act (ESA) compliance commitments for ongoing and proposed projects, and monitoring of completed projects.
- Avoid or minimize any potentially adverse project-related effects to breeding SWFLs or their habitat.
- Identify key habitat parameters and incorporate suitable habitat features into restoration planning.

The specific objectives included:

- Maintain project ESA compliance in specific action areas by conducting five surveys.
- Determine impacts of river maintenance activities on specific sub-populations of SWFLs.
- Monitor SWFL nests to determine productivity, parasitism and depredation rates, population recruitment, and to identify limiting factors.
- Determine relationships between SWFL nesting and hydrologic parameters.

Related Studies

This study is a continuation of ongoing efforts that have grown in size and complexity since 1995. A variety of studies have been conducted over the past two decades to investigate aspects of SWFL ecology and reproduction. Below is a brief synopsis of the various related studies conducted over the last 22 years:

- 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 1997 through 2001 cowbird trapping and removal effort and to gain a better understanding of the effects and intensity of factors such as brood parasitism and depredation on productivity of riparian obligate species. Parasitism levels, depredation, 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 7 miles 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 cowbirds may reduce brood parasitism; however, compensatory factors such as habitat, depredation, and nest abandonment appear to offset the increased nest success resulting from 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 conducted between 1999 and 2008 to determine the distribution and abundance of BHCOs and host bird species within the Middle Rio Grande. Transects were established within four study areas to determine the distribution and density of BHCOs and to determine the effectiveness of the cowbird trapping program conducted between 1997 and 2001. Point count data from 1999 to 2008 showed a dramatic decline in BHCOs per point in the Sevilleta and Bosque del Apache reaches. BHCO abundance increased within the San Marcial reach and declined slightly in the San Acacia reach. Similarly, host species abundance increased markedly in the San Marcial reach while decreasing slightly in the other three reaches. Higher quality habitat in the San Marcial reach likely attracted riparian-obligate host species which, in turn, may have attracted greater numbers of BHCOs. Methods and results of this study can also be found as a component of *Riparian Obligate Nesting Success as Related to Cowbird Abundance and Vegetation Characteristics Along the Middle Rio Grande, New Mexico* (Moore 2006).

- A 12-year study to monitor and evaluate the impacts of livestock grazing on the establishment and development of riparian vegetation was concluded in 2008. This study was initiated in 1997 to determine the effects of seasonal livestock grazing on the potential future habitat of the endangered SWFL and the physical disturbance to existing occupied habitats. Data from a series of established livestock exclosures and photo stations were collected biannually and processed. The established browse threshold of 35 percent was exceeded during three different sampling periods at several exclosures. However, long-term impacts to regenerating riparian habitat were only documented at one exclosure during the 10 year study. Results are presented in *A Long-Term Assessment of Livestock Impacts on Riparian Vegetation: Elephant Butte Project Lands* (Ahlers, Reed and Siegle 2009).

- Development of a geographic information systems-based SWFL habitat suitability model was initiated in 1998 for the Middle Rio Grande. The model continues to be refined based on changes in hydrology, habitat use by SWFLs, and updated vegetation maps. Riparian vegetation in the Middle Rio Grande between Highway 60 and Elephant Butte Reservoir was classified using the Hink and Ohmart (1984) classification system. This system identifies vegetation polygons based on dominant species and structure. Plant community types are classified according to the dominant and/or codominant species in the canopy and shrub layers. During the summer and fall of 2002, as part of the Middle Rio Grande (MRG) Endangered Species Collaborative Program, Reclamation personnel updated vegetation maps from Belen to San Marcial using a combination of ground-truthing and aerial photo analysis (Callahan and White 2004). 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. Updates to habitat maps were again completed in 2008, 2012 and, most recently, 2016. Results and interpretation of the 2016 data can be found in *Southwestern Willow Flycatcher Habitat Suitability 2016: Middle Rio Grande, New Mexico* (Siegle and Ahlers 2017).

- 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 collected at 112 nests and were used to increase overall knowledge of the

nesting and general habitat requirements of the species. The resulting data analysis has helped to provide guidelines for riparian restoration projects targeted for SWFL habitat. See *Vegetation Quantification of Southwestern Willow Flycatcher Nest Sites* (Moore 2007) for details of this study. In 2007, data were gathered at 11 non-nest sites within maturing habitat in both the delta of Elephant Butte Reservoir and adjacent to the Los Lunas Restoration Site to assess the suitability of these areas for nesting SWFLs. Results of this study are available in *An Assessment of Potential Southwestern Willow Flycatcher Habitat* (Moore 2009). Most recently, this effort has been conducted at three plots within the cleared portion and three plots within the natural portion of the Los Lunas site. Results will be presented in Siegle and Ahlers (in press).

- Beginning in 2004, detailed hydrological data at each SWFL nest were recorded on each monitoring visit. Data from the 2004 through 2008 breeding seasons were compared to SWFL nest variables (success, productivity, depredation, parasitism, and distance to water) to determine what, if any, relationships exist between hydrology and nesting. For details of this hydrology monitoring study, see *A Review of Vegetation and Hydrologic Parameters Associated with the Southwestern Willow Flycatcher – 2002 to 2008: Elephant Butte Reservoir Delta*. (Ahlers 2009).

- 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. Three additional photostations were established in 2013 to document the developing habitat in the vicinity of Monticello Point. Currently, 13 sets of annual photos at each of the original 13 stations have been taken and some have documented either considerable vegetation growth and development or habitat decline. Most recent results of this study will be presented in *Elephant Butte Reservoir Delta Photostations – 2005-2017* (Ahlers, in press).

- In conjunction with SWFL nest monitoring, a hydrology monitoring study was implemented in 2004 and continued through 2011. Initially, 19 hydrostations (custom-built staff gauges) were installed in proximity to the core SWFL population in the headwaters of Elephant Butte Reservoir to measure water depth at certain locations. Four additional hydrostations (20, 22, 23, and 24) were installed in newly occupied habitat in 2008 and monitoring of three others was discontinued due to difficulty of access or deterioration of habitat. Hydrostations were placed in select locations representative of the overall site's hydrology. They were monitored during the SWFL breeding seasons from 2004 through 2011. Of the 20 hydrostations monitored in 2011, nine were never flooded, three never dried, and eight were flooded and dried during the survey season. Data were collected weekly and were used to determine the relationship between flows in the Low Flow Conveyance Channel (LFCC) and depth of water within the core SWFL breeding areas of the Elephant Butte Reservoir delta. For additional details regarding this portion of the hydrology study, see Moore and Ahlers (2012).

- During the spring and summer of 2010, a study designed to monitor the newly occupied SWFL habitat adjacent to the sediment plug in the Bosque del Apache National Wildlife Refuge (NWR) was initiated. Several alternatives to address the recurring sediment plug problem at River Mile 82 were considered and the alternative of channel realignment was chosen. The new alignment was designed to alleviate issues associated with the sediment plug while minimizing impacts to

higher suitability SWFL habitat. However, impacts in the form of lower water table elevations and/or changing overbank flooding regimes are still possible. In order to establish a baseline within the project area, groundwater monitoring wells and vegetation sampling sites, including transects at well locations, nest plots at nest locations, and hemispherical photography at both, were established during the spring and summer of 2010. Additional groundwater wells and vegetation transects were installed in habitat on the east side of the river in 2011, north of the northern refuge boundary in 2014, and adjacent to the new alignment on the east side of the refuge in 2017 and 2018. Data are collected annually and the most recent results can be found in *Bosque del Apache Sediment Plug Baseline Studies – Annual Report 2016* (Siegle, Ahlers and Moore 2017a).

- A similar study designed to monitor impacts of sediment plug management in the delta of Elephant Butte Reservoir was initiated during the summer of 2011. A series of piezometers was installed; vegetation monitoring transects were established; and vegetation at six SWFL nests was quantified within survey site EB-09. An eighth year of data collection was conducted in 2017 and results will be presented in the forthcoming report. Latest results can be found in Siegle, Ahlers, and Moore (2017b).

- Prompted by the population expansion of the tamarisk beetle (*Diorhabda* sp.) within the Middle Rio Grande, an impact monitoring study was initiated in 2015 to determine impacts to occupied SWFL habitat. Canopy cover analysis via hemispheric photography, landscape photography and microclimate monitoring is conducted within SWFL-occupied tamarisk-dominated habitat in four different survey sites. Hemispheric photos are taken annually in early, mid- and late summer in order to document any changes to foliar density. Landscape photos taken annually document visual changes to the habitat and microclimate data reveal changes to temperature and humidity caused by tamarisk defoliation. The presence of *Diorhabda* has been documented within all study plots; defoliation has been observed within two of the four. Latest results can be found in Dillon and Ahlers (2017).

Methods

Study Area

Survey sites were selected based on environmental compliance requirements related to Reclamation and Corps projects and a need to monitor SWFL population trends within the Middle Rio Grande. Sites consist of riparian habitat bounded by waterbodies, levees, or other physical features and are typically surveyed by one person in one day. The 2017 survey area encompassed selected sites along the Rio Grande in New Mexico between Bandelier National Monument and Elephant Butte Reservoir. This stretch contained eight distinct survey reaches: Frijoles, 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 environmental compliance, effort needed to ensure thorough coverage, and events which limited access (e.g. flooding and fire). Table 1 shows a summary of the survey effort within each reach.

Table 1. Number of sites and surveys per survey reach – Middle Rio Grande 2017.

Survey reach	Number of sites	Number of surveys
Frijoles	1	3
Belen	36	3: all sites but SV-11, 12, 13, 14 and 15 (4 surveys)
Sevilleta/La Joya[(1)]	11	4
San Acacia	6	3
Escondida	14	5
Bosque del Apache	14	5
Tiffany	10	2 (3rd survey not completed due to Tiffany fire)
San Marcial	61	Sites between railroad trestle and powerline surveyed 3 or 4 times due to Tiffany fire; sites downstream of powerline surveyed 5 times.

[(1)] Site SV-08 in the Sevilleta/La Joya Reach was not surveyed due to landowner issues.

Presence/Absence Surveys

All sites were surveyed using the repeated call-playback method in accordance with the protocols established in Sogge, Ahlers and Sferra (2010). Surveys in individual sites were conducted a minimum of 5 days apart; generally between 05:30 and 10:30 or 11:00 MDT (depending on weather conditions), by trained and permitted personnel. Survey forms were completed daily for each respective site. A minimum of three surveys were conducted at sites when only general research or study needs were required. A minimum of five surveys were conducted for all project-related sites. A large fire that prevented access to many sites in the Tiffany and northern San Marcial reaches began on June 26th and burned most potential habitat within these sites. These sites were surveyed three or four times.

The first survey is conducted in late May 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 (Willow Flycatchers that are not the *extimus* subspecies, or *extimus* subspecies that are passing through and not actively defending territories) would also be detected. For sites with only a three-survey requirement, the second and third surveys were conducted between early June and mid-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. In sites with a five survey requirement, the second and third surveys were conducted during June and the fourth and fifth surveys were conducted from late June to mid-July. The additional two surveys were initiated in 2000 to derive a greater degree of confidence regarding the breeding status, habitat association, and presence/absence of SWFLs at the selected sites. WIFLs documented on or after June 10 were typically considered resident birds (i.e., SWFLs) for reporting purposes, however several were determined to be late migrants based on their behavior and were not included as residents. Each site was surveyed as thoroughly as conditions would allow.

Nest Searches/Monitoring

Within most occupied sites, 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. Due to logistical and personnel constraints, nest searching and regular nest monitoring were not conducted in a few occupied sites. At a minimum, all territories were visited at least once during the typical nesting period to determine pairing status. Thus, for several pairs, nests were not located or nest fates were unknown. 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 at al. 1999). Nest areas were located by observing diagnostic SWFL breeding behavior and listening for calls within the habitat patch. Once located, the nest sites were approached cautiously with minimum disturbance to vegetation. Typically, adult SWFLs did not immediately reveal nest locations. All suitable mid-story trees and shrubs in the suspected area were carefully inspected until the characteristic small, cup-shaped nest (as described in Tibbitts, Sogge and Sferra [1994]) was found. Nests were usually located within a few minutes of nest search initiation. Once located, descriptive flagging was placed at a distance from the nest (usually 8 to 10 meters) to minimize attraction of predators. On subsequent visits, time spent at the nest was minimized, dead-end trails were not made, and a variety of paths to and from the nest were used, again to minimize disturbance and reduce predator attraction.

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

At the conclusion of the first or early-season nesting attempts, the nesting pair was not monitored for approximately one week to minimize disturbance and allow for possible initiation of another nesting attempt. Then a re-nest/second brood search was performed. A re-nest is a nesting attempt that occurs after a nest fails while a second brood is a nesting attempt following an initial successful nesting attempt. When possible, nests were monitored through completion. However, certain nests that were not monitored to completion were considered successful if they had nestlings at least eight days old at the last visit.

In 2002, the practice of addling or removing BHCO eggs from parasitized nests was initiated when necessary and possible. This activity was continued in 2017. SWFL eggs were never disturbed and time spent at the nest was minimized. Frequently, based on nesting chronology, it was determined that the BHCO egg would not have a chance to hatch. In these cases the BHCO egg(s) was left untouched and the nests were monitored normally to minimize disturbance.

Hydrology Monitoring

Beginning in 2004 and continuing through 2017, hydrological conditions below the nest were recorded on each nest visit. These data were collected in order to make informed management decisions in regard to SWFL populations and nesting habitat, and to maximize the benefits from and use of available water. One of three possible hydrologic conditions was recorded – dry soil, saturated soil, or flooded site – and daily data were compiled for each nest at season's end to determine the hydrologic regime throughout the nesting cycle. Four hydrological scenarios emerged, including: 1) Dry all cycle, 2) Saturated/flooded then dry, 3) Saturated/flooded all cycle, and 4) Flooded all cycle. Distance to water was also recorded at each visit and average distance throughout the nest cycle was computed following the breeding season.

Results

Presence/Absence Surveys

During presence/absence surveys conducted from May 16 through July 21, 2017, there were 943 WIFLs detected. Based on detections prior to June 10 and/or the birds' lack of territorial behavior, 382 were believed to have been migrants. The remaining 561 birds comprised 259 pairs and 43 unpaired male territories. SWFL detections within the Frijoles, Belen, Sevilleta/La Joya, San Acacia, Escondida, Bosque del Apache, Tiffany, and San Marcial Reaches are presented in Figures 3 through 13, respectively. A total of 302 SWFL territories were documented within the Middle Rio Grande study area during the 2017 season. WIFL detection results are summarized in Table 2.

During the 2017 season, either four or five surveys were completed in 90 sites (59 percent of the sites surveyed). Within 14 of these sites, a total of 28 new SWFL territories were located during the fourth or fifth survey periods (Table 3). However, within three of these sites, flooding prevented access until the latter part of the survey season; these sites accounted for 12 of the late-documented territories. Thus, the remaining eight sites produced 16 new territories during the final two survey periods. All but two of these territories were located in close proximity to other SWFL territories during intensive nest searching and monitoring efforts conducted later in the survey season (i.e. during the 4th and 5th survey periods) by experienced biologists. It is likely that, during formal surveys, these birds were mistaken for other territorial SWFLs nearby. The two newly documented territories represent less than one percent of all SWFL territories documented during 2017. 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).

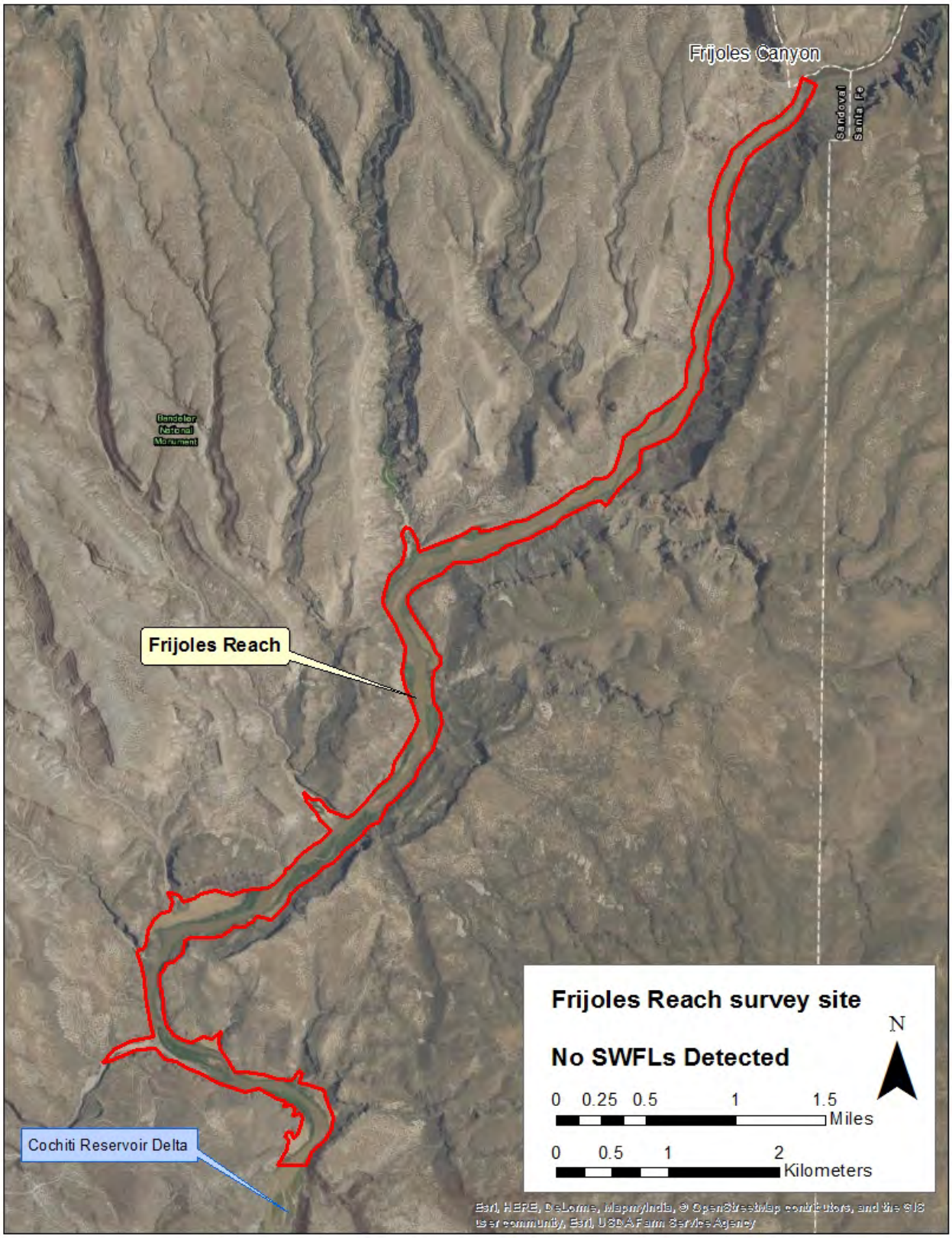


Figure 3. Overview of SWFL detections within the Frijoles Reach.

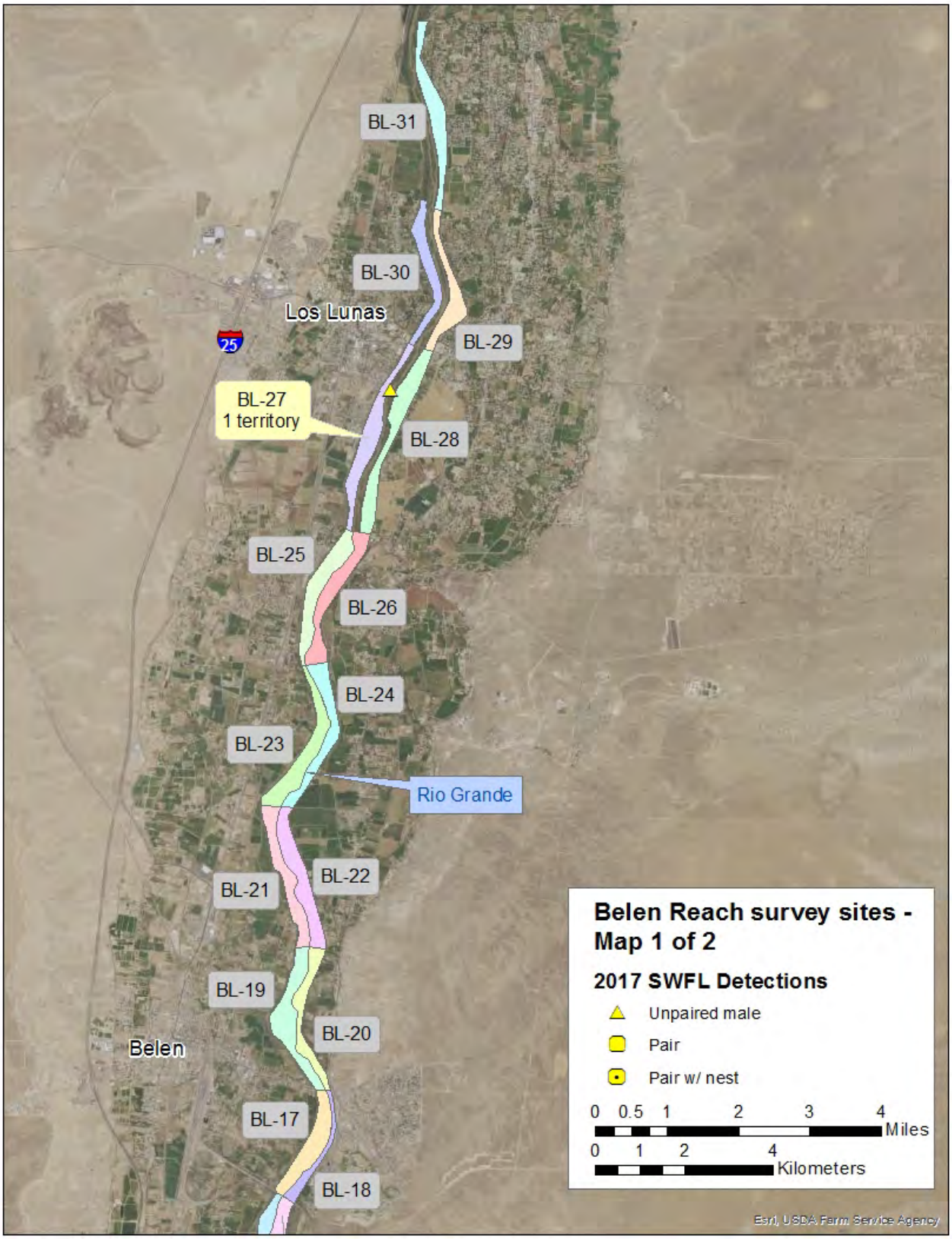


Figure 4. Overview of SWFL survey sites and detections within the Belen Reach - northern portion.

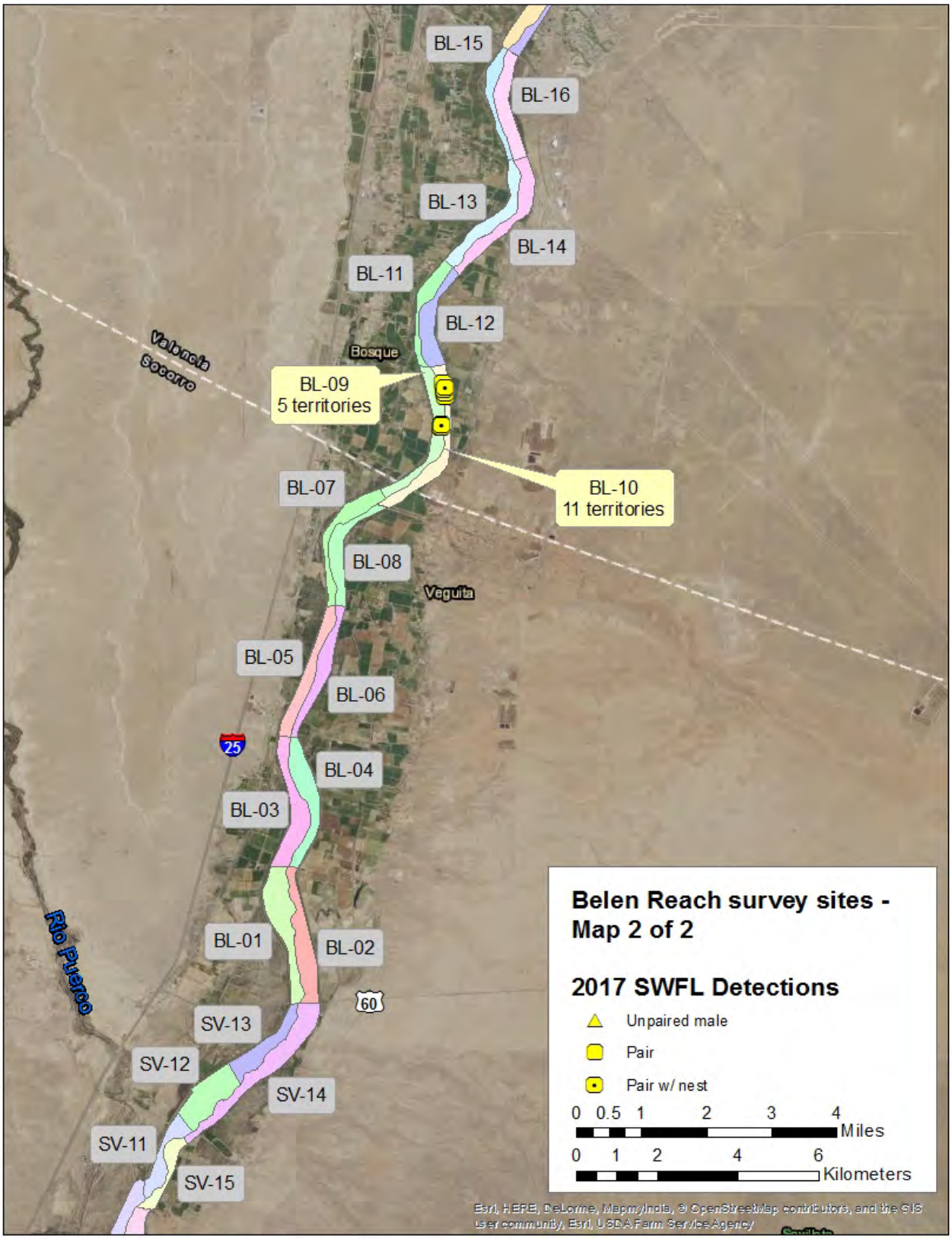


Figure 5. Overview of SWFL survey sites and detections within the Belen Reach - southern portion.

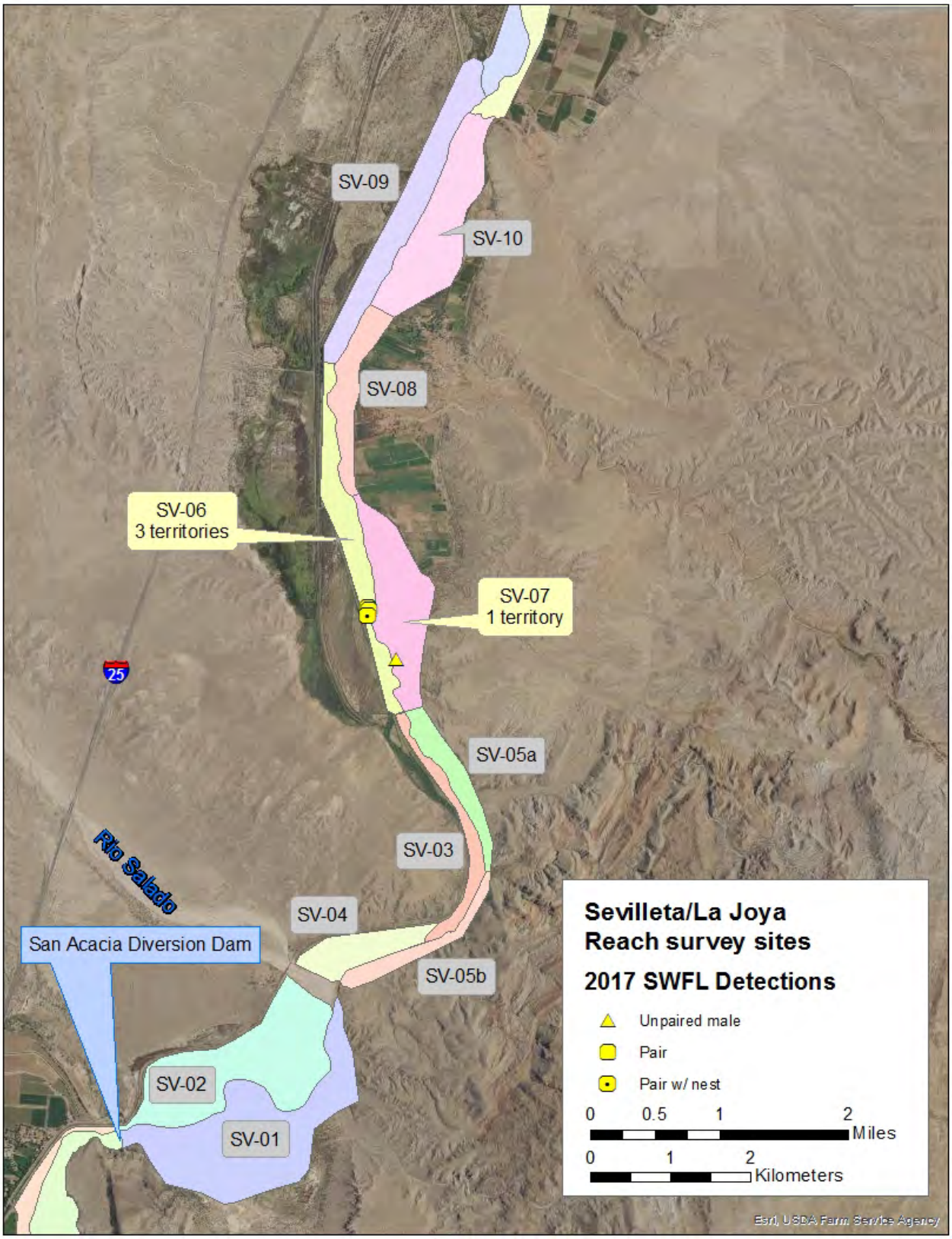


Figure 6. Overview of SWFL detections within the Sevilleta/La Joya survey sites.

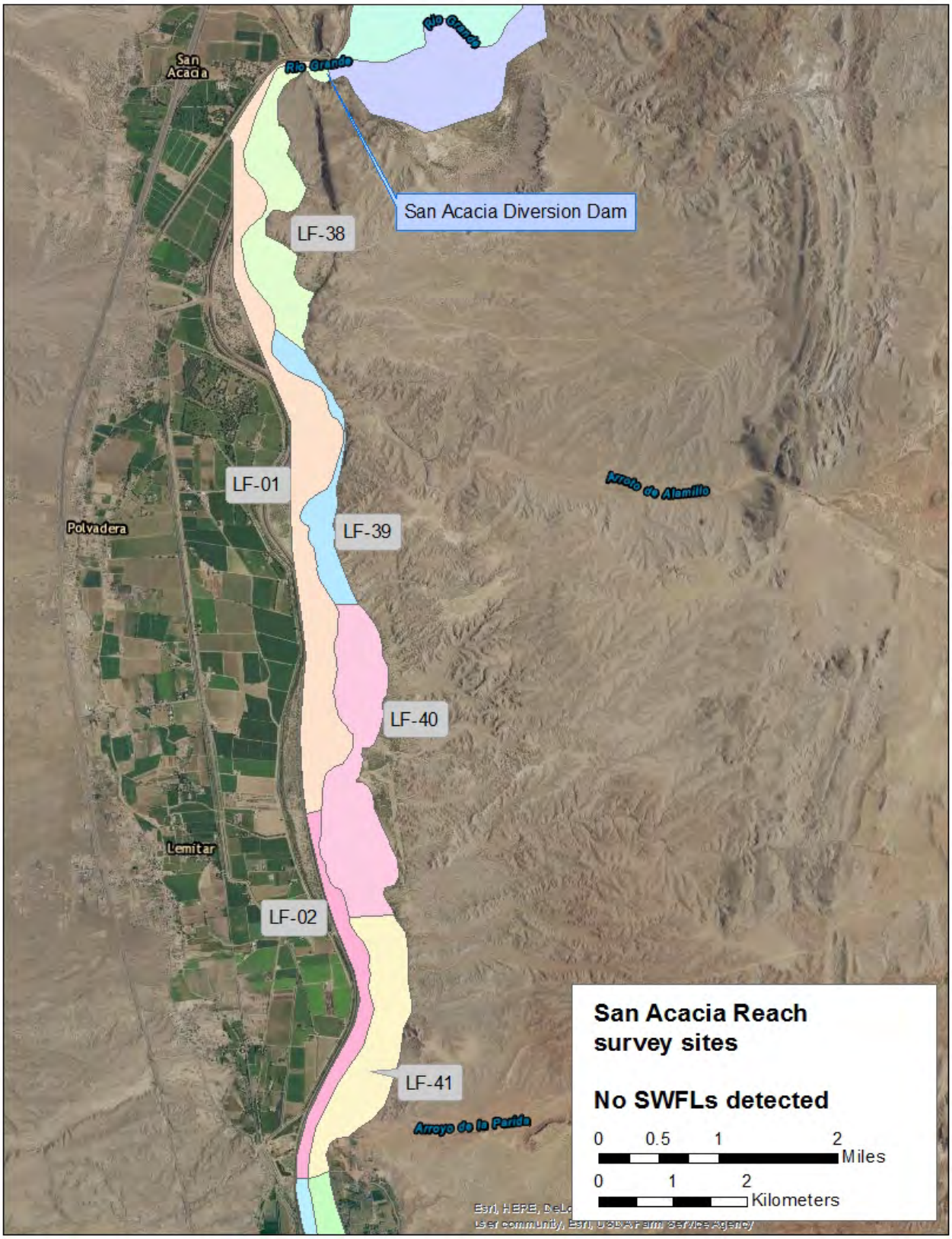


Figure 7. Overview of SWFL detections within the San Acacia survey sites.

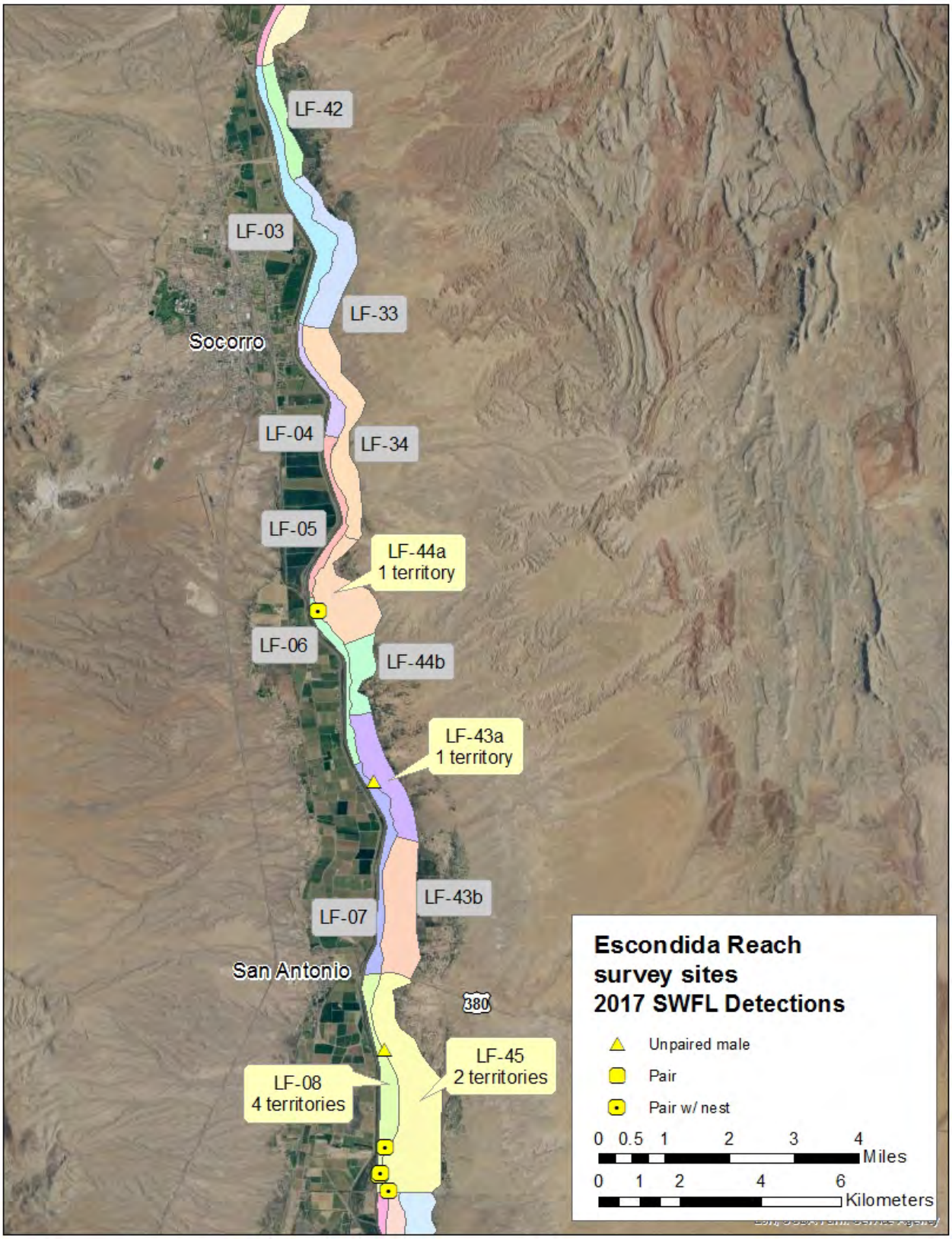


Figure 8. Overview of SWFL detections within the Escondida survey sites.

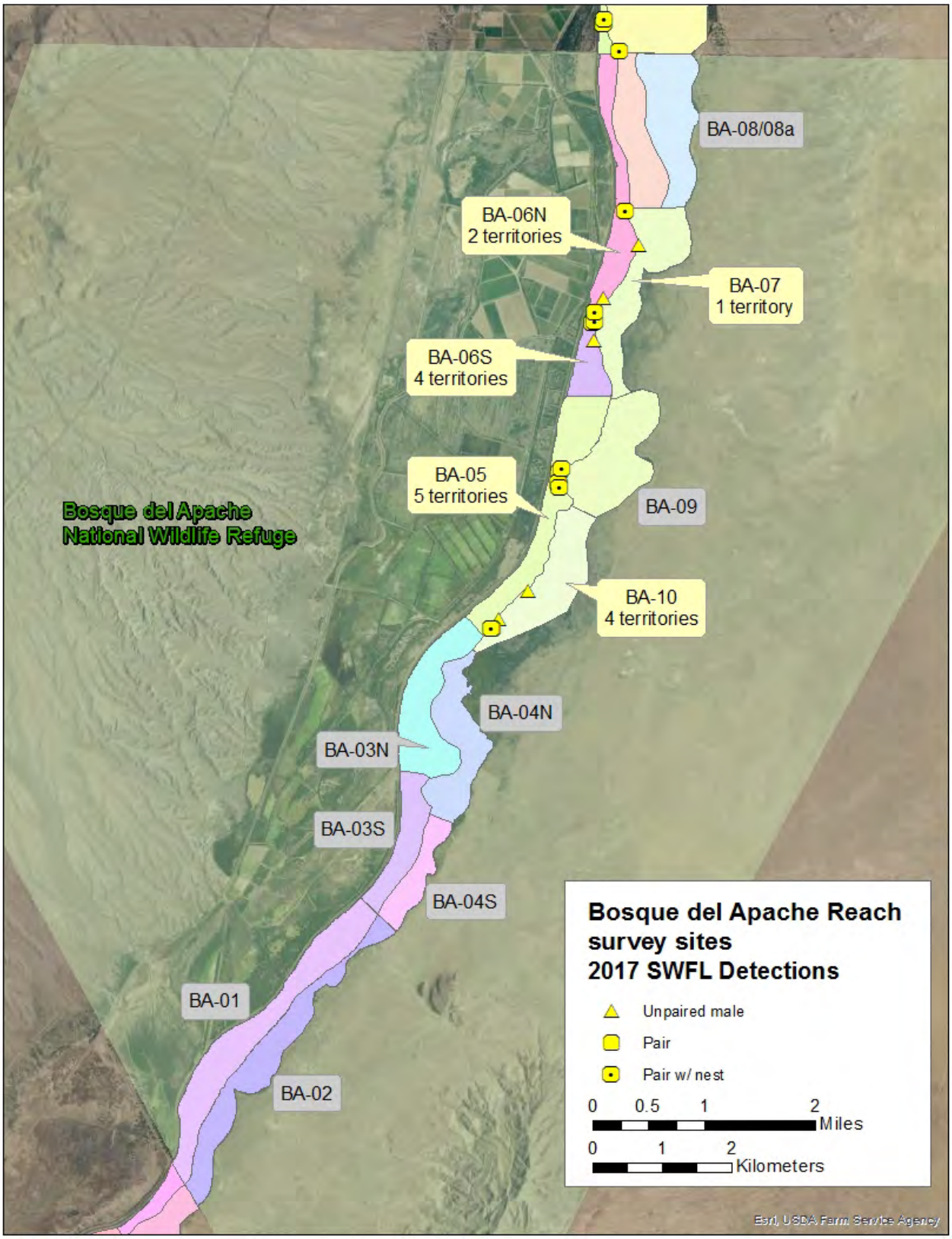


Figure 9. Overview of SWFL detections within the Bosque del Apache survey sites.

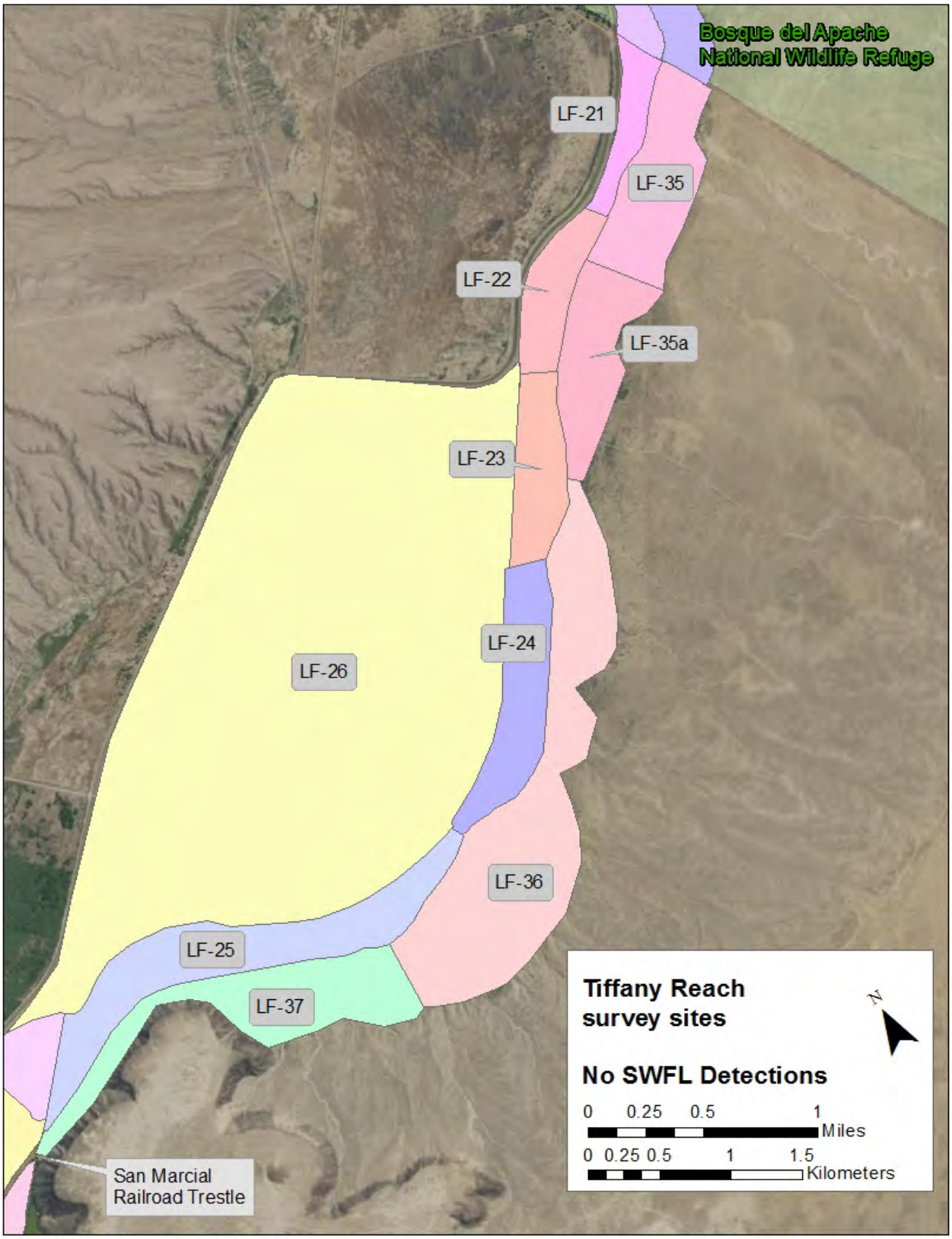


Figure 10. Overview of SWFL detections within the Tiffany survey sites.

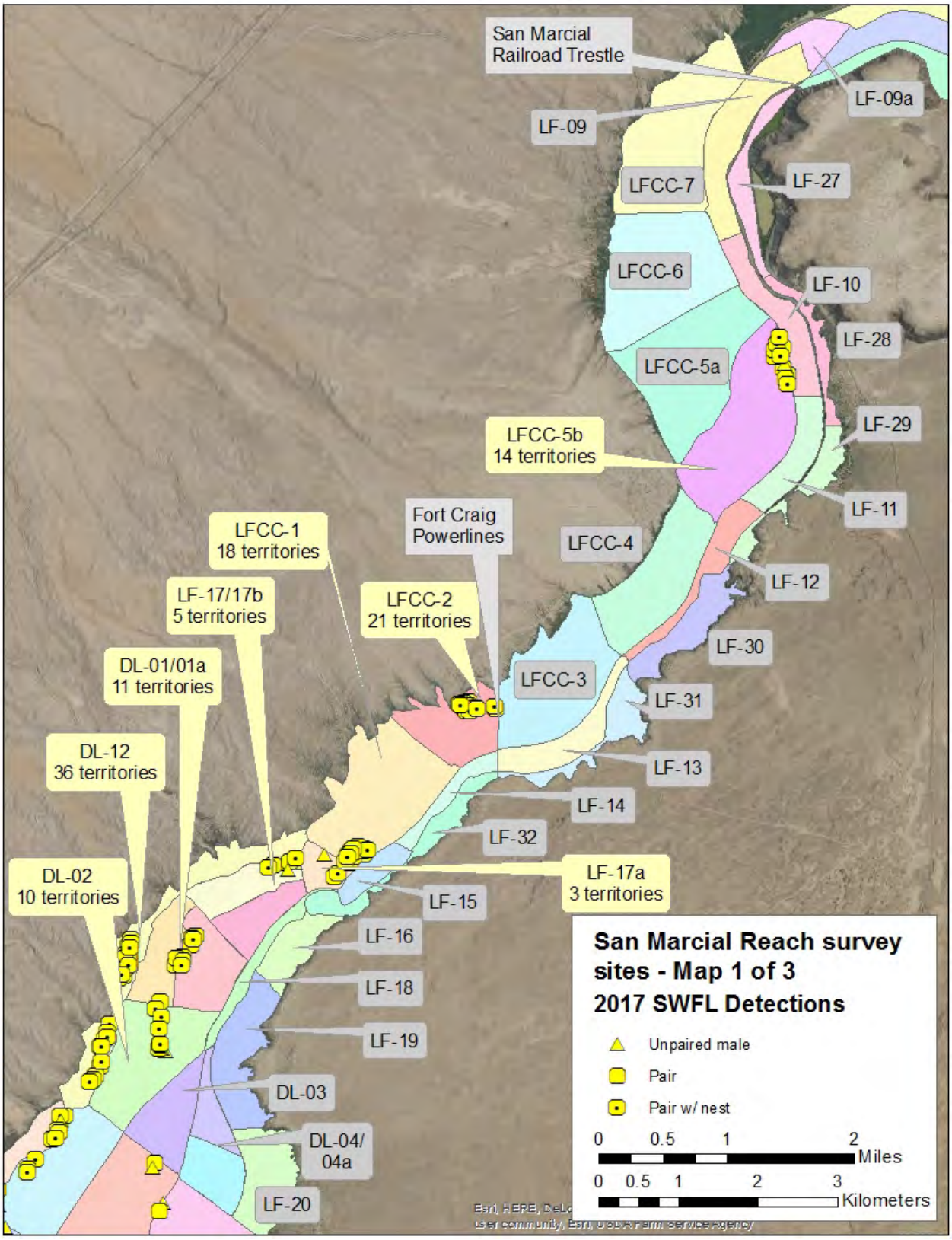


Figure 11. Overview of SWFL detections within the northern San Marcial survey sites.

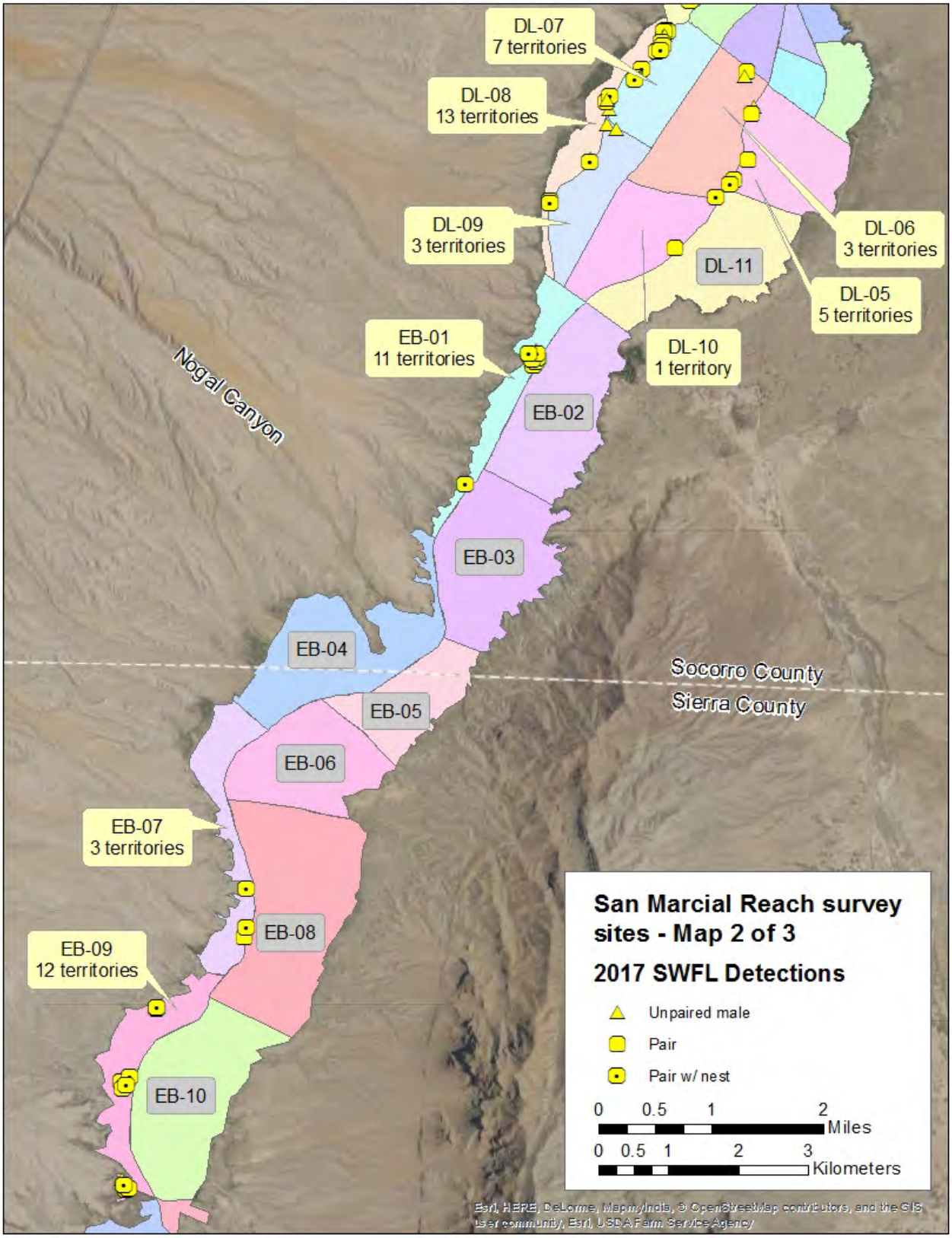


Figure 12. Overview of SWFL detections within the central San Marcial survey sites.

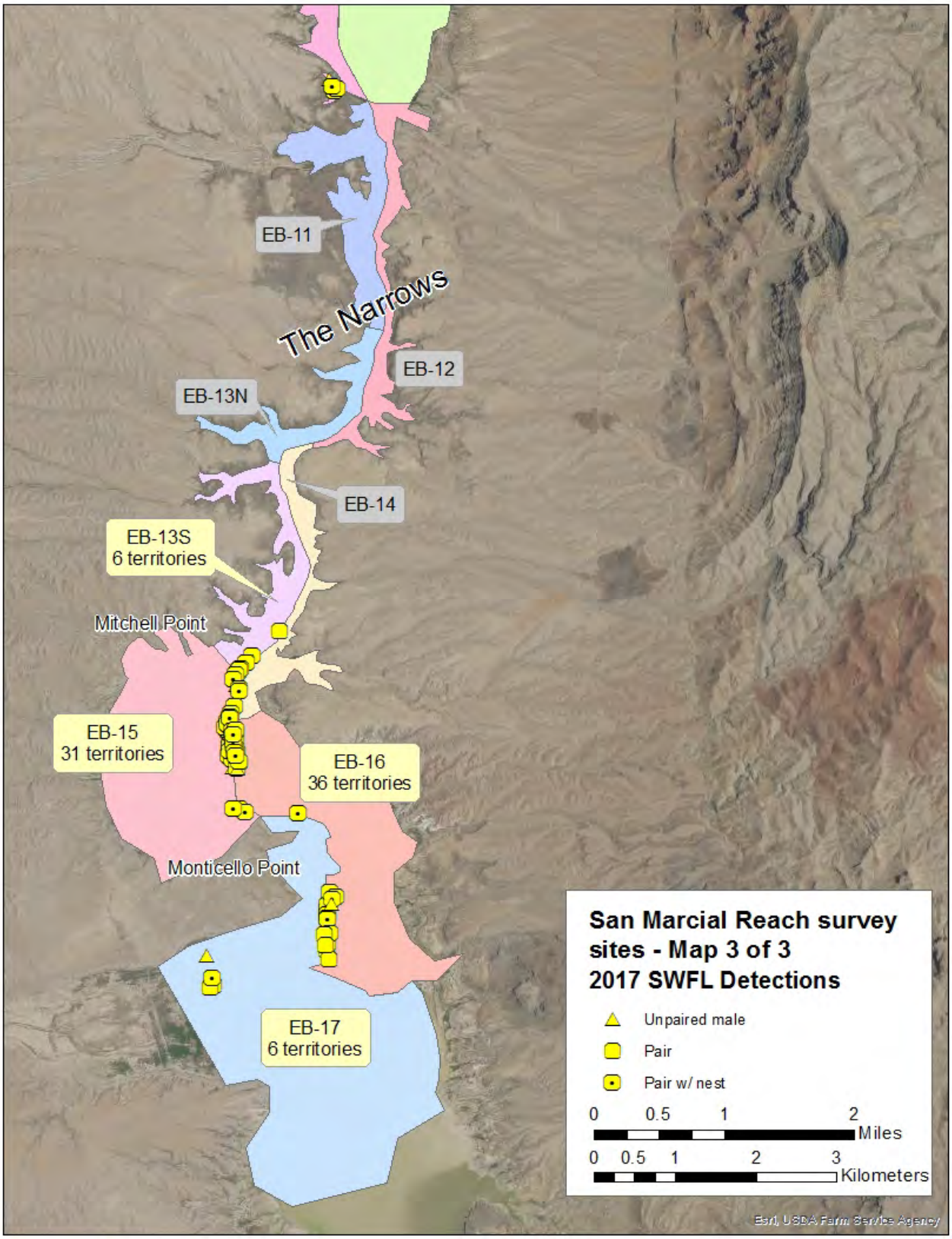


Figure 13. Overview of SWFL detections within the southern San Marcial survey sites.

Table 2. 2017 Willow Flycatcher survey detections within 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	County
Frijoles Reach	30	0	0	0	N/A	N/A	30 migrants	Sandoval
BL-03	2	0	0	0	N/A	N/A	2 migrants	Socorro
BL-05	1	0	0	0	N/A	N/A	1 migrant	Socorro
BL-06	2	0	0	0	N/A	N/A	2 migrants	Socorro
BL-08	1	0	0	0	N/A	N/A	1 migrant	Socorro
BL-09	16	5	10	5	9	3 successful; 6 failed	6 migrants; 5 pairs w/ nests	Socorro/Valencia
BL-10	25	11	22	11	18	5 successful; 13 failed	3 migrants; 11 pairs w/ nests	Socorro/Valencia
BL-11	1	0	0	0	N/A	N/A	1 migrant	Valencia
BL-12	3	0	0	0	N/A	N/A	3 migrants	Valencia
BL-13	3	0	0	0	N/A	N/A	3 migrants	Valencia
BL-14	6	0	0	0	N/A	N/A	6 migrants	Valencia
BL-15	6	0	0	0	N/A	N/A	6 migrants	Valencia
BL-16	4	0	0	0	N/A	N/A	4 migrants	Valencia
BL-17	4	0	0	0	N/A	N/A	4 migrants	Valencia
BL-18	3	0	0	0	N/A	N/A	3 migrants	Valencia
BL-19	2	0	0	0	N/A	N/A	2 migrants	Valencia
BL-20	1	0	0	0	N/A	N/A	1 migrant	Valencia
BL-21	2	0	0	0	N/A	N/A	2 migrants	Valencia
BL-22	1	0	0	0	N/A	N/A	1 migrant	Valencia
BL-23	6	0	0	0	N/A	N/A	6 migrants	Valencia
BL-26	3	0	0	0	N/A	N/A	3 migrants	Valencia
BL-27	2	0	1	1	N/A	N/A	1 migrant; 1 unpaired male	Valencia
BL-28	1	0	0	0	N/A	N/A	1 migrant	Valencia
BL-29	1	0	0	0	N/A	N/A	1 migrant	Valencia
BL-31	2	0	0	0	N/A	N/A	2 migrants	Valencia
SV-14	1	0	0	0	N/A	N/A	1 migrant	Socorro
SV-15	2	0	0	0	N/A	N/A	2 migrants	Socorro
Belen Reach[4] Summary	101	16	33	17	27	8 successful; 19 failed	68 migrants; 1 unpaired male; 16 pairs w/ nests	

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	County
SV-01	1	0	0	0	N/A	N/A	1 migrant	Socorro
SV-02	3	0	0	0	N/A	N/A	3 migrants	Socorro
SV-03	3	0	0	0	N/A	N/A	3 migrants	Socorro
SV-04	4	0	0	0	N/A	N/A	4 migrants	Socorro
SV-05a/b	7	0	0	0	N/A	N/A	7 migrants	Socorro
SV-06	9	3	6	3	1	1 unknown	3 migrants; 2 pairs; 1 pair w/ nest	Socorro
SV-07	4	0	1	1	N/A	N/A	3 migrants; 1 unpaired male	Socorro
SV-09	2	0	0	0	N/A	N/A	2 migrants	Socorro
SV-10	8	0	0	0	N/A	N/A	8 migrants	Socorro
Sevilleta Reach[5] Summary	41	3	7	4	1	1 unknown	34 migrants; 1 unpaired male; 2 pairs; 1 pair w/ nest	
LF-01	5	0	0	0	N/A	N/A	5 migrants	Socorro
LF-02	6	0	0	0	N/A	N/A	6 migrants	Socorro
LF-39	3	0	0	0	N/A	N/A	3 migrants	Socorro
LF-41	2	0	0	0	N/A	N/A	2 migrants	Socorro
San Acacia Reach[6] Summary	16	0	0	0	N/A	N/A	16 migrants	
LF-03	6	0	0	0	N/A	N/A	6 migrants	Socorro
LF-04	1	0	0	0	N/A	N/A	1 migrant	Socorro
LF-05	7	0	0	0	N/A	N/A	7 migrants	Socorro
LF-06	7	0	0	0	N/A	N/A	7 migrants	Socorro
LF-07	1	0	0	0	N/A	N/A	1 migrant	Socorro
LF-08	13	4	8	4	6	2 successful; 4 failed	5 migrants; 4 pairs w/ nests	Socorro
LF-33	5	0	0	0	N/A	N/A	5 migrants	Socorro
LF-34	1	0	0	0	N/A	N/A	1 migrant	Socorro
LF-43a	7	0	1	1	N/A	N/A	6 migrants; 1 unpaired male	Socorro
LF-43b	7	0	0	0	N/A	N/A	7 migrants	Socorro
LF-44a	6	1	2	1	1	1 unknown	4 migrants; 1 pair w/ nest	Socorro
LF-44b	3	0	0	0	N/A	N/A	3 migrants	Socorro

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	County
LF-45	4	1	3	2	2	2 failed	1 migrant; 1 unpaired male; 1 pair w/ nest	Socorro
Escondida Reach[7] Summary	68	6	14	8	9	2 successful; 6 failed; 1 unknown	54 migrants; 2 unpaired males; 6 pairs w/ nests	
BA-03S	3	0	0	0	N/A	N/A	3 migrants	Socorro
BA-04N	4	0	0	0	N/A	N/A	4 migrants	Socorro
BA-05	11	5	10	5	6	3 successful; 2 failed; 1 unknown	1 migrant; 5 pairs w/ nests	Socorro
BA-06N	6	1	3	2	1	1 failed	3 migrants; 1 unpaired male; 1 pair w/ nest	Socorro
BA-06S	8	3	7	4	5	1 successful; 4 failed	1 migrant; 1 unpaired male; 3 pairs w/ nests	Socorro
BA-07	1	0	1	1	N/A	N/A	1 unpaired male	Socorro
BA-08/08a	1	0	0	0	N/A	N/A	1 migrant	Socorro
BA-10	10	2	6	4	4	1 successful; 3 failed	4 migrants; 2 unpaired males; 2 pairs w/ nests	Socorro
Bosque del Apache Reach[8] Summary	44	11	27	16	16	5 successful; 10 failed; 1 unknown	17 migrants; 5 unpaired males; 11 pairs w/ nests	
LF-26	1	0	0	0	N/A	N/A	1 migrant	Socorro
LF-36	4	0	0	0	N/A	N/A	4 migrants	Socorro
Tiffany Reach[9] Summary	5	0	0	0	N/A	N/A	5 migrants	
LF-09/09a	3	0	0	0	N/A	N/A	3 migrants	Socorro
LF-10	6	0	0	0	N/A	N/A	6 migrants	Socorro
LF-12	2	0	0	0	N/A	N/A	2 migrants	Socorro
LF-13	2	0	0	0	N/A	N/A	2 migrants	Socorro
LF-15	1	0	0	0	N/A	N/A	1 migrant	Socorro
LF-17/17b	12	4	11	7	5	5 failed	1 migrant; 3 unpaired males; 4 pairs w/ nests	Socorro

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	County
LF-17a	16	2	5	3	3	1 successful; 2 unknown	11 migrants; 1 unpaired male, 2 pairs w/ nests	Socorro
LF-19	1	0	0	0	N/A	N/A	1 migrant	Socorro
LF-20	6	0	0	0	N/A	N/A	6 migrants	Socorro
LF-27	1	0	0	0	N/A	N/A	1 migrant	Socorro
LF-28	2	0	0	0	N/A	N/A	2 migrants	Socorro
LF-31	2	0	0	0	N/A	N/A	2 migrants	Socorro
LFCC-01	35	17	35	18	31	5 successful; 25 failed; 1 unknown	1 unpaired male; 17 pairs w/ nests	Socorro
LFCC-02	45	17	38	21	24	6 successful; 9 failed; 9 unknown	7 migrants; 4 unpaired males; 1 pair; 16 pairs w/ nests	Socorro
LFCC-04	5	0	0	0	N/A	N/A	5 migrants	Socorro
LFCC-05a	2	0	0	0	N/A	N/A	2 migrants	Socorro
LFCC-05b	33	11	25	14	10	1 successful; 6 failed; 3 unknown	8 migrants; 3 unpaired males; 3 pairs; 8 pairs w/ nests	Socorro
DL-01/01a	27	11	22	11	12	5 successful; 6 failed; 1 unknown	5 migrants; 1 pair; 10 pairs w/ nests	Socorro
DL-02	26	6	16	10	10	2 successful; 8 failed	10 migrants; 4 unpaired males; 6 pairs w/ nests	Socorro
DL-03	1	0	0	0	N/A	N/A	1 migrant	Socorro
DL-04/04a	2	0	0	0	N/A	N/A	2 migrants	Socorro
DL-05	10	4	9	5	1	1 unknown	1 migrant; 1 unpaired male; 3 pairs; 1 pair w/ nest	Socorro
DL-06	7	2	5	3	1	1 unknown	2 migrants; 1 unpaired male; 1 pair; 1 pair w/ nest	Socorro
DL-07	15	5	12	7	4	3 failed; 1 unknown	3 migrants; 2 unpaired males; 1 pair; 4 pairs w/ nests	Socorro
DL-08	27	10	23	13	17	3 successful; 12 failed; 2 unknown	4 migrants; 3 unpaired males; 1 pair; 9 pairs w/ nests	Socorro
DL-09	6	1	4	3	2	1 failed; 1 unknown	2 migrants; 2 unpaired males; 1 pair w/ nest	Socorro

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	County
DL-10	4	1	2	1	0	N/A	2 migrants; 1 pair	Socorro
DL-11	5	0	0	0	N/A	N/A	5 migrants	Socorro
DL-12	77	36	72	36	56	14 successful; 34 failed; 8 unknown	5 migrants; 1 pair; 35 pairs w/ nests	Socorro
EB-01	34	10	21	11	13	4 successful; 9 failed	13 migrants; 1 unpaired male; 10 pairs w/ nests	Socorro
EB-02	6	0	0	0	N/A	N/A	6 migrants	Socorro
EB-04	6	0	0	0	N/A	N/A	6 migrants	Socorro
EB-07	10	3	6	3	2	2 unknown	4 migrants; 1 pair; 2 pairs w/ nests	Sierra
EB-08	2	0	0	0	N/A	N/A	2 migrants	Sierra
EB-09	31	11	23	12	11	2 successful; 8 failed; 1 unknown	8 migrants; 1 unpaired male; 1 pair; 10 pairs w/ nests	Sierra
EB-11	1	0	0	0	N/A	N/A	1 migrant	Sierra
EB-12	2	0	0	0	N/A	N/A	2 migrants	Sierra
EB-13N	1	0	0	0	N/A	N/A	1 migrant	Sierra
EB-13S	22	6	12	6	6	2 successful; 3 failed; 1 unknown	10 migrants: 1 pair; 5 pairs w/ nests	Sierra
EB-14	2	0	0	0	N/A	N/A	2 migrants	Sierra
EB-15	64	27	58	31	38	9 successful; 26 failed; 3 unknown	6 migrants; 4 unpaired males; 27 pairs w/ nests	Sierra
EB-16	80	34	70	36	51	8 successful; 39 failed; 4 unknown	10 migrants; 2 unpaired males; 2 pairs; 32 pairs w/ nests	Sierra
EB-17	26	5	11	6	1	1 successful	15 migrants; 1 unpaired male; 4 pairs; 1 pair w/ nest	Sierra

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	County
San Marcial Reach[10] Summary	668	223	480	257	298	63 successful; 194 failed; 41 unknown	188 migrants; 34 unpaired males; 22 pairs; 201 pairs w/ nests	
Middle Rio Grande Summary	**943**	**259**	**561**	**302**	**351**	**78 successful; 229 failed; 44 unknown**	**382 migrants; 43 unpaired males; 24 pairs; 235 pairs w/ nests**	

[1] When a single WIFL responded to the tape playback, and there was no evidence of pairing, it was considered to be an unpaired male.
[2] A resident SWFL is a WIFL documented on or after June 10 that exhibits territorial behavior or for which nesting is confirmed.
[3] A second brood occurs after a SWFL pair has had a successful nesting attempt. 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.
[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
[8] Bosque del Apache Reach = From north boundary of NWR, downstream to southern boundary of NWR.
[9] Tiffany Reach = From south boundary of BDA NWR, downstream to railroad trestle.
[10] San Marcial Reach = From railroad trestle, downstream through The Narrows to Elephant Butte Reservoir Pool (Monticello Bay)

Migrant – any WIFL that does not exhibit territorial behavior and is typically detected only during the period prior to June 10th.
Resident – a resident SWFL whose breeding status is unknown.
Unpaired Male – a resident SWFL that exhibited behavioral characteristics typical of a territorial flycatcher, however breeding was neither suspected nor confirmed
Pair – a SWFL territory where breeding was confirmed or behavioral evidence strongly suggested that pairing had occurred
Pair w/ nest – a SWFL territory where breeding was confirmed by the discovery of an active nest.

Table 3. SWFLs and territories documented for the first time during 4th or 5th surveys during 2017.

Survey Site	New SWFLs	New Territories
BA-05	2 (1 pair)	1
BA-06N	2 (1 pair)	1
BA-10	2 (1 pair)	1
DL-01a	2 (1 pair)	1
DL-02	2 (1 pair)	1
DL-08	2 (1 pair)	1
EB-09	17 (1 unpaired male, 8 pairs)	9
EB-13S	2 (1 pair)	1
EB-15	8 (4 pairs)	4
EB-16	4 (2 pairs)	2
EB-17	6 (3 pairs)	3
LF-44a	2 (1 pair)	1
LFCC-05b	2 (1 pair)	1
SV-06	2 (1 pairs)	1

Belen Reach

This reach extends from the southern boundary of the Pueblo of Isleta to the confluence of the Rio Puerco and Rio Grande and encompasses riparian habitat within the active floodplain. It contains 36 sites that were surveyed three times (with the exception of SV-11, 12, 13, 14 and 15, which were surveyed four times to increase the likelihood of WIFL detections). 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. Based on the 2016 habitat mapping/modeling effort (Siegle and Ahlers 2017), this reach ranks second behind San Marcial in overall abundance of suitable habitat (Figure 14). 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. The SWFL population in this reach has been slowly growing since pairing was first documented in 2005. During 2017 surveys, 101 WIFLs were recorded in this reach; 68 were determined to be migrants and the remaining 33 included 16 pairs and one unpaired male SWFL within three sites (Table 2).

Site BL-09 is located on the west side of the Rio Grande approximately 17 km (10.5 miles) upstream of the Highway 60 bridge at Bernardo (3825679 N 337557 E to 3822643 N 336576 E). Mature cottonwood galleries are the dominant vegetation type within this site. In many areas a dense understory of Russian olive or saltcedar is present. Most of this site is typically dry, particularly towards the western boundary, as it is perched above the river channel. However, high river flows during 2017 flooded lower lying portions of the site. During the past decade, several lower terraces or river bars have been colonized by native willows and several small patches of moderately suitable habitat have developed. Five nesting SWFL pairs were located in a patch of coyote willow, Russian olive and saltcedar during 2017 surveys.

Site BL-10 is on the east side of the Rio Grande immediately across the river from BL-09 (3825721 N 338192 E to 3822172 N 336839 E). Habitat within this site is dominated by a cottonwood gallery with a patchy understory of saltcedar, Russian olive and occasional

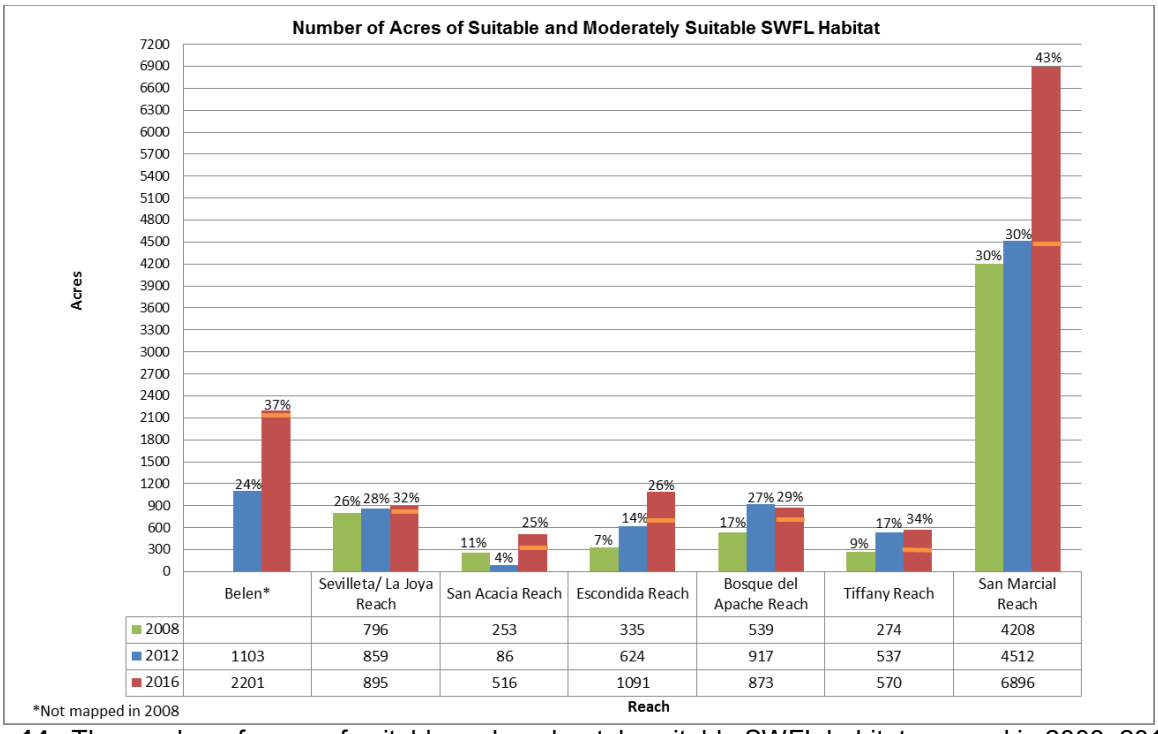


Figure 14. The number of acres of suitable and moderately suitable SWFL habitat mapped in 2008, 2012, and 2016 by river reach along the Middle Rio Grande, New Mexico. The percentage above each column is the percent of total potential habitat acreage within each reach that provided suitable and moderately suitable habitat. All acreage above the orange line in 2016 columns is the number of acres of SC/SC3d and SC4d, vegetation types reclassified to moderately suitable in 2016, within each reach.

coyote willow. Swaths of moderately suitable habitat comprised primarily of Russian olive and saltcedar have developed adjacent to the river and much of this habitat was flooded during the early breeding season in 2017. During 2017 surveys, 25 WIFLs were recorded within this site; these included 3 migrants and 11 nesting SWFL pairs.

Site BL-27 is immediately south of the Los Lunas (NM Hwy 6) bridge on the west side of the Rio Grande (3852770 N 342608 E to 3848584 N 341191 E). Mature woodlands comprised of cottonwood, mulberry, and saltcedar compose much of the habitat within the site, particularly away from the river. These areas are relatively dry and little woody regeneration is occurring. Adjacent to the river, lower terraces are being colonized by dense growths of coyote willow, Goodding's willow, cottonwood and saltcedar. Some of these patches were flooded during 2017 and are considered moderately suitable for breeding SWFLs. One unpaired male SWFL territory was documented in a swath of young, dense coyote willow in 2017.

Sevilleta/La Joya Reach

This reach extends from the confluence of the Rio Grande and Rio Puerco downstream to San Acacia Diversion Dam, encompassing the riparian habitat within the active floodplain. Lands within this reach are managed by the New Mexico Department of Game and Fish (La Joya State Waterfowl Area) and U.S. Fish and Wildlife Service (Sevilleta National Wildlife Refuge). All sites in this reach, with the exception of SV-08, were surveyed four times in 2017. 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. On lower terraces and river bars, moderate overbank flooding occurs during high flow events. The river channel within the downstream portion of this reach is not degraded due to the San Acacia Diversion Dam which backs-up water, allowing the portion immediately upstream of the dam to aggrade. Based on 2016 habitat mapping/modeling, 895 acres of suitable or moderately suitable habitat is located within this reach (Figure 14; Siegle and Ahlers 2017). During 2017, a total of 41 WIFLs were detected in this reach; 34 were determined to be migrants and the remaining seven consisted of one unpaired male SWFL and three pairs. Resident SWFLs were located in sites SV-06 and SV-07 (Table 2).

Site SV-06 is 6 km (3.7 miles) downstream of the Rio Grande/Rio Puerco confluence on the west side of the river (3801755 N 328855 E to 3797415 N 329795 E). Portions of this site not immediately adjacent to the river are dry and habitat is dominated by mid-aged cottonwood, Russian olive, and/or saltcedar. Closer to the river where the water table is shallower, younger natives have established and formed small stands of cottonwood or coyote willow often mixed with Russian olive. Large swaths of moderately suitable habitat occur in the southern end of the site. Three migrant WIFLs and three SWFL pairs were located in this site during 2017 surveys.

Site SV-07 is immediately across the Rio Grande from the southern half of SV-06 (3800075 N 329074 E to 3797415 N 329795 E). This site is dominated by large patches of overstory cottonwood and saltcedar. Smaller patches of mixed Russian olive, cottonwood, saltcedar and willow occur sporadically adjacent to the river. Due to the perched nature of this site, overbank flooding is rare, although old high-flow channels bisect the site and an unused ditch runs the length of it and rejoins the river in the southern end of the site. Three migrants WIFLs and one unpaired male SWFL were documented in this site in 2017.

Escondida Reach

The active floodplain between the Escondida Bridge and the northern Bosque del Apache NWR boundary comprises this survey reach. It is bounded by the LFCC to the west and upland habitat to the east. The 14 sites in this reach were each surveyed 5 times. This reach is similar hydrologically - although the river is less incised in areas - and vegetatively to the San Acacia Reach. Habitat is a mixture of cottonwood gallery, saltcedar and other woody shrubs of various heights and densities, and smaller patches of native willows along the river. Nearly 1,100 acres of suitable habitat were mapped in this reach in 2016 (Figure 14; Siegle and Ahlers 2017). Typically, little overbank flooding occurs although high river flows in 2017 flooded many lower lying areas for the first half of the survey season. During the past several years, mortality has been observed in certain patches of willows due to drought conditions. Ideally, flooding and/or a higher water table in 2017 reversed some of these trends. Small numbers of resident SWFLs have been documented in this reach since 2002. During 2017 surveys, 68 WIFLs were located including 54 migrants, two unpaired male SWFLs, and six breeding pairs (Table 2).

Site LF-08 is immediately north of the Bosque del Apache NWR on the west side of the river (3754715 N 328897 E to 3749334 N 328979 E). This is a long, narrow site dominated by mixed native and exotic vegetation. Much of the habitat is relatively young and sparse, dominated by saltcedar and seepwillow (*Baccharis salicifolia)*. A linear cottonwood gallery

occupies the southern portion of the site and patches of more mature saltcedar mixed with Russian olive and willow exist both along the levee road and the river. A large portion of this site was flooded in 2017. Thirteen WIFLs, including five migrants and four nesting SWFL pairs were documented during 2017 surveys.

Site LF-43a is located on the east side of the Rio Grande approximately 4 km (2.5 miles) upstream of San Antonio and the Highway 380 bridge (3761109 N 328195 E to 3758083 N 329348 E). The majority of this site is dominated by saltcedar in various age classes either growing monotypically or mixed with other species of riparian vegetation. A large, linear cottonwood gallery covers much of the southern half of the site and small strips of coyote willow, cottonwood and *Baccharis* form higher quality patches of WIFL habitat adjacent to the river. Two large patches of saltcedar within this site were cleared several years ago for exotic species control purposes. Aside from the lower riverside terraces, this site receives little overbank flooding. Six migrants and one unpaired male territory were located in this site during 2017.

Site LF-44a is located on the east side of the Rio Grande approximately 9 km (5.5 miles) upstream of San Antonio and the Highway 380 bridge (3765515 N 328063 E to 3762865 N 328052 E). The site is relatively wide and dominated by various age classes of saltcedar. The western side of the site is sparsely vegetated by smaller stature saltcedar, screwbean mesquite (*Prosopis pubescens*), and various weedy herbaceous species. Closer to the river are stringers of taller saltcedar mixed with Russian olive and occasional willows. Saltcedar has been cleared within certain portions of the site and several dirt roads bisect it. Due to the perched floodplain, little overbank flooding occurs and very little suitable SWFL habitat exists within the site. During 2017 surveys, six WIFLs, including four migrants and one SWFL pair were located in this site.

Site LF-45 is located on the east side of the Rio Grande between the Highway 380 bridge and the northern Bosque del Apache NWR boundary (3754736 N 329080 E to 3749275 N 329455 E). It is a relatively large site that is dominated by various age classes of saltcedar. An old ditch and berm system bisects much of the site north to south. East of the berm habitat is sparse and dry and composed of either open areas, weeds, or sparse saltcedar. Adjacent to the river, the saltcedar is often mixed with Russian olive, cottonwood, or willow to present higher quality SWFL habitat. Much of this site was flooded by high river flows during the summer of 2017. However, the site is usually dry. Four WIFLs, including one migrant WIFL, one unpaired male SWFL territory, and one pair, were located within this site in 2017.

Bosque del Apache Reach

This reach encompasses riparian habitat within the active floodplain of the Bosque del Apache NWR. Fourteen sites were each surveyed five times during 2017. Habitat within this reach varies widely from decadent, dense saltcedar to large, mature cottonwood galleries to dense patches of coyote willow and Russian olive. The Rio Grande within the northern portion of this reach is highly aggraded and a sediment plug causes major portions of the active floodplain to be inundated during high flows. Flooding of existing habitat increased suitability for breeding SWFLs between 2008 and 2010. Subsequently, multiple years of extreme drought eliminated overbank flooding and drew

down the water table. Much of the native component of the occupied habitat in this reach was either severely stressed or died between 2010 and 2013. Recently, however, the native vegetation has begun to recover in certain areas and in 2017 high river flows and the sediment plug covered the floodplain with as much as 10 feet of water. A total of 873 acres of suitable SWFL habitat was mapped within this reach in 2016 (Figure 14; Siegle and Ahlers 2017). During 2017, 44 WIFLs, including 17 migrants, 5 unpaired male SWFLs, and 11 pairs were detected in this reach (Table 2).

Site BA-05 is located on the west side of the Rio Grande immediately upstream of the main refuge entrance road and bridge over the LFCC (3744316 N 328879 E to 3741030 N 327004 E). Vegetation within this site is dominated by younger age classes of Russian olive, saltcedar, coyote willow and seepwillow along the river, with large patches of gallery cottonwood overstory. Drought conditions have negatively impacted habitat within this site since 2010. However, the site was flooded during the summer of 2017 by up to ten feet of water. During average water years, portions of the site often contain water or saturated soils for a large part of the summer. During 2017 surveys, 11 WIFLs were located in this site; 1 was determined to be a migrant WIFL and 10 SWFLs formed 5 pairs.

Site BA-06N is immediately south of the northern Bosque del Apache NWR boundary on the west side of the Rio Grande (3749294 N 328913 E to 3745590 N 328829 E). This site is relatively narrow, particularly on the northern end, and habitat consists of a mix of native and exotic vegetation. Saltcedar dominates much of the site away from the river. Nearer to the river, patches of young coyote willow, seepwillow, cottonwood and Russian olive have developed. This habitat, during higher river flows, is flooded due to this site's proximity to the sediment plug and, because of this flooding, was first colonized by breeding SWFLs in 2009. Severe drought between 2012 and 2016 severely limited the hydrology within this site and negatively impacted occupied SWFL habitat. During 2017, the entire site was again flooded for much of the summer and six WIFLs were documented. These included three migrants, one unpaired male, and one pair.

Site BA-06S is a relatively short (1.3 km) site that is approximately 4 km (2.5 miles) south of the northern Bosque del Apache NWR boundary on the west side of the river (3745590 N 328829 E to 3744316 N 328879 E). Habitat within this site consists primarily of saltcedar with a cottonwood and/or Goodding's willow canopy along the western levee, sparse mid-age saltcedar in the interior and young cottonwood, Russian olive and willow in the southern portion of the site along the river. During high river flows, this site receives overbank flooding due to its proximity to the sediment plug. However, occupied habitat within this site has declined in quality during the past five years due to drought conditions. In 2017, the site was again flooded during the majority of the summer. During the 2017 survey season, one migrant WIFL, one unpaired male SWFL and three pairs were located.

Site BA-07 is located on the east side of the Rio Grande across from sites BA-06N and BA-06S (3747044 N 329380 E to 3744284 N 328986 E). Habitat ranges from young stands of monotypic saltcedar to mixtures of willows, saltcedar and Russian olive to gallery cottonwoods. A large marsh occupies the northeastern end of the site. Lower lying areas of the site are flooded when river flows are high. Indeed, during 2017 the site was flooded by

up to 10 feet of water for much of the summer. A single unpaired male SWFL was documented within mixed native and exotic habitat during 2017.

Site BA-10 is a 2.5 km long site on the east side of the river approximately 7.5 km (4.6 miles) south of the northern refuge boundary (3742787 N 328318 E to 3740664 N 327026 E). Habitat within this site, particularly away from the river, is dominated by a mix of sparse saltcedar, Russian olive and coyote willow. Lower-lying areas along the eastern uplands regularly contain standing water. Several patches along the river contain a dense mix of cottonwood, coyote willow, saltcedar and Russian olive and provide higher quality SWFL habitat. Like most sites within this reach, drought has negatively impacted habitat during the past several years. However, extensive flooding was documented in this site during 2017 and 10 WIFLs were documented. Of these, four migrants, two unpaired male SWFLs and two pairs were recorded.

Tiffany Reach

The Tiffany Reach extends from the southern boundary of the Bosque del Apache NWR to the northern boundary of Elephant Butte Project Lands (i.e. San Marcial railroad trestle) and encompasses riparian habitat both within and outside the active floodplain of the Rio Grande. Much of the habitat in this reach was burned by the Tiffany Fire which began on June 26, 2017. Because of the fire, sites in this reach were only surveyed twice. Prior to the fire, vegetation in this reach consisted primarily of various age classes of saltcedar with occasional patches of Russian olive and native willows and cottonwoods, particularly near the river. A large, dry marsh also exists at the foot of Black Mesa, upstream from the railroad trestle. Portions of this reach receive overbank flooding during high river flows and a sediment plug in the southern end of this reach in both 2005 and 2008 forced river water through habitat in the southern end. A total of five WIFLs were recorded in this reach in 2017 – all were determined to be migrants (Table 2).

San Marcial Reach

This reach is the longest survey reach in the study area (52 km – 32 miles) and contains the most survey sites and SWFL territories. The length of this reach has more than tripled since 1995 when surveys began. The gradual recession of Elephant Butte Reservoir between 1998 and its recent low in 2013 exposed an additional 34 km (21 miles) of survey area. The reach extends from the north boundary of Elephant Butte Project Lands (i.e., San Marcial railroad trestle) downstream through the delta of Elephant Butte Reservoir. It encompasses 61 sites, both inside and outside the active floodplain. While these sites are typically surveyed five times each for project compliance, the Tiffany Fire prevented access to a portion of the reach during 2017 and certain sites were only surveyed three or four times. Habitat in this reach consists of some of the best native SWFL habitat within the subspecies' range. A total of 6,896 acres of suitable habitat was mapped in this reach in 2016 (Figure 14; Siegle and Ahlers 2017) – by far the highest total of any study reach. Vast expanses of native Goodding's willow and coyote willow habitat formed in the conservation pool of Elephant Butte Reservoir as the reservoir receded during the late 1990's and early 2000's. This habitat, located primarily on the west side of the floodplain, is irrigated by the LFCC outfall which filters through the interspersed patches of willow, saltcedar, and cattail (*Typha* sp.) marsh. River channel degradation through the San Marcial Reach in 2005 lowered the water table in this reach which negatively impacted suitable SWFL habitat. More recently, prolonged flooding from the LFCC outfall followed by drought has impacted high quality habitat within the Elephant Butte

Reservoir pool. Smaller patches of high quality habitat have also developed outside the reservoir pool during the past several years. During 2017 surveys, 668 WIFLs, including 188 migrants, 34 unpaired males, and 223 pairs were recorded in the San Marcial reach. This reach continues to contain one of the largest breeding populations within the SWFL's range (Table 2).

Site LF-17 is located in the northern end of the conservation pool of Elephant Butte Reservoir, and south of the LFCC outfall (3718796 N 308899 E to 3718303 N 307471 E). 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. Then, in 2009, the boundary between LF-17 and 17b was adjusted eastward to encompass the SWFL territories that had moved into more suitable habitat to the east. Due to water provided by the LFCC outfall and slowed by beaver activity, standing water has historically been present throughout portions of this site. Over the past five years however, drought conditions have reduced the extent of flooding, particularly later in the summer. Habitat quality within much of this site has declined during the past several years as vegetative dominance shifted towards saltcedar and territory numbers have declined accordingly. Territory numbers in this site peaked in 2008 at 32 and have declined since. During 2017, 12 WIFLs were located in this site including 1 migrant, 3 unpaired males SWFL territories and 4 pairs.

Site LF-17a is located immediately north of LF-17 adjacent to the LFCC outfall (3719016 N 309039 E to 3718308 N 309016 E). The higher quality habitat within this site adjacent to the LFCC is a mixture of native willows interspersed by high-flow channels filled with cattails. Between the years 2000 and 2010, habitat in this site expanded so that these cattail-filled high-flow channels were nearly filled in with native willows. A large patch of cattails is still present in the northwestern end 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, receives regular flooding. However, sediment deposition and associated aggradation within this site, in combination with drought conditions which have reduced flows in the LFCC, has resulted in drier than normal conditions over the past several years. Habitat has been stressed by the alternation of prolonged flooding and drought, although the high quality occupied habitat has recently shown signs of regeneration. During 2017, 16 WIFLs, including 11 migrants, 1 unpaired male SWFL and 2 pairs were located in this site.

Site LFCC-01 is on the west side of the LFCC outside of the active Rio Grande floodplain and just north of site LF-17a (3719889 N 310952 E to 3718675 N 309560 E). It is a large site that contains vast expanses of open water bordered by dense saltcedar, cattail marsh, or cottonwood and willow. Small patches of moderately-suitable SWFL habitat occur throughout the site with the best being small patches of young cottonwood, saltcedar, and coyote willow adjacent to the LFCC. These patches have expanded in recent years and are often flooded due to water provided by the LFCC and/or a high water table. In late July 2015, a wildfire burned through the mixed cattail/willow/saltcedar habitat on the eastern edge of the site, resulting in a total loss of this habitat. Three SWFL territories, including two nesting pairs, had been located in this habitat prior to the fire. Fortunately, the fire spared the

largest occupied patch of habitat in the southern end of the site. During 2017, 35 WIFLs were located in this site. These include one unpaired male SWFL and 17 pairs.

Site LFCC-02 is also outside the active floodplain and directly north of LFCC-01 on the west side of the LFCC (3720110 N 311419 E to 3719889 N 310952 E). Habitat varies widely in this site. In the northwestern portion, there is a large open water area that is usually flooded and bordered by a cattail marsh. Surrounding the open water and cattail marsh, where water is shallower or absent, large stands of mixed cottonwood and saltcedar have grown. Much of the cattail marsh and surrounding cottonwood and saltcedar habitat were burned in the 2015 fire. The highest quality SWFL habitat in this site occurs in the northeastern corner of the site adjacent to the powerline right-of-way. This habitat consists of dense, monotypic saltcedar or mid-aged Goodding's willow and was mostly spared by the 2015 fire. The Tiffany Fire in 2017 burned immediately north of the site. Hydrology is provided presumably by seepage from both the uplands and the LFCC. During 2017 surveys, 45 WIFLs were located. These include 7 migrants, 4 unpaired male SWFLs and 17 pairs.

Site LFCC-05b is another large site located to the west of the LFCC and outside of the active floodplain. It is approximately 4 km (2.5 miles) south of the San Marcial railroad trestle (3725558 N 314857 E to 3722974 N 314143 E). The entire site burned in the Tiffany Fire during late June and early July 2017. Habitat within the site was dominated by saltcedar in varying densities and heights. Scattered willows and cottonwoods were established within the saltcedar matrix in the northern and southern portions of the site where hydrology is more conducive to native riparian plant success. The interior and eastern edge of the site were very sparsely vegetated. Standing water occurs occasionally in the low-lying ditch adjacent to the eastern levee road. Prior to the Tiffany Fire in 2017, the highest quality SWFL habitat consisted of a mix of saltcedar, willows and cottonwoods on the northeastern boundary of the site. A total of 33 WIFLs were observed in this site prior to the 2017 fire. These included 8 migrants, 3 unpaired male SWFLs, and 11 SWFL pairs.

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 was one of the most heavily occupied SWFL sites in the Middle Rio Grande between 2002 and 2008. 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. Habitat within this site, although once highly suitable, has declined in quality during the past decade. Initially, encroachment by cattails and excessive flooding from the LFCC outfall had greatly thinned the native Goodding's willow and caused the high quality habitat, and consequently the occupant SWFLs, to move east toward site DL-01a. Because of this fact, in 2009 the eastern boundary was shifted further east to encompass SWFLs occupying improving habitat to the east. More recently, drought and reduced flows within the LFCC have dried the habitat significantly. Habitat within this site currently consists of vast swaths of cattails interspersed by small patches of willow and saltcedar. One breeding SWFL pair was located in this site during 2017.

Site DL-01a was initially included in Site DL-01, but was split out several years ago to give increased attention to the large SWFL population which formerly occupied DL-01. The site

is in the northern end of the Elephant Butte Reservoir conservation pool approximately 2 km (1.2 miles) south of the LFCC outfall (3717453 N 308282 E to 3716809 N 307932 E). The majority of habitat in this site is young to mid-aged saltcedar. Sporadic stands of Goodding's willow, coyote willow and cattails are interspersed with the saltcedar on the western edge of the site. Many of these natives have died due to water stress. On the eastern edge of the site, there are also scattered native willows and cottonwoods mixed in with the overall saltcedar matrix. However, many of the native trees have died presumably due to a lack of groundwater. During 2017 surveys, 25 WIFLs, including 5 migrants and 10 SWFL pairs were located within this site.

Site DL-02 is immediately south of DL-01 in the Elephant Butte Reservoir conservation pool (3716809 N 307932 E to 3715299 N 306713 E). Habitat within most of the site is very similar to DL-01 and has experienced a similar decline in quality during the past several years. High quality habitat is currently limited in the site and consists of stands of mid-aged Goodding's willow and coyote willow, a sparse saltcedar understory, and large expanses of cattails. When the LFCC is flowing, the western and central portions of the site are regularly flooded. However, for the past several years these areas dried significantly which may actually benefit the habitat by providing a break from flooding. The northeastern side of the site, where groundwater is deeper, is dominated by various age classes of saltcedar. This site was the most heavily occupied site in the study area between 2010 and 2012, when nearly 60 territories were documented annually. However, a significant reduction in territories has occurred since. SWFLs in this site were formerly concentrated in a swath of high quality native habitat occurring in the western side of the site. This concentration has moved eastward during the past several years as previously high quality habitat has declined due to prolonged flooding and encroachment by cattails. Currently occupied habitat consists of a greater saltcedar component and has been unusually dry for the past five years. Ten migrant WIFLs, 4 unpaired male SWFL territories and 6 SWFL pairs were documented in this site in 2017, for a total of 26 WIFLs.

Site DL-05, located within the Elephant Butte Reservoir pool on the east side of the river (3714748 N 307408 E to 3713246 N 306814 E), is a relatively dry site that extends to the eastern bluffs. A majority of the habitat in this site is too sparse for SWFL habitation and consists of various ages of saltcedar or weedy openings. A large swath of Goodding's willow exists in the interior of the site and small patches of higher quality habitat have either persisted or established adjacent to the Delta Channel (the maintained alignment of the Rio Grande within the Elephant Butte Reservoir pool). These patches also contain a saltcedar component but present higher quality SWFL habitat. Ten WIFLs, including one migrant, one unpaired male SWFL and four SWFL pairs, were located in this site during 2017 surveys.

Site DL-06 is immediately south of Site DL-02 on the west side of the Delta Channel 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. A braided high-flow channel of the LFCC traverses the site and provides flooded conditions during higher flows; however, the northern and eastern portions of the site are very dry. For the past five years, very little, if any, water flowed through this site and habitat quality has visibly declined. In 2017, seven

WIFLs were observed including two migrant WIFLs, one unpaired male SWFL, and two SWFL pairs.

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 along the western edge adjacent to 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 outfall is present in sufficient quantity. However, drought conditions over the past several years have greatly dried this site and both willow and marsh habitat has suffered. During 2017 surveys, 15 WIFLs were located in this site. These included three migrant WIFLs, two unpaired male SWFLs and five SWFL pairs.

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 mid-aged saltcedar, Goodding's willow, coyote willow, and seepwillow. Several patches of high quality SWFL habitat exist adjacent to the LFCC outfall and portions of the site are regularly flooded or contain standing water when LFCC flows are high. The very southern end of this site burned in August of 2011. Territories in this site were immediately adjacent to the LFCC outfall in mid-age stands of native willows and saltcedar. During 2017 surveys, 27 WIFLs were recorded in this site. Of these, 4 were migrant WIFLs, 3 were unpaired male SWFLs and 20 formed 10 breeding SWFL pairs.

Site DL-09, located directly south of DL-07 and north of the LFCC outfall/Delta Channel 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. Most of these cattails burned in August of 2011 and have not regenerated given the recent drought. Several large patches of high quality Goodding's willow habitat, with sparse saltcedar and coyote willow in the understory, exist along the western side of the site. However, due to several years of drought, most of the willow patches are stressed or dying. Some of these willow patches also burned during the fire. Floodwater typically covers much of this site but has been almost entirely absent for the past five years. During 2017 surveys, six WIFLs were located in this site including two migrants, two unpaired male SWFLs and one SWFL pair.

Site DL-10 is located directly north of the LFCC outfall/Rio Grande confluence and bordered by the Delta Channel on the east (3713090 N 306690 E to 3711593 N 304811 E). Several large swaths of suitable SWFL habitat are scattered throughout this site. This habitat consists of Goodding's willow with or without a mixture of saltcedar and occasional cottonwood or coyote willow. However, during the past several years this site has been very dry and many of the native willows have suffered. The southern half of the site is almost exclusively cattail marsh, most of which burned during the fire of 2011 and has not regenerated. Several willow patches were also burned. Two migrant WIFLs and one SWFL pair were documented in this site in 2017.

Site DL-12 is located immediately west (and across the LFCC outfall) of sites LF-17, DL-01, and DL-02. The site is narrow and is bounded by the LFCC primary water course along the

east and uplands on the west (3719016 N 309039 E to 3715506 N 306009 E). Lower areas adjacent to the LFCC are flooded during higher LFCC flows. Habitat is comprised of narrow patches of cottonwood, Goodding's willow, coyote willow, and saltcedar. A large cattail marsh separates this site from the occupied sites to the east. Occupied habitat consists of a saltcedar matrix interspersed with occasional Goodding's willow, coyote willow, and cottonwood. In 2013, this site became the most heavily occupied site in the study area. This trend has continued through 2017 when a total of 77 WIFLs were recorded. These included 5 migrants and 36 SWFL pairs.

Site EB-01 is a long, narrow site that encompasses 4 km (2.5 miles) of riparian habitat within Elephant Butte Reservoir pool on the west side of the river immediately upstream of Nogal Canyon (3712009 N 304210 E to 3708220 N 302630 E). A majority of this site is cattail marsh. However, small patches of suitable SWFL habitat exist throughout the site, particularly adjacent to the river and its confluence with the LFCC. These patches have become heavily occupied by breeding SWFLs in recent years. Historically, this site has been flooded by groundwater and the LFCC outfall and, indeed, it contained standing water for much of the 2017 season. An occupied patch of habitat burned during the fire of 2011 and localized cattle use (i.e. grazing and loafing) has severely impacted small patches of native habitat. A total of 34 WIFLs were documented in this site in 2017 including 13 migrants, 1 unpaired male SWFL territory, and 10 SWFL pairs.

Site EB-07 is located to the west of the Delta Channel approximately 5 km (3.1 miles) upstream of the Elephant Butte Reservoir Narrows (3705885 N 299727 E to 3701965 N 299342 E). The northern end of this site is dominated by a mix of young saltcedar, seepwillow and cattail marsh. The rest of the site is a mix of cattail marsh and mid-aged Goodding's willow. Much of the cattail marsh has died due to the recent drought. Portions of this site are kept wet by seepage from adjacent uplands, at least in normal years. Four migrant WIFLs and three SWFL pairs were located in this site during 2017.

Site EB-09 is located within the pool of Elephant Butte Reservoir immediately upstream of The Narrows (3701931 N 299615 E to 3698740 N 298618 E). This site formerly contained some of the best young native habitat in the entire study area. Large swaths of Goodding's and coyote willow, interspersed with open water and cattail marsh, developed as reservoir levels dropped and irrigation of habitat was provided by both a breach of the riverside levee and seepage from adjacent uplands. Standing water or saturated soils were present along much of the western edge of the site. The water table is lower along the eastern (river) side of the site but still supported a large swath of native willows and cottonwoods. Currently, native habitat is suffering from years of drought. Willows have either died or are exhibiting signs of severe stress and saltcedar has encroached. However, a levee breach in 2017 again moved water through the site for much of the summer which may help rejuvenate the habitat. Additionally, many patches of habitat have remained attractive to breeding SWFLs. During 2017, 31 WIFLs were located in EB-09. These included 8 migrants, 1 unpaired male SWFL, and 11 pairs.

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 seepwillow to cattail marsh. Large side canyons contain high quality Goodding's willow habitat. Portions of this site normally contain saturated soils due to seepage from nearby uplands. In 2009 and 2010, rising reservoir levels flooded most of this site making surveying difficult. Between 2011 and 2017, most of this site was dry, as the reservoir has receded. In 2016, the SWFL population in EB-15 expanded into the southern end of this site. Occupied habitat consists of a relatively narrow strip of saltcedar mixed with sparse Goodding's willow immediately adjacent to the Delta Channel. In 2017, 22 WIFLs were recorded. These included 10 migrants and 6 SWFL pairs.

Site EB-15 is immediately downstream of The Narrows and encompasses the Monticello Bay portion of Elephant Butte Reservoir (3691076 N 296957 E to 3689874 N 297269 E). This site was surveyed in its entirety for the first time in 2012. Previously, a lack of habitat and elevated reservoir levels prevented surveys. Habitat within this site has developed rapidly due to the high water table provided by a fluctuating reservoir and seepage from nearby uplands. Much of the habitat within the site is still very young and sparse but some very high quality habitat consisting of a mix of saltcedar and Goodding's willow has developed in the northern and eastern portions adjacent to the Delta Channel. A rising reservoir flooded the southern portion of this site in 2017. Within the high quality habitat adjacent to the Delta Channel, a total of 64 WIFLs were located during 2017 surveys. These consisted of 6 migrants, 4 unpaired male SWFLs and 27 SWFL pairs.

Site EB-16 was formally surveyed for the first time in 2013. It is located on the east side of the reservoir pool downstream of The Narrows (3691041 N 296981 E to 3687844 N 299187 E). This site has been partially inundated by fluctuating reservoir levels and, due to these hydrologic conditions, has developed patches of high quality SWFL habitat during the past five years. This habitat is a mixture of Goodding's willow, coyote willow and saltcedar and has developed very rapidly. Currently, two patches of habitat are occupied by breeding SWFLs; one immediately below The Narrows that consists of a mix of saltcedar and willows and one on the southeastern edge of Monticello Point that has a greater willow component. Much of this site was flooded by reservoir water during 2017. During 2017 surveys, 80 WIFLs and 36 territories were recorded in this site, tying it with DL-12 for highest occupancy. The 80 WIFLs included 10 migrants, 2 unpaired male SWFLs, and 34 SWFL pairs.

Site EB-17 is a large site immediately south of EB-16 and Monticello Point within the Elephant Butte Reservoir pool (3689874 N 297269 E to 3685365 N 298868 E). Much of this site is periodically inundated by fluctuating reservoir levels. Indeed, in 2017 much of the site was under as much as eight feet of water. However, the northern portion of the site has dried out occasionally during the past five years and has been colonized by large stands of willows and saltcedar. These stands have grown rapidly due to an abundant water supply and currently are comprised of high quality SWFL breeding habitat. Within this habitat, 26 WIFLs were documented in 2017. These consisted of 15 migrants, 1 unpaired male SWFL, and 5 SWFL pairs.

Nest Searches/Monitoring

In 2017, 351 nests were monitored within the Middle Rio Grande. Of these, 78 nests were successful, while 229 failed, and the outcome of 44 nests was unknown. An estimated 196 SWFL young fledged during the 2017 breeding season. Documented nesting attempts confirmed the existence of 235 pairs; 24 additional pairs were observed and, although nesting was suspected, nests were not located in any of these territories. Successful nests include those which fledged young or supported chicks at least eight days old on the last nest visit and every effort was made to monitor nests until nestlings were at least ten days old.

The following is a reach-by-reach summary of the SWFL nest monitoring efforts of 2017. It is important to note that the number of nests found per site or reach should not be used as a direct measure of breeding activity. Although every reasonable effort was made to locate the nests of breeding pairs, the availability of qualified personnel and logistics limited the extent of nest searching in some areas. The number of territories found within each reach or site should be used in lieu of nests. See Appendix B for detailed nest monitoring data forms.

Belen Reach

For several years following the initiation of surveys in this reach, the only nesting documented was immediately north of the Rio Puerco/Rio Grande confluence in site SV-11. This site consists of dense, mature saltcedar immediately adjacent to a river bar covered by young coyote willow. For the past several years, however, this site has been unoccupied and nesting SWFLs in this reach are located further upstream. The number of SWFL territories in this reach increased greatly between 2008 and 2013. Since then, territory numbers have been fairly stable (Table 4). Recently, the bulk of these territories have been in sites BL-09 and BL-10. Occupied habitat within these sites is located on lower riverside terraces and is in the form of a mix of Russian olive, saltcedar, and coyote willow. A higher water table promotes dense vegetation growth at these sites. A total of 27 nests was monitored in this reach in 2017; 16 were depredated, 3 were parasitized by a cowbird, 1 was abandoned and 8 nests successfully fledged 21 young (as noted in Table 4, some nests can be both parasitized and depredated).

Table 4. Summary of SWFL nest monitoring (2002 to 2017) – Belen Reach.

Year	# Territories	# Pairs	# Nests found*	# Nests parasitized (%)**	# Nests depredated (%)**	# Nests abandoned (%)**	Unknown success	# Successful nests (%)	Estimated total # chicks fledged	Estimated productivity (# chicks per successful nest)
2002	1	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2003	N/S									
2004	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2005	4	1	2	1 (50%)	0	1 (50%)	0	1 (50%)	2	2.0
2006	1	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2007	10	1	2	1 (50%)	2 (100%)	0	0	0	0	N/A
2008	4	1	1	0	0	0	0	1 (100%)	3	3.0
2009	3	3	3	0	1 (50%)	0	1	1 (50%)	1	1.0
2010	6	4	3	1 (33%)	2 (67%)	0	0	0	0	N/A
2011	9	4	3	0	0	1 (50%)	1	1 (50%)	3	3.0
2012	14	9	10	0	1 (10%)	0	0	9 (90%)	18	2.0
2013	23	17	22	2 (9%)	7 (32%)	1 (5%)	0	14 (64%)	36	2.6
2014	18	16	14	0	4 (29%)	0	0	10 (71%)	26	2.6
2015	17	16	17	1 (7%)	2 (13%)	1 (7%)	2	11 (73%)	31	2.8
2016	20	13	21	1 (7%)	6 (46%)	2 (15%)	8	4 (31%)	14	3.5
2017	17	16	27	3 (11%)	16 (59%)	1 (4%)	0	8 (30%)	21	2.6
Total	147	101	125	10 (9%)	41 (36%)	7 (6%)	12	60 (53%)	155	2.6

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

Sevilleta/La Joya Reach

SWFL nesting was first documented in this reach in 1999 when four pairs produced three nests. During the following years, nest abundance in this reach increased annually to a high of 21 nests in 2004 (Table 5). Following this peak, nest abundance fluctuated and gradually decreased to zero nests monitored during the summers of 2014 and 2015. During 2017, one nest was located in this reach and its fate was unknown.

Table 5. Summary of SWFL nest monitoring (1999 to 2017) – Sevilleta/La Joya Reach

Year	# Territories	# Pairs	# Nests Found*	# Nests parasitized (%)**	# Nests depredated (%)**	# Nests abandoned (%)**	Unknown success	# Successful nests (%)	Estimated total # chicks fledged	Estimated productivity (# chicks per successful nest)
1999	4	4	3	0	0	1 (33%)	0	2 (67%)	5	2.5
2000	8	5	6	2 (33%)	0	2 (33%)	0	3 (50%)	6	2.0
2001	11	10	9	4 (50%)	1 (13%)	0	1	6 (75%)	12	2.0
2002	13	10	13	4 (31%)	6 (46%)	0	0	8 (62%)	16	2.0
2003	17	9	12	1 (9%)	3 (27%)	4 (36%)	1	4 (36%)	10	2.5
2004	19	18	21	5 (36%)	7 (50%)	0	7	7 (50%)	14	2.0
2005	17	10	10	0	1 (25%)	2 (50%)	6	1 (25%)	3	3.0
2006	21	15	18	4 (25%)	6 (38%)	1 (6%)	2	8 (50%)	20	2.5
2007	14	8	6	2 (33%)	2 (33%)	0	0	4 (67%)	11	2.8
2008	31	18	13	4 (36%)	3 (27%)	4 (36%)	2	4 (36%)	9	2.3
2009	18	15	14	5 (36%)	5 (36%)	0	0	5 (36%)	14	2.8
2010	13	9	10	2 (20%)	5 (50%)	0	0	3 (30%)	7	2.3
2011	9	7	6	2 (40%)	4 (67%)	0	0	1 (17%)	3	3.0
2012	6	5	5	0	4 (80%)	0	0	1 (20%)	1	1.0
2013	4	4	6	1 (25%)	2 (50%)	0	2	1 (25%)	2	2.0
2014	4	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2015	8	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2016	5	4	1	n/a	n/a	n/a	1	n/a	n/a	n/a
2017	4	3	1	n/a	n/a	n/a	1	n/a	n/a	n/a
Total	222	154	154	36 (27%)	46 (35%)	14 (11%)	23	57 (44%)	130	2.3

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

Escondida Reach

Only a handful of unpaired male territories were documented in this reach prior to 2011. Habitat quality has slowly increased during the past five or six years as river bars and islands formed and dense stands of coyote willow established. Additionally, the growing SWFL population within both the Belen and Bosque del Apache Reaches have acted as source populations for sites in the Escondida Reach. Nesting was first documented in this reach during 2012 when eight pairs and six nests were located. Pair and nest abundance has fluctuated during the past five years; in 2017 six pairs produced nine nests in this reach.

Bosque del Apache Reach

Since the first SWFL nest was documented in this reach in 2003, territories and associated nest numbers increased until 2012, when numbers began to decline (Table 6). The increase was due in large part to a drastic improvement in habitat quality and quantity stimulated by overbank flooding from the sediment plug which formed in 2008. Nest abundance increased from a single nest in 2003 to a high of 38 documented in 2012. Due to degrading habitat caused by the recent drought, nest abundance began to decrease in 2013 and this decrease has continued. During 2017, the 11 documented pairs produced 16 nests. Of these, 5 were successful and fledged a total of 12 SWFL young.

Table 6. Summary of SWFL nest monitoring (2003 to 2017) – Bosque del Apache NWR.

Year	# Territories	# Pairs	# Nests found*	# Nests parasitized (%)**	# Nests depredated (%)**	# Nests abandoned (%)**	Unknown success	# Successful nests (%)	Estimated total # chicks fledged	Estimated productivity (# chicks per successful nest)
2003	3	1	1	0	0	0	0	1 (100%)	1	1.0
2004	1	1	2	1 (50%)	1 (50%)	0	0	1 (50%)	3	3.0
2005	0	0	0	0	0	0	0	0	0	0
2006	4	1	1	0	1(100%)	0	0	0	0	0
2007	7	6	1	0	0	0	1	0	0	0
2008	5	3	2	0	0	0	2	0	0	0
2009	20	16	19	1 (6%)	5 (28%)	1 (6%)	1	11 (61%)	28	2.3
2010	34	22	25	1 (4%)	8 (35%)	1 (4%)	2	14 (61%)	38	2.7
2011	49	30	34	4 (12%)	15 (44%)	3 (9%)	0	12 (35%)	32	2.7
2012	51	29	38	10 (28%)	19 (53%)	1 (3%)	2	9 (25%)	22	2.4
2013	27	19	20	7 (35%)	11 (55%)	0	0	4 (25%)	11	2.8
2014	23	13	17	2 (13%)	8 (53%)	1 (7%)	2	4 (27%)	9	2.3
2015	11	6	5	1 (50%)	0	0	3	2 (100%)	6	3.0
2016	17	13	1	n/a	n/a	n/a	1	n/a	n/a	n/a
2017	16	11	16	4 (27%)	7 (47%)	1 (7%)	1	5 (33%)	12	2.4
Total	271	171	182	31 (19%)	75 (45%)	8 (5%)	15	63 (38%)	162	2.6

Unknowns not included in nest variable calculation.

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

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

Tiffany Reach

With the exception of 2004, when 11 nests were documented, the number of SWFL nests located within this reach has been limited and sporadic. Nest numbers fluctuated between zero and four from 2005 to 2010 and nesting has not been documented since 2010. A total of 19 nests have been

monitored in this reach since 2004 and overall nesting success was relatively high (65 percent). No nesting was documented in this reach in 2017.

San Marcial Reach

A total of 223 pairs and 298 nests (including renests and second broods) were documented within this reach in 2017 (Table 7). The majority –178 pairs and 233 nests - are located within the conservation pool of Elephant Butte Reservoir. This population, after experiencing huge increases since its discovery in 1996, appears to have levelled off. Pair numbers have fluctuated slightly since the peaks documented in 2010 and 2011 and 223 SWFL pairs were documented in this reach in 2017. Nest numbers have also fluctuated since 2010 and in 2017 the highest nest count to date (298) was recorded in this reach. Nesting activity was confirmed for 201 pairs and, while the remaining 22 pairs likely nested, nests were not found. Fledging of SWFL young occurred in 63 of the 257 nests with known outcomes, for an overall nest success rate of 25 percent. Nest depredation continued to be higher than average in 2017 and accounted for 63 percent of nest fates in the San Marcial Reach. BHCO parasitism was observed in 28 nests (11 percent) and 13 nests (5 percent) were abandoned. A total of 158 SWFLs were assumed to have fledged from this reach in 2017.

Hydrology Monitoring

To investigate microscale impacts of hydrology on SWFL reproduction, hydrology data were compared to SWFL nest variables (i.e., success, productivity, depredation, and BHCO parasitism). During 2017, 93 percent of nests with known outcomes (n = 307) were within 100 m of surface water and 82 percent were within 50 m of surface water. Although an apparent trend of higher nest success at nests further from water compared to nests closer to water was observed, we found no significant difference (Page A3). Productivity of successful nests less than 100 m from water was statistically greater than those greater than 100 m from water (W=-132.0, Df=1, P=0.01; Page A4). No difference in productivity was found for nests within versus greater than 50 m from water (Page A4). Four classes were used to analyze nesting variables based on hydrology immediately under each nest: dry all season, saturated/flooded then dry, saturated all season, and flooded all season (a subset of saturated all season). Of all nests monitored in 2017, 59 percent were dry all season, 9 percent were saturated or flooded then dried, 32 percent were saturated all season, and 10 percent were flooded all season (n=307). Although nests that were dry all cycle were numerically more successful, based on a Chi-square test, there was no difference in nesting success based on hydrology under the nest (χ^2=3.95, Df=3, *P*=0.27; Page A1). Productivity was also similar between the four different classes ($F_{(3, 78)}$=0.48, P=0.70). Additionally, there was no significant difference in depredation rates by hydrology under the nest (χ^2=4.93, Df=3, *P*=0.18; Page A1). Lastly, BHCO parasitism rates were similar for the three classes with sample sizes sufficient for analysis (dry all cycle, saturated/flooded then dry, and saturated/flooded all cycle - χ^2=5.17, Df=2, *P*=0.08; Page A2).

Table 7. Summary of SWFL nest monitoring in the San Marcial Reach (1996 to 2017).

Year	# Territories	# Pairs (% of total territories)	# Nests found*	# Nests parasitized (%)**	# Nests depredated (%)**	# Nests abandoned (%)**	Unknown success	# Successful nests (%)	Estimated total # chicks fledged	Estimated productivity (# chicks per successful nest)
1996	13	1 (8%)	1	0	0	1 (100%)	---	0	0	---
1997	10	3 (30%)	2	0	0	0	0	2 (100%)	4	2.0
1998	11	4 (36%)	2	0	0	0	0	2 (100%)	7	3.5
1999	12	5 (42%)	5	1 (20%)	0	1 (20%)	0	4 (80%)	10	2.5
2000	23	20 (87%)	19	2 (12%)	1 (6%)	2 (12%)	2	14 (82%)	29	2.1
2001	25	25 (100%)	36	0	7 (19%)	2 (6%)	0	27 (75%)	79	2.9
2002	60	50 (83%)	66	11 (17%)	19 (29%)	6 (9%)	0	36 (55%)	≥86	2.4
2003	82	67 (82%)	96	17 (18%)	31 (33%)	13 (14%)	3	48 (52%)	≥126	2.6
2004	113	92 (81%)	153	25 (17%)	48 (32%)	15 (10%)	4	71 (48%)	187	2.6
2005	107	77 (72%)	127	16 (13%)	37 (31%)	7 (6%)	7	68 (57%)	≥197	2.9
2006	142	117 (82%)	148	15 (10%)	47 (33%)	11 (8%)	4	83 (58%)	≥213	2.6
2007	197	153 (78%)	220	29 (14%)	40 (19%)	31 (15%)	10	117 (56%)	320	2.7
2008	235	168 (71%)	186	5 (3%)	56 (34%)	16 (10%)	23	87 (53%)	209	2.4
2009	319	224 (70%)	294	37 (14%)	90 (33%)	26 (10%)	21	129 (47%)	356	2.8
2010	298	235 (79%)	241	23 (10%)	110 (50%)	14 (6%)	20	82 (37%)	202	2.5
2011	318	237 (75%)	240	48 (23%)	80 (38%)	9 (4%)	30	92 (44%)	208	2.3
2012	252	181 (72%)	223	30 (14%)	106 (51%)	12 (6%)	16	65 (31%)	153	2.4
2013	266	182 (68%)	173	20 (13%)	78 (49%)	1 (1%)	13	72 (45%)	164	2.3
2014	307	205 (67%)	255	28 (12%)	142 (62%)	8 (4%)	27	58 (25%)	151	2.6
2015	300	224 (75%)	287	35 (13%)	130 (50%)	10 (4%)	25	100 (38%)	272	2.7
2016	303	209 (69%)	256	21 (10%)	102 (47%)	20 (9%)	38	87 (42%)	238	2.7
2017	257	223 (87%)	298	28 (11%)	161 (63%)	13 (5%)	41	63 (25%)	158	2.5
Total	3650	2702 (74%)	3328	391 (13%)	1286 (42%)	218 (7%)	284	1307 (43%)	3369	2.6

Unknowns not included in nest variable calculation.

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

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

Discussion

Presence/Absence Surveys

Overview of Middle Rio Grande Surveys

As shown in Figure 15 and Table 8, the number of SWFL territories within Reclamation survey sites has dramatically increased since 1999. The vast majority of these territories (74 percent) have been found within Elephant Butte Reservoir. Suitable SWFL habitat developed within the exposed reservoir pool in conjunction with the receding reservoir from the late-1990s to 2005 (Figure 16). This habitat continued to develop into the largest expanse of suitable native SWFL habitat in the range of the subspecies. As of the 2016 habitat mapping/modeling effort (Siegle and Ahlers 2017), nearly 7,000 acres of suitable and moderately suitable habitat were located within the San Marcial Reach, most of which is in the conservation pool of Elephant Butte Reservoir. However, in recent years, much of the suitable habitat in the reservoir pool as well as that upstream of the reservoir has declined in quality. Adverse changes due to an incised river channel, prolonged flooding, and drought have all contributed to reduced habitat quality.

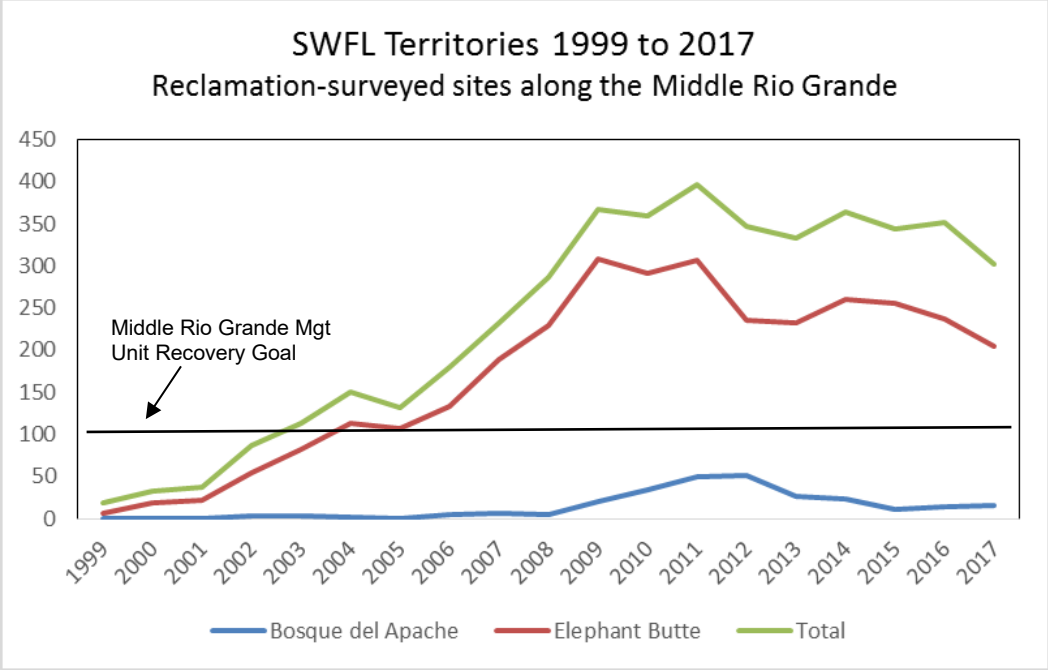


Figure 15. Overview of SWFL territories within the Middle Rio Grande – 1999 to 2017.

Table 8. Reach summary of SWFL territories/pairs within the active floodplain of the Rio Grande surveyed by Reclamation between 1995 and 2017.

Reach	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
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
Frijoles	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
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
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
San Acacia	n/s	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
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
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
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
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

Reach	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Velarde	1 T 0 P	0	0	0	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Frijoles	n/s	n/s	1 T 0 P	1 T 0 P	n/s	2 T 1 P	0	1 T 0 P	0	0	0	0
Belen	1 T 0 P	10 T 1 P	4 T 1 P	3 T 3 P	6 T 4 P	9 T 4 P	14 T 9P	23 T 17 P	18 T 16 P	17 T 16 P	20 T 13 P	17 T 16 P
Sevilleta/ La Joya	21 T 15 P	14 T 8 P	31 T 18 P	18 T 14 P	13 T 9 P	9 T 7 P	6 T 5 P	4 T 4 P	4 T 0 P	8 T 0 P	5 T 4 P	4 T 3 P
San Acacia	0	0	2 T 0 P	1 T 0 P	0	0	0	0	0	0	0	0
Escondida	1 T 0 P	0	1 T 0 P	0	4 T 0 P	8 T 2 P	23 T 8 P	8 T 5 P	4 T 0 P	7 T 1 P	5 T 4 P	8 T 6 P
Bosque del Apache	4 T 1 P	7 T 6 P	5 T 3 P	20T 16 P	34 T 22 P	49 T 30 P	51 T 29 P	27 T 19 P	23 T 13 P	11 T 6 P	17 T 13 P	16 T 11 P
Tiffany[1]	9 T 2 P	4 T 3 P	8 T 3 P	5 T 4 P	5 T 2 P	4 T 0 P	1 T 0 P	4 T 0 P	8 T 0 P	1 T 0 P	5 T 2 P	0
San Marcial[2]	142 T 117 P	197 T 153 P	235 T 168 P	319 T 224 P	298 T 235 P	318 T 237 P	252 T 181 P	266 T 182 P	307 T 205 P	300 T 224 P	303 T 209 P	257 T 223 P
Total	179 T 135 P	232 T 171 P	287 T 193 P	369 T 264 P	360 T 272 P	399 T 281 P	347 T 232 P	333T 227 P	364 T 234 P	344 T 247 P	355 T 245 P	302 T 259 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.

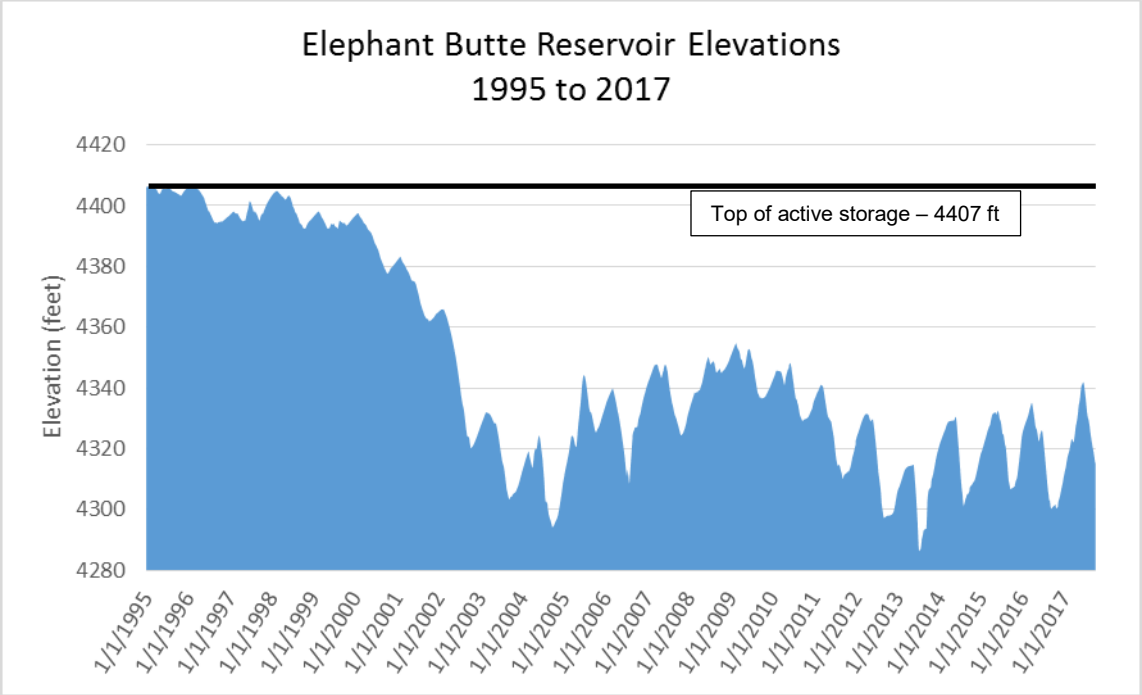


Figure 16. Elephant Butte Reservoir elevations – 1995 to 2017.

Many historically occupied patches of suitable native habitat have transitioned into a mixed community of native willows and exotic saltcedar during the past 10 years of extreme drought. Others slowly converted to cattail marsh due to prolonged flooding. Both of these situations can reduce the structure and density of suitable SWFL habitat, making it less attractive to breeding SWFLs. Other smaller patches of suitable habitat have also developed within various reaches of the study area. Typically, these other patches were on low lying terraces immediately adjacent to the Rio Grande that were subject to overbank flooding during high flow periods. One such area was aided by the sediment plug which formed at River Mile 82 in the Bosque del Apache Reach, forcing river water onto the adjacent floodplain and attracting a relatively large population of nesting SWFLs between 2009 and 2012 (Figure 15). This habitat declined in quality between 2012 and 2015 due to drought but has begun to recover.

During the last six years, a breeding population of SWFLs has developed in suitable habitat in the Belen Reach. This population appears to have stabilized at approximately 20 territories. Additionally, a new sub-population of SWFLs has recently emerged within the LFCC sites in the San Marcial reach. These territories occupy habitat ranging from nearly monotypic saltcedar to willow-dominated and are outside the active Rio Grande floodplain. In 2017, 53 territories were recorded in these sites. Lastly, during the past four years, a large population of SWFLs has established downstream of The Narrows of Elephant Butte Reservoir – 73 territories were located in this area in 2017. This habitat is most directly influenced by a rising and falling reservoir and many of these territories were over deeply flooded habitat during the early portion of the 2017 breeding season. This pattern of habitat creation and loss and the flycatcher's ability to follow the movement of suitable habitat is how the species has been able to persist in the ephemeral systems of the desert Southwest.

The SWFL recovery plan (USFWS 2002) established a recovery goal of 100 territories for the Middle Rio Grande Management Unit which is one of six Management Units within the larger Rio Grande Recovery Unit. This goal was achieved in 2003, and has been exceeded every year since (Figure 15). In 2017, 302 SWFL territories were documented within Reclamation surveyed sites along the Middle Rio Grande. The remaining portion of this section discusses the number, trends, and distribution of SWFL territories within each of the respective reaches since surveys were initiated.

Frijoles Reach

Reclamation personnel have conducted surveys in this reach, which consists of one site, annually since 2011; the reach was surveyed, in part, by other entities in 2008 and 2009. Only five territories including four unpaired males and one pair have been documented in the eight years of surveys (Table 8) and no breeding has been confirmed. Large patches of high quality SWFL habitat that receive regular flooding during higher river flows occur within this reach. Some of these patches were partially scoured during high flows recorded in 2013. While initially detrimental to habitat, this scouring event ultimately benefited habitat as deposited sediments became colonized by dense growths of native vegetation. Barring a major setback, within the next year or two, this habitat will become suitable for SWFLs and should replace suitable habitat that has begun to decline due to age. Given the abundance of suitable habitat within the Frijoles Reach, it is unknown why this reach has not become occupied by a SWFL population. Reclamation personnel have documented large numbers of migrant WIFLs within this site on early surveys only to find them gone once the resident breeding period begins. If a small number of these migrants were to establish territories within this site and breed successfully, it is likely that this reach could eventually contain a sizeable population that could act as a much needed refuge and source population.

Belen Reach

This reach was first surveyed in 2002 and one SWFL territory was detected. Since then, SWFL territories and pairs gradually increased to a high of 23 territories and 17 pairs in 2013. Since then, territory numbers have fluctuated annually between 17 and 20. Historically, many of the territories (and all breeding pairs until 2011) in this reach were located within site SV-11 which is the southernmost site within this reach and immediately upstream of the once sizeable breeding population in site SV-09. The territories in SV-11 have all been either on or immediately adjacent to terraces, river bars, or high flow channels occupied by younger age class coyote willow, saltcedar, and Russian olive. During recent years, the small population in SV-11 has vanished while the upstream population has grown. Habitat within much of this reach consists of sparse, decadent saltcedar and Russian olive. Cottonwood galleries and grassy meadows are also interspersed throughout this reach. Smaller patches of suitable native and mixed native/exotic habitat have developed where hydrology is favorable. These small patches currently provide suitable habitat for the population of SWFLs found within sites BL-09, 10 and 11. Given the availability of suitable habitat in this reach [approximately 2,200 acres was mapped in 2016 (Siegle and Ahlers 2017)] and the decline of habitat quality in the delta of Elephant Butte Reservoir, it is possible that this population will continue to grow over the next several years. However, the low nest success observed in 2017 (30 percent) may limit its growth potential.

Sevilleta/La Joya Reach

SWFLs in the Sevilleta/La Joya Reach were first documented in 1999 while conducting routine avian point counts. Limited surveys were conducted and four territories all comprised of pairs were confirmed. Comprehensive surveys were initiated throughout the reach in 2000. Between 2000 and 2008, the number of territories generally increased, reaching a high of 31 (Table 8). In contrast, territory numbers declined steadily between 2008 and 2012 and have remained stable between four and eight between 2012 and 2017. This recent decline, with the exception of site SV-03, has not been accompanied by an apparent decrease in habitat suitability. Site SV-03, in the early 2000s, was unique in that occupied habitat was composed almost entirely of monotypic saltcedar. Currently, occupied habitat in sites SV-06 and SV-07 consists of a mixture of coyote willow, saltcedar, Russian olive and cottonwood on lower riverside terraces. Habitat modeling identified 895 acres of suitable habitat within the reach in 2016 (Siegle and Ahlers 2017) but the downward trend in territory numbers does not bode well for the persistence of this population.

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 – only 516 acres were mapped in 2016 - and composed of small patches of native vegetation along the river channel. Very little overbank flooding occurs due to the degraded nature of the river channel. Sporadic high river flows during the past several years combined with the formation of river bars and lower terraces have resulted in reestablishment of riparian vegetation, both native and exotic, along these bars and terraces. In 2008, two SWFL territories within this reach were discovered, which were the first documented since surveys began in 1996 (Table 8). In 2009, a single unpaired male was found on June 13th and again on June 23rd at the same location. Pairing was not confirmed and the territory was designated as that of an unpaired male. No territorial SWFLs have been documented in this reach since. Due to the limited habitat within this reach, it is unlikely that a substantial number of SWFL territories will become established here anytime in the near future.

Escondida Reach

Habitat within this reach is similar to that in the San Acacia Reach. However, the river channel is less incised in many areas and quality habitat has increased in abundance during the past eight years (Figure 14; Siegle and Ahlers 2017). The majority of habitat is sparse exotic vegetation in the form of saltcedar and Russian olive with an occasional overstory of cottonwood. Suitable SWFL habitat exists adjacent to the river and on recently formed riverbars. This reach of the river, aside from lower terraces and river bars, seldom receives any overbank flooding. Small numbers of resident SWFLs have been documented in this reach since 2002 (Table 8). Between 2011 and 2013, a small breeding population of SWFLs emerged in the lower portion of this reach, adjacent to the Bosque del Apache NWR. This population was likely supported by the relatively large source population established in the Bosque del Apache NWR during those years. However, during 2014 and 2015, this small population vanished and only a single breeding pair and several scattered territories were recorded in this reach. This occurred coincidentally with the reduction in territories in the Bosque del Apache Reach. During 2016 and 2017, a handful of territories and breeding pairs were again located within the downstream sites in the Escondida Reach and future surveys will determine if this population is able to persist.

Bosque del Apache Reach

SWFL territories within the active floodplain of the Bosque del Apache NWR were few in number and broadly distributed throughout the reach during the 2002 to 2008 period. The number of SWFL territories for this seven year period ranged annually from zero to seven. However, from 2009 through 2012, the number of SWFL territories dramatically increased (Table 8). As predicted in the 2008 report (Moore and Ahlers 2009), "Flooding in 2007 and 2008 will likely promote development of higher quality SWFL habitat and it will be interesting to see if larger populations develop in this reach", the attractiveness of habitat did improve due to overbank flooding and the SWFLs responded accordingly. The 51 territories documented in 2012 was second only to the San Marcial Reach in terms of abundance. This relatively large local population likely benefitted adjacent reaches by serving as a source population for colonization of developing suitable habitat.

As noted in previous sections, overbank flooding and the sediment plug which formed in 2008 were largely responsible for increasing habitat suitability within this reach. This, in combination with the high levels of nest success observed in both 2009 and 2010, promoted the explosive growth of this SWFL population. Conversely, drought experienced since 2012 has severely impacted habitat quality, and consequently nest success, within this reach. Many occupied habitat patches have shown signs of extreme water stress and most of the younger age cottonwoods and willows either did not entirely leaf out or died altogether. This reduced habitat suitability prompted returning birds to relocate during the past several years as evidenced by the large reduction in SWFL territories. During the spring and summer of 2017, however, high flows and the sediment plug again forced water onto the floodplain within most of this reach. This may help to rejuvenate native habitat. Additionally, Reclamation has initiated a river realignment project to reduce maintenance by bypassing the sediment plug and relocating the river channel to the east. All of the above factors will undoubtedly affect the SWFL population in this reach and continued surveys will determine the status of this population.

Tiffany Reach

When formal SWFL surveys began in the Middle Rio Grande in 1995, this reach contained the largest documented population of breeding SWFLs (11 territories including 7 pairs - referred to as the "Condo Site" – NMNHP 1995). Surveys were suspended in 1996 and the reach was not surveyed in its entirety again until 2004 when 16 territories, including 13 pairs, were documented. Since then, the population has fluctuated between one and nine territories and no breeding has been documented since 2010. The reason for this decrease is unclear since the suitability of habitat had not declined until the Tiffany Fire burned the entire Tiffany Reach in 2017 (570 acres of suitable habitat were recorded in this reach in 2016). The future of the reach depends on the regeneration of habitat that occurs. However, it is highly unlikely that a substantial SWFL population will establish in the near future.

San Marcial Reach

SWFL surveys in this reach began in 1995 (Table 8). For the following 14 years, the SWFL population increased dramatically (Figure 17). Since 2000, a majority of these SWFL territories have occurred in the exposed conservation pool of Elephant Butte Reservoir. As reservoir levels decreased during the late-1990s and early-2000s (Figure 16), vast expanses of primarily native habitat developed on the western side of the floodplain. This habitat consisted of dense Goodding's and coyote willow of various age classes and is provided with water by the LFCC outfall. SWFLs

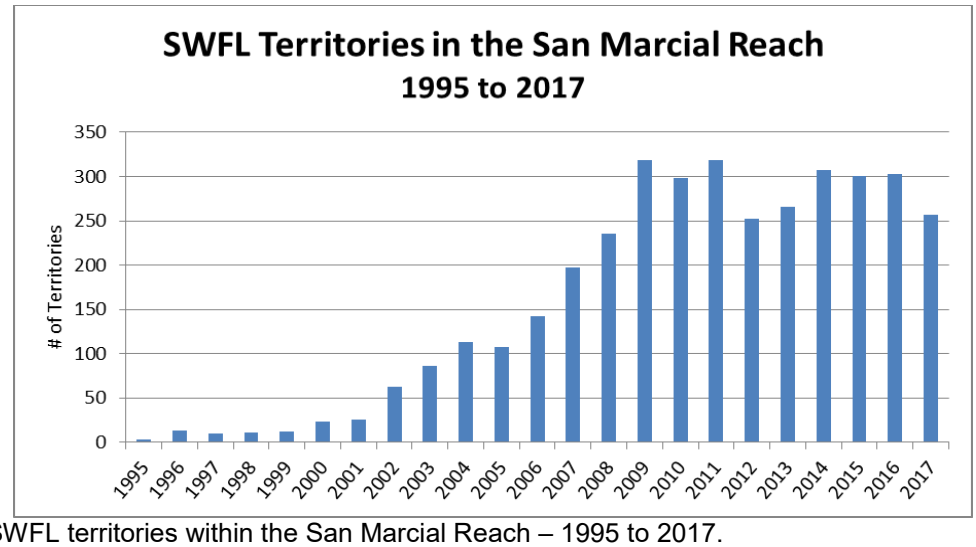


Figure 17. SWFL territories within the San Marcial Reach – 1995 to 2017.

first occupied suitable habitat in the uppermost reaches of the reservoir (sites LF-17 and LF-17a) and expanded downstream as habitat became suitable. During this same period, channel degradation and lower flows within the Rio Grande caused habitat upstream of the reservoir pool in the San Marcial Reach to decline in quality. Due to these factors, the vast majority of SWFL territories in this reach, and the study area as a whole, are found within the exposed reservoir pool.

Currently, the oldest age classes of suitable habitat in the upper reservoir pool have deteriorated in quality during the past several years. A combination of prolonged flooding, natural succession, and the recent drought (Figure 18) has led to a die-off of willows and encroachment by less suitable vegetation including saltcedar and cattails. As noted in the Hydrology section, water from the LFCC outfall has shifted east as sedimentation has aggraded the surrounding area, increasing habitat quality in these more easterly areas. However, an overall decline in habitat quality has caused the SWFL population in the upper reservoir pool to either move into adjacent, potentially less suitable habitat or occupy other reaches of the Rio Grande. This decline in habitat quality and shift to more marginal habitat has halted the dramatic growth observed in this population between 2001 and 2009.

Conversely, a large proportion of the developing habitat within the three southern-most survey sites – EB-15, 16 and 17 – which is supported by a shallow water table and fluctuating reservoir level, is native willow and is healthy and vigorous. The population in these three sites first established in 2010 and 2011, when one and five territories were located, respectively. During 2017, 73 territories were located and this habitat is currently some of the highest quality habitat found in the study area. This localized population is likely to expand as additional habitat becomes available and will represent a valuable source population for the San Marcial Reach and beyond.

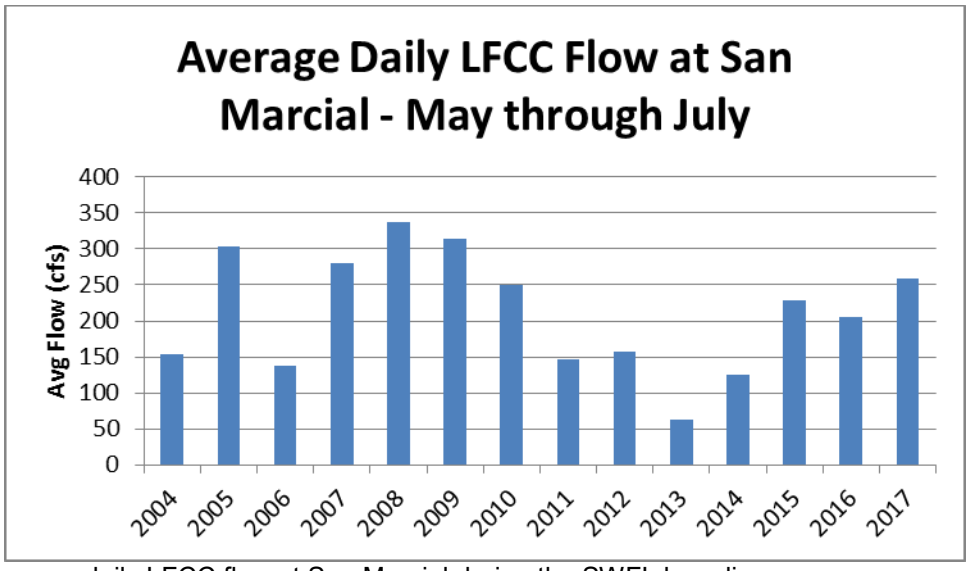


Figure 18. Average daily LFCC flow at San Marcial during the SWFL breeding season.

Habitat mapping/modeling conducted in 2016 documented an increase in habitat within the San Marcial Reach compared to 2012; 6,896 acres compared to 4,512 (Figure 14). However, two new classes of monotypic saltcedar habitat were added to the moderately suitable habitat class based on their usage by breeding SWFLs between 2014 and 2016. Without these classes, suitable acreages in the San Marcial reach were roughly equal in 2012 and 2016. However, as noted above, drought, the increased presence of exotic saltcedar, and the age of many of these native stands has decreased the suitability of much of this habitat, although not enough to be reclassified as unsuitable. A slight decrease in habitat suitability is enough to halt the rapid growth exhibited by this population between 2000 and 2009. Additionally, the Tiffany Fire burned a large portion of the northern San Marcial sites, further reducing the quantity of suitable SWFL habitat in the reach. These factors have caused the San Marcial population to be trending smaller (Figure 17) and emphasize the fact that additional suitable habitat elsewhere within the Rio Grande is urgently needed in order to prevent further population decline.

Lastly, much consideration has been given to the potential detrimental effects of a rising reservoir pool on this population of SWFLs. During the past 10 years, SWFLs have moved farther into the exposed pool of Elephant Butte Reservoir (see figures in Attachment – Pages A-23 to A-28). The developing sub-population in sites EB-15 through 17 would be most highly impacted and likely displaced if reservoir levels were to rise significantly. However, it is likely that not only within the reservoir pool but within the Middle Rio Grande as a whole, a stagnant reservoir could be far more detrimental to the SWFL population. In recent years, prolonged drought conditions and reduced flows in both the river and LFCC have prevented irrigation of habitat via flooding. This has reduced habitat vigor and density, and promoted encroachment of exotics like saltcedar. Within the reservoir itself, the dynamics of a rising and falling pool would cause habitat 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 habitat could persist and provide highly suitable SWFL habitat for a large source population.

Nest Searches/Monitoring

Overview of Middle Rio Grande Nest Monitoring

During the 2017 SWFL breeding season a total of 351 nests (307 with known outcomes) were monitored within the Middle Rio Grande Study Area (Table 9). A total of 3,488 nests with known outcomes have been monitored since 1999 (Table 10). As shown in Figure 19, nest success declined drastically to 25 percent in 2017 – the lowest rate in the history of this study. Nest success has declined recently due primarily to the increase in depredation rates which is likely a factor of decreasing habitat quality. Nest success rates above 50 percent usually led to growth of the Middle Rio Grande SWFL population. Rates below 50 percent have caused population growth to level off and, in certain years, territory numbers have decreased. The recent trends in nest success and depredation do not bode well for this flycatcher population.

Table 9. Summary of 2017 SWFL nesting parameters within the Middle Rio Grande.

General Nest Data		
Parasitism Rate 12% (38 out of 307 nests)		
Depredation Rate 62% (189 out of 307 nests)		
Abandonment Rate 5% (16 out of 307 nests)		
Nest Success 25% (77 out of 307 nests)		
Territory Vegetation Type		
Number of nests in exotic-dominated territories	83	27% of total
Number of nests in *Salix*-dominated territories	89	29% of total
Number of nests in mixed dominance territories	135	44% of total
Nest Substrate Species		
Number of nests in *Salix* substrate	89	29% of total
Number of nests in saltcedar substrate	215	70% of total
Number of nests in Russian olive substrate	2	1% of total
Number of nests in other (Seepwillow/Cottonwood) substrate	1	<1% of total
Nest Substrate/Territory Vegetation Combination		
Number of nests in saltcedar substrate within *Salix*-dominated territories	15	(17% of 89 nests)
Number of nests in *Salix* substrate within exotic or mixed dominance territories	7	(4% of 160 nests)
Nest Success Per Nest Substrate Species		
Percentage of successful nests in *Salix* substrate	24%	(21 out of 89 nests)
Percentage of successful nests in saltcedar substrate	26%	(56 out of 215 nests)
Nest Success Per Territory Vegetation Type		
Percentage of successful nests in *Salix*-dominated territories	20%	(18 out of 89 nests)
Percentage of successful nests in exotic-dominated territories	23%	(19 out of 83 nests)
Percentage of successful nests in mixed dominance territories	30%	(40 out of 135 nests)
Cowbird Parasitism Per Nest Substrate Species		
Percentage of nests parasitized in *Salix* substrate	15%	(13 out of 89 nests parasitized)
Percentage of nests parasitized in saltcedar substrate	12%	(25 out of 215 nests parasitized)
Cowbird Parasitism Per Territory Vegetation Type		
Percentage of nests parasitized in *Salix*-dominated territories	14%	(12 out of 89 nests)
Percentage of nests parasitized in exotic-dominated territories	15%	(12 out of 83 nests)
Percentage of nests parasitized in mixed dominance territories	10%	(14 out of 135 nests)
Productivity[(1)] Per Territory Vegetation Type		
Productivity of nests found in *Salix*-dominated territories	2.22/nest	(40 young from 18 nests)
Productivity of nests found in exotic-dominated territories	2.63/nest	(50 young from 19 nests)
Productivity of nests found in mixed dominance territories	2.65/nest	(106 young from 40 nests)
Productivity[(1)] Per Nest Substrate Species		
Productivity of nests found in *Salix* substrate	2.33/nest	(49 young from 21 nests)
Productivity of nests found in saltcedar substrate	2.63/nest	(147 young from 56 nests)
Productivity[(1)] Compared to Nest Substrate Species and Territory Vegetation Type		
Productivity of nests in *Salix* substrate within *Salix* dominated territories	2.31/nest	(37 young from 16 nests)
Productivity of nests in saltcedar substrate within *Salix* dominated territories	1.5/nest	(3 young from 2 nests)
Productivity of nests in saltcedar substrate within exotic dominated territories	2.63/nest	(50 young from 19 nests)
Total SWFL nests of known outcomes monitored during 2016	231	

Note: Summary data only from nests with known outcomes

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

Table 10. Summary of SWFL nesting parameters within the Middle Rio Grande – 1999 to 2017.

General Nest Data		
Parasitism Rate 14% (472 nests)		
Depredation Rate 42% (1457 nests)		
Abandonment Rate 7% (237 nests)		
Nest Success 43% (1501 nests)		
Territory Vegetation Type		
Number of nests in *Salix*-dominated territories	2011	58% of total
Number of nests in exotic-dominated territories	499	14% of total
Number of nests in mixed dominance territories	978	28% of total
Nest Substrate Species		
Number of nests in *Salix* substrate	1662	48% of total
Number of nests in saltcedar substrate	1762	51% of total
Number of nests in Russian olive substrate	50	1% of total
Number of nests in other (*Baccharis*/cottonwood) substrate	14	<1% of total
Nest Substrate/Territory Vegetation Combination		
Number of nests in saltcedar substrate within *Salix*-dominated territories	488	24% of 2011 nests
Number of nests in *Salix* substrate within exotic or mixed dominance territories	154	10% of 1477 nests
Nest Success Per Nest Substrate Species		
Percentage of successful nests in *Salix* substrate	45%	746 out of 1662 nests
Percentage of successful nests in saltcedar substrate	41%	724 out of 1762 nests
Percentage of successful nests in Russian olive substrate.	52%	26 out of 50 nests
Percentage of successful nests in other (*Baccharis*/cottonwood) substrate	36%	5 out of 14 nests
Nest Success Per Territory Vegetation Type		
Percentage of successful nests in *Salix*-dominated territories	46%	922 out of 2011 nests
Percentage of successful nests in exotic-dominated territories	43%	212 out of 499 nests
Percentage of successful nests in mixed dominance territories	38%	367 out of 978 nests
Cowbird Parasitism Per Nest Substrate Species		
Percentage of nests parasitized in *Salix* substrate	13%	208 out of 1662 nests parasitized
Percentage of nests parasitized in saltcedar substrate	14%	252 out of 1762 nests parasitized
Percentage of nests parasitized in Russian olive substrate	18%	9 out of 50 nests parasitized
Percentage of nests parasitized in other (*Baccharis*/cottonwood) substrate	21%	3 out of 14 nests parasitized
Cowbird Parasitism Per Territory Vegetation Type		
Percentage of nests parasitized in *Salix*-dominated territories	13%	255 out of 2011 nests
Percentage of nests parasitized in exotic-dominated territories	13%	67 out of 499 nests
Percentage of nests parasitized in mixed dominance territories	15%	150 out of 978 nests
Productivity[(1)] Per Territory Vegetation Type		
Productivity of nests found in *Salix*-dominated territories	2.59/nest	2386 young from 922 nests
Productivity of nests found in exotic-dominated territories	2.43/nest	516 young from 212 nests
Productivity of nests found in mixed dominance territories	2.59/nest	951 young from 367 nests
Productivity[(1)] Per Nest Substrate Species		
Productivity of nests found in *Salix* substrate	2.62/nest	1955 young from 746 nests
Productivity of nests found in saltcedar substrate	2.53/nest	1830 young from 724 nests
Productivity of nests found in Russian olive substrate	2.23/nest	58 young from 26 nests
Productivity[(1)] Compared to Nest Substrate Species and Territory Vegetation Type		
Productivity of nests in *Salix* substrate within *Salix* dominated territories	2.61/nest	1805 young from 692 nests
Productivity of nests in saltcedar substrate within *Salix* dominated territories	2.54/nest	572 young from 225 nests
Productivity of nests in saltcedar substrate within exotic dominated territories	2.42/nest	499 young from 206 nests
Total SWFL nests of known outcomes monitored from 1999-2017	3488	

Note: Summary data only from nests with known outcomes 1999-2017

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

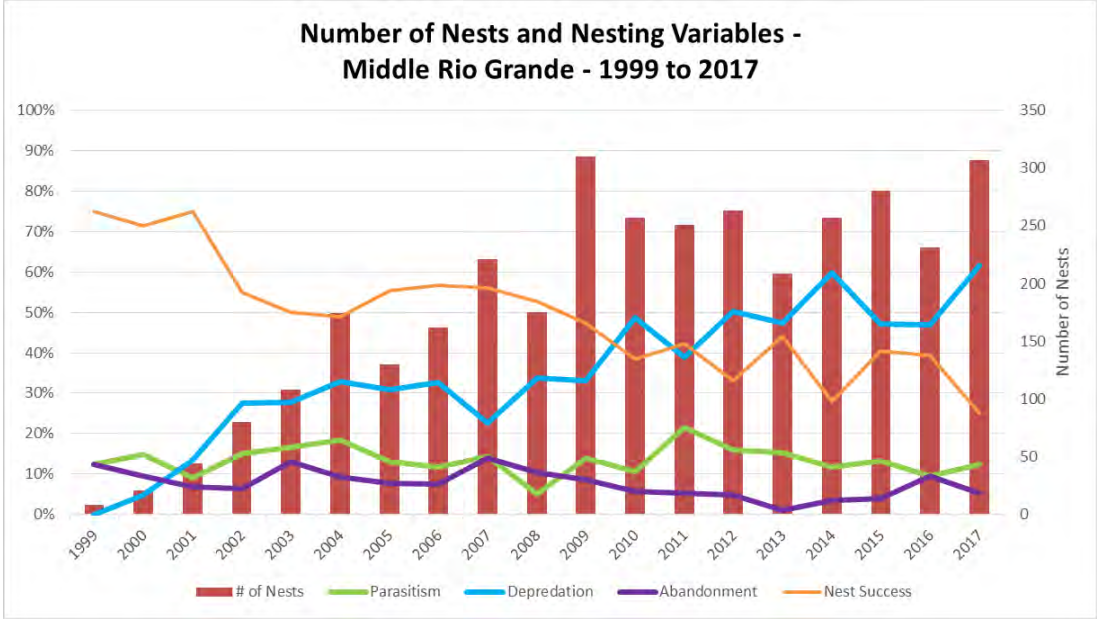


Figure 19. Summary of SWFL nesting within Bureau of Reclamation surveyed sites between 1999 and 2017.

Habitat Availability and Selection

Since 2005, nesting SWFLs in the study area have begun utilizing habitat with a greater saltcedar component (Figure 20). SWFLs gradually converted from using almost entirely *Salix*-dominated habitats to a more even mixture of the three different habitat types: *Salix*-dominated, exotic-dominated (usually saltcedar), and mixed. Dominance is defined as habitat composed of at least 75 percent *Salix* or exotic species. During 2014, a switch in habitat use took place and SWFLs nested more often in mixed habitat than in *Salix* or exotic-dominated habitats. This trend has continued into 2017 (Table 9). This is the sixth consecutive year that fewer than 50 percent of territories were in *Salix*-dominated habitat and illustrates the shift in habitat use within the Middle Rio Grande.

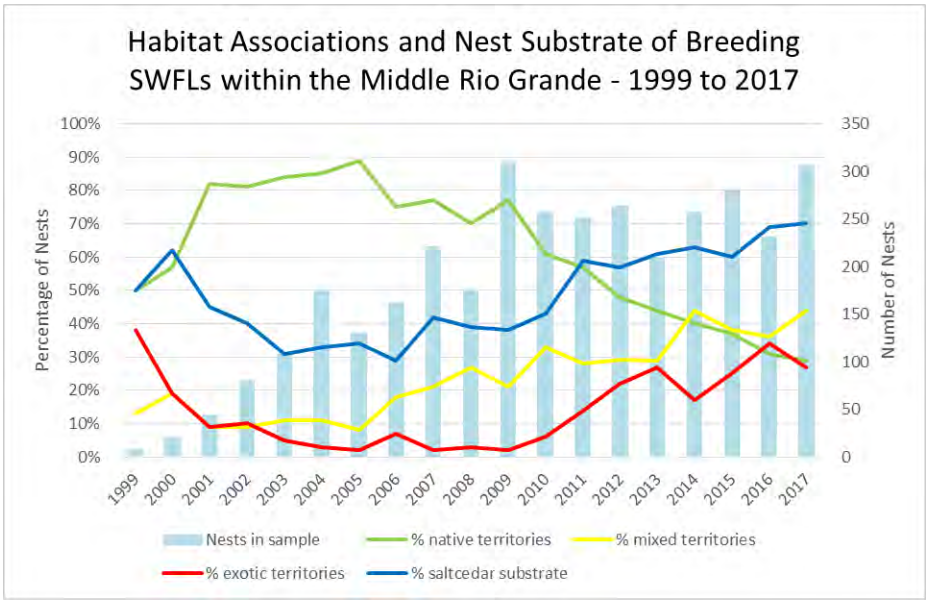


Figure 20. Percentage of SWFL territories located in three habitat types (native, exotic, and mixed) within the Middle Rio Grande between 1999 and 2017.

Drought conditions and senescence of natives has allowed exotic saltcedar to become more of a habitat component, and prompted SWFLs to occupy lesser quality habitats – primarily within the Elephant Butte Reservoir delta. This ability to occupy saltcedar-dominated habitat may benefit the SWFL population in times of drought as saltcedar is more drought tolerant and may provide a refuge until conditions are suitable for native habitat. Conversely, the recent spread of the tamarisk beetle, which has been documented throughout the Middle Rio Grande during the past two years, could negatively impact occupied saltcedar habitat via defoliation and changes to microclimate during the SWFL breeding season. Dillon and Ahlers (2017) documented limited defoliation and microclimate impacts during the 2017 breeding season. These impacts are only likely to intensify as *Diorhabda* extent and abundance increases within the Middle Rio Grande.

In order to explore the relationship between SWFL nesting variables and habitat, data collected at nests between 1999 and 2017 were comingled and statistically analyzed. Over the past 19 years, a total of 3,488 SWFL nests (with known outcomes) have been monitored along the Middle Rio Grande (Table 10). Tables 11 and 12 and this section of the report provide details of habitat comparisons for SWFLs nesting along the Middle Rio Grande. Graphical illustrations of key nesting parameters are also provided in the Attachment. General nest data from the 3,488 monitored nests indicate an overall brood parasitism rate of 14 percent, a nest depredation rate of 42 percent, a nest abandonment rate of 7 percent, and an overall nest success rate of 43 percent over the past 19 years (Table 10). Although annual results were often similar to average study period rates, the large sample size associated with the comingled data set provides greater insight into the relationships of habitat, hydrology and nesting variables. Sound management decisions should be based on the best available data, and should not typically be based on a single year's dataset.

Table 11. Habitat and SWFL nest variable comparisons from the Middle Rio Grande – 1999 to 2017 (n=3,488).

Chi-square Test (α = 0.05)		
Comparison	Df and χ^2 value	*P*-value
Success and dominant territory vegetation	Df=2, 18.66	<0.01
Success and substrate species	Df=2, 6.68	0.04
Parasitism and dominant territory vegetation	Df=2, 3.98	0.14
Parasitism and substrate species	Df=2, 3.22	0.20
Kruskal-Wallis Test (α = 0.05)		
Comparison	Df and H	*P*-value
Productivity and dominant territory vegetation	Df=2, 9.15	0.01
Productivity and substrate species (*Salix,* saltcedar, Russian olive)	Df=2, 9.86	0.01

Data from known nest outcomes only. **Yellow** = statistically significant difference.

Between 1999 and 2017, data on the nest substrate and dominant vegetation within the territory were collected at all 3,488 nests. It is likely that vegetative density and structure, and hydrology play a greater role in territory selection than species composition. However, as shown in Table 10, 58 percent of SWFL nesting territories were dominated by *Salix* and only 14 percent were dominated by exotic species (primarily saltcedar). The remaining nests were found in mixed stands (28 percent).

Table 12. Hydrology and SWFL nest variable comparisons from the Middle Rio Grande – 2004 to 2017 (n=2,920).

Chi-square Test (α = 0.05)		
Comparison	Df and χ^2 value	*P*-value
Nest success and hydrology under the nest	Df=3, 19.10	<0.01
Depredation rates and hydrology under the nest	Df=3, 19.90	<0.01
Parasitism rates and hydrology under the nest	Df=3, 12.10	0.01
Nest success and distance to water (> or < 100m)	Df=1, 1.16	0.28
Nest success and distance to water (> or < 50m)	Df=1, 0.62	0.43
Mann-Whitney W-test (α = 0.05)		
Comparison	Df and w	*P*-value
Productivity and distance to water (> or < 100m)	Df=1, -4,273.0	0.81
Productivity and distance to water (> or < 50m)	Df=1, 11,445.9	0.03
ANOVA (α = 0.05)		
Comparison	Df and F-ratio	*P*-value
Productivity of successful nests based on hydrology under the nest	Df=3, 6.64	<0.01

Data from known nest outcomes only. **Yellow** = statistically significant difference.

From these data it is clearly evident that SWFLs select native dominated stands, when available, far more often than exotic dominated stands when establishing territories on the Middle Rio Grande. However, a disproportionate use of saltcedar as the nest substrate is also apparent. SWFLs selected saltcedar as the nest substrate 70 percent of the time in 2017 (n=307) and 50 percent of the time since 1999 (n=3,488). These data suggest a preference for establishing territories within native dominated stands, while selecting saltcedar as the substrate when constructing a nest. It is likely that the preference for saltcedar as the nest substrate is due to the natural twig structure that saltcedar provides. Table 11 summarizes the following statistical comparisons used to assess relationships between vegetation species composition and nesting variables.

A Chi-square test was conducted to compare success rates and dominant territory vegetation (i.e., native, exotic, and mixed) for SWFL nest data between 1999 and 2017 (n=3,488; Page A13). Nests in native stands (46 percent success) were statistically more successful (χ^2=18.66, Df=2, *P*<0.01) than mixed stands (38 percent). It is unclear why nests in mixed stands experience such a reduced nest success rate.

Statistical analysis (Chi-square test) comparing nest success to nest substrate was also conducted for the past 19 years of SWFL nesting data (Page A13). Nest success was significantly higher in *Salix* than in either saltcedar or Russian olive (χ^2=6.68, Df=2, *P*=0.04). Very few nests were constructed in Russian olive (n = 50) compared to Salix (n = 1662) and saltcedar (n = 1762). Nests located in *Salix* substrate are typically located in high quality native habitat which helps to explain the higher nest success rate

Productivity (i.e. nestlings fledged per nest) is also an important variable to the maintenance or growth of SWFL populations. Nest productivity of successful nests among the dominant vegetation communities and nest substrates were compared using a Kruskal-Wallis H test (Page A15). A successful nest is defined as one which fledges at least one SWFL chick. Productivity of successful nests within exotic territories (2.43 young/nest) was statistically less (H=9.15, Df=2, P=0.01) than that of nests located in both mixed territories (2.59 young/nest) and native territories (2.59 young/nest). This is likely due to the fact that native habitat is of higher quality and thus provides

increased shade, forage, thermal stability, and concealment from predators. Similarly, successful nests placed in *Salix* substrate (2.62 young/nest) were statistically more productive (H=9.86, Df=2, P=0.01) than those placed in saltcedar (2.53 young/nest) and Russian olive (2.23 young/nest).

Cowbird brood parasitism was once considered to be a primary limiting factor to SWFL populations (USFWS 2002) and can severely impact populations locally. Reclamation trapped cowbirds in the San Marcial Reach between 1996 and 2001. Thus, discussion and analysis of cowbird parasitism is warranted. A Chi-square test was conducted to compare BHCO parasitism rates between 1999 and 2017 within the three territory vegetation types - native, exotic, and mixed (Page A15). No statistically significant difference in parasitism rates was documented among the three habitat types (χ^2=3.98, Df=2, *P*=0.14).

A similar result was found when looking at parasitism and nest substrate (Page A15). There was no statistical difference in parasitism rates by nesting substrate (χ^2=3.22, Df=2, *P*=0.20).

Hydrology and Nesting Variables

Beginning in 2004, hydrological data at each nest was collected on each nest visit. One of three possible hydrologic conditions, including dry, saturated soil, or flooded, was recorded and daily data were compiled for each nest at season's end to determine the hydrologic regime throughout the nesting cycle. As a result, four separate scenarios were evaluated, including: 1) dry all cycle, 2) saturated/flooded then dry, 3) saturated/flooded all cycle, and 4) flooded all cycle (a subset of saturated/flooded all cycle). These four scenarios were then compared to nesting variables to determine potential relationships. Distance to water was also recorded and averaged at the end of the season. Table 12 and the following sections present these comparisons. Graphical illustrations of the study results are presented in the Attachment.

Between 2004 and 2017, SWFL nests that were dry all cycle (39 percent success) were less successful than the other three categories (which ranged from 41 to 47 percent success) and statistical differences (based on a Chi-square test, n=3,227; Page A5) were documented between dry all season and both saturated/flooded all season and flooded all season (χ^2=19.10, Df=3, P<0.01). This difference is likely due to a number of factors including increased foliage density and possibly decreased terrestrial predators in wetter sites.

Similarly, nest depredation and brood parasitism rates were higher in the drier hydrologic regimes (e.g. dry all cycle and saturated/flooded then dry), which explains the reduced nest success documented under drier conditions. Nest depredation rate for nests that were dry all cycle and saturated/flooded then dry were 46 and 47 percent, respectively; depredation rates within saturated/flooded all cycle and flooded all cycle nests were 40 and 38 percent, respectively (Page A6). Based on a Chi-square test (χ^2=19.90, Df=3, P<0.01), nests that were dry all season were depredated at a higher rate than those that were saturated/flooded all season and flooded all season (Table 12). BHCO parasitism was 15 percent in nests that were dry all cycle and ranged from 11 to 14 percent for the other three classes (Page A7). Again, a Chi-square test showed a significantly higher parasitism rate for nests that were dry all season compared to those that were either saturated/flooded all season or flooded all season (χ^2=12.10, Df=3, P=0.01). As stated above, it is likely that increased habitat quality, vegetative cover, and reduced predator access are responsible for these differences.

Lastly, productivity within each of the four hydrologic regimes was investigated and, similar to the previous comparisons, dry all cycle was the least productive during the 2004 to 2017 sample period (n=3,227; Page A9). This regime produced an average of 2.50 young per successful nest while the other three ranged from 2.59 to 2.73. A Kruskall-Wallis test showed that both saturated/flooded all cycle and flooded all cycle were more productive than dry all cycle (H=17.33, Df=3, P<0.01). Considering the previous three comparisons, this is no surprise. Wetter sites provide higher thermal stability, relative humidity, prey abundance and foliage density – all factors that contribute to higher overall habitat quality for this species.

Regarding distance to water, 79 percent of nests monitored between 2004 and 2017 were within 50 meters of water and 91 percent were within 100 meters. Nest success was not significantly different between nests located within 50 meters of water and those greater than 50 meters from water (Page A8) based on a Chi-square test (χ^2=0.62, Df=1, *P*=0.43). Regarding productivity (Page A9), nests within 50 meters were more productive than those outside (Mann-Whitney W test, W=11,445.9, Df=1, P=0.03). There was no significant difference in nest success (Page A8) or productivity (Page A9) at nests located within 100 meters of water compared to those located greater than 100 meters from water.

Brown-headed Cowbird Brood Parasitism

In 1995, four of six (66 percent) SWFL nests within the Tiffany Reach "Condo Site" were parasitized by cowbirds (NMNHP 1995). Cowbird control efforts were implemented within the San Marcial Reach from 1996 through 2001; only 3 of 65 nests (5 percent) during this period were parasitized. From 2002 to present, cowbird trapping has not been conducted. During this post-trapping period, parasitism rates among San Marcial SWFL nests ranged from 3 to 23 percent, with an average parasitism rate of 13 percent (n=2,986) (Table 7). The higher parasitism rate documented after cowbird trapping was discontinued may indicate that, on a local scale, cowbird trapping is effective at reducing parasitism rates. However, nest success rates, which are the ultimate indicator of BHCO trapping effectiveness, were not affected. The relatively small sample size of SWFL nests monitored during the cowbird trapping period compared to the post-trapping nest numbers may also be responsible for the different results.

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

The practice of addling or removing BHCO eggs from parasitized SWFL nests was a practice initiated in 2002 and continued through 2017. Of the 38 nests that were parasitized in 2017, 2 successfully fledged SWFL young, 19 failed, and the fate of 1 was unknown; a 5 percent success

rate. Cowbird eggs were addled in six nests. Of these, five failed and one successfully fledged SWFL young. From 2002 to 2017, 462 SWFL nests have been parasitized and the outcomes known. BHCO eggs were addled or removed from 134 nests, 28 of which successfully fledged SWFL young (21 percent success). Parasitized nests during the same period in the Middle Rio Grande that were unaltered were not as successful. Of 328 parasitized nests monitored, 298 failed and 30 successfully fledged SWFL young—a 9 percent success rate. This difference was statistically significant based on a Chi-square test ($\chi^2 = 11.96$, Df = 1, $P < 0.01$).

Elephant Butte Reservoir Pool SWFL Population

Although the previous section discussed the nest parameters of the entire Middle Rio Grande SWFL population, a brief discussion of the population within Elephant Butte Reservoir is warranted when discussing changes in habitat, vegetation dominance and use of saltcedar in SWFL territories. The reservoir delta continues to contain the majority of nesting SWFLs in the study area (Table 13). The exposed pool of Elephant Butte Reservoir contained 66 percent of all nests found during the 2017 breeding season. This is a smaller percentage than during the earlier years of this study due to the sizeable subpopulations upstream of the reservoir in the San Marcial, Bosque del Apache and Belen Reaches but still represents a majority of the breeding territories.

A summary of SWFL nest variables from 1999 through 2017 within Elephant Butte Reservoir is shown in Figure 21 and Table 14 and data analyses are presented in the Attachment. Figure 22 shows the relationship between the percentage of both dry and flooded nests and nest variables. Several notable trends emerge from these charts. Nesting success has declined greatly since the peaks observed during the mid-2000's. Depredation rates continue to increase and are the primary cause of nest failure. This is likely due to a combination of factors including decreased habitat quality in the reservoir pool and the recent drought. The high density of SWFL nests in the heavily occupied habitat of the reservoir pool may also contribute to the increased depredation rate and relatively low BHCO parasitism rates.

During the past 19 years, BHCO parasitism of SWFL nests within Elephant Butte Reservoir has averaged 13 percent. There have been fluctuations annually, particularly between 2008 and 2011, but only once has parasitism exceeded 20 percent. Parasitism rate is likely tied to habitat quality, and apparently habitat within the reservoir pool is still sufficient to prevent BHCO parasitism from limiting the growth of the SWFL population. Future monitoring will determine if parasitism rates increase in the face of potential habitat quality decreases from continued drought and tamarisk beetle expansion.

Table 13. Rio Grande Reach summary of SWFL nests in lands surveyed by Reclamation between 1995 and 2017.

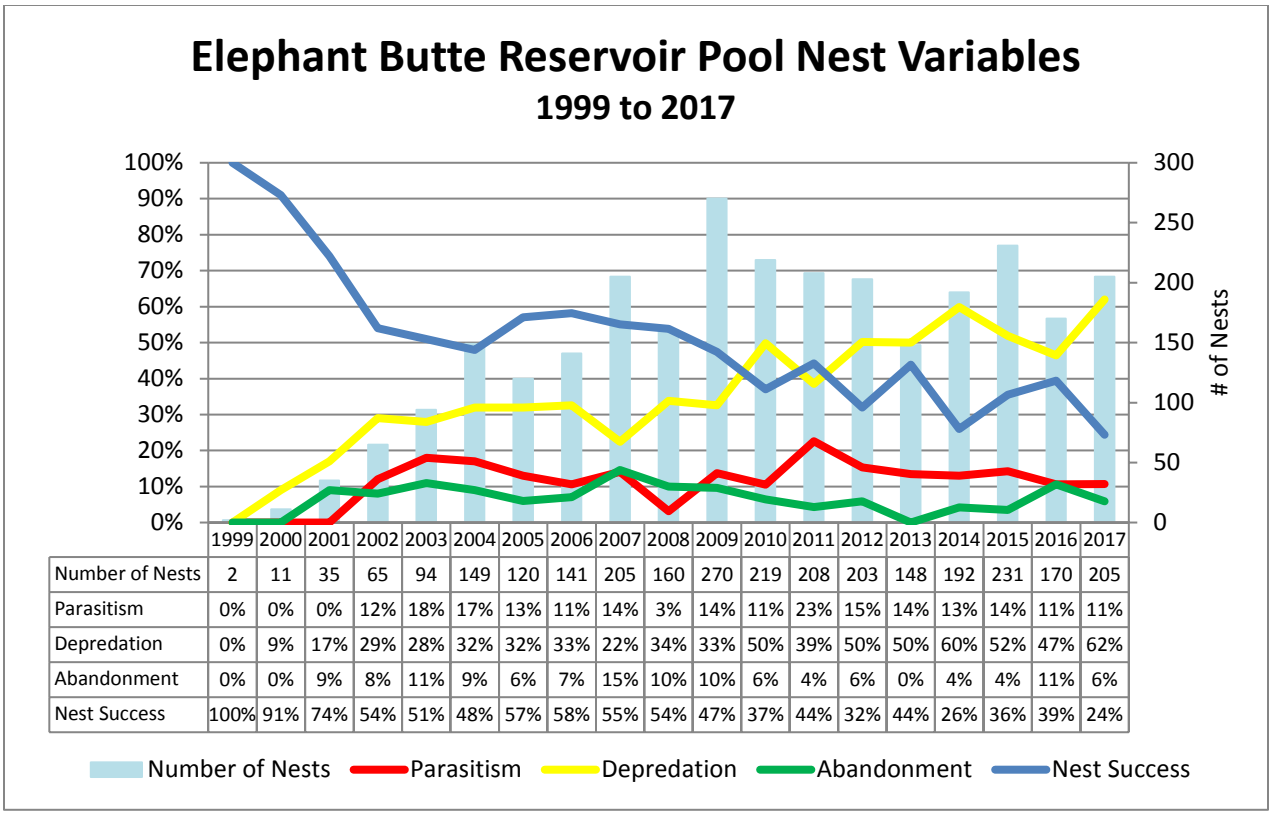
	'95	**'96**	**'97**	**'98**	**'99**	**'00**	**'01**	**'02**	**'03**	**'04**	**'05**	**'06**	**'07**	**'08**	**'09**	**'10**	**'11**	**'12**	**'13**	**'14**	**'15**	**'16**	**'17**
Velarde	n/a[1]	n/a[1]	6	3	1	2	0	0	0	0	0	0	0	0	0	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Belen	n/s	n/s	n/s	n/s	n/s	n/s	n/s	0	n/s	0	2	0	2	1	3	3	3	10	22	14	17	21	27
Sevilleta/ La Joya	n/s	n/s	n/s	n/s	3	6	9	13	12	21	10	18	6	13	14	10	6	5	6	0	0	1	1
Escondida	n/s	n/s	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	3	0	1	0	9
Bosque del Apache	n/s	n/s	n/s	0	0	0	0	0	1	2	0	1	1	2	19	25	34	38	20	17	5	1	16
Tiffany[(2)]	6	0	n/s	n/s	n/s	n/s	n/s	1	2	11	4	1	3	0	3	1	0	0	0	0	0	0	0
San Marcial	0	1	2	2	5	19	36	66	96	153	127	148	220	186	294	241	240	223	173	255	287	256	298
Elephant Butte Reservoir[(3)]	0	0	2	1	2	13	35	65	96	153	127	145	215	183	291	236	237	218	159	214	251	197	233
Total	6	1	8	5	9	27	45	80	111	187	143	168	232	202	333	280	283	282	224	286	310	279	351

n/s = not surveyed

(1) Nest monitoring not conducted by Reclamation (NMNHP conducted nest monitoring)

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

(3) Elephant Butte Reservoir is a subset of San Marcial and not counted towards the totals.



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Number of Nests	2	11	35	65	94	149	120	141	205	160	270	219	208	203	148	192	231	170	205
Parasitism	0%	0%	0%	12%	18%	17%	13%	11%	14%	3%	14%	11%	23%	15%	14%	13%	14%	11%	11%
Depredation	0%	9%	17%	29%	28%	32%	32%	33%	22%	34%	33%	50%	39%	50%	50%	60%	52%	47%	62%
Abandonment	0%	0%	9%	8%	11%	9%	6%	7%	15%	10%	10%	6%	4%	6%	0%	4%	4%	11%	6%
Nest Success	100%	91%	74%	54%	51%	48%	57%	58%	55%	54%	47%	37%	44%	32%	44%	26%	36%	39%	24%

Figure 21. Summary of SWFL nesting within Elephant Butte Reservoir pool from 1999 to 2017.

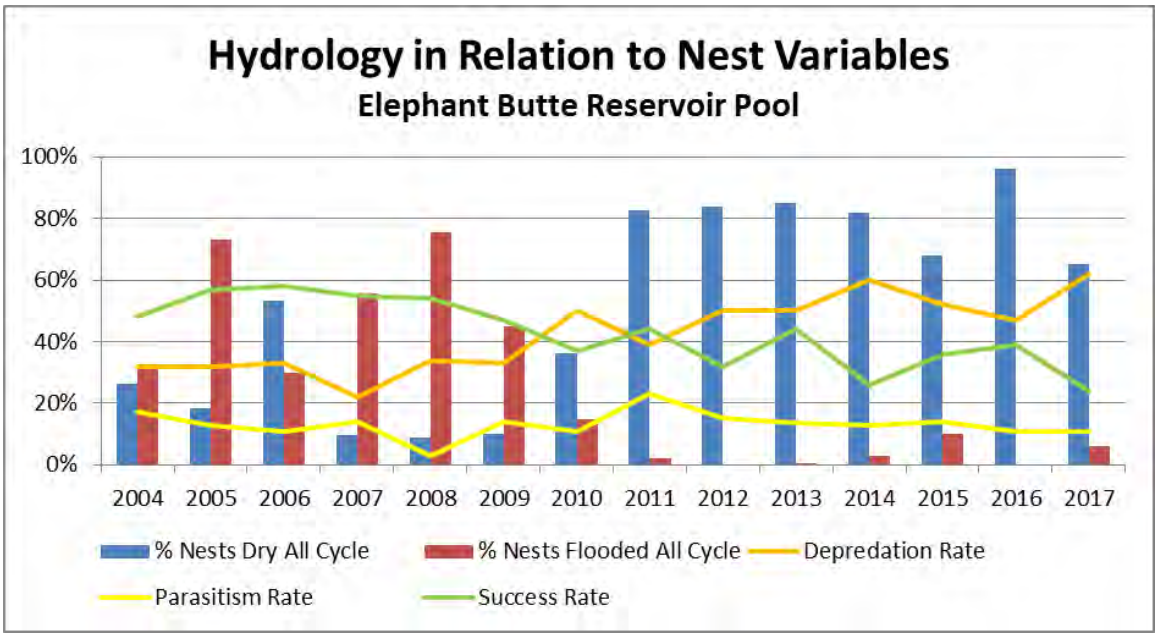


Figure 22. Relationship of hydrology under the nest and nesting variables within Elephant Butte Reservoir nesting SWFLs between 2004 and 2017.

-**Table 14.** Summary of SWFL nesting parameters within Elephant Butte Reservoir – 1999 to 2017.

General Nest Data		
Parasitism Rate 13% (371 nests)		
Depredation Rate 42% (1188 nests)		
Abandonment Rate 7% (205 nests)		
Nest Success 43% (1221 nests)		
Territory Vegetation Type		
Number of nests in *Salix*-dominated territories	1757	62% of total
Number of nests in exotic-dominated territories	338	12% of total
Number of nests in mixed dominance territories	733	26% of total
Nest Substrate Species		
Number of nests in *Salix* substrate	1388	49% of total
Number of nests in saltcedar substrate	1433	51% of total
Number of nests in Russian olive substrate	1	<1% of total
Number of nests in other (*Baccharis*/cottonwood) substrate	6	<1% of total
Nest Substrate/Territory Vegetation Combination		
Number of nests in saltcedar substrate within *Salix*-dominated territories	454	26% of 1757 nests
Number of nests in *Salix* substrate within exotic or mixed dominance territories	91	9% of 1071 nests
Nest Success Per Nest Substrate Species		
Percentage of successful nests in *Salix* substrate	46%	639 out of 1388 nests
Percentage of successful nests in saltcedar substrate	41%	581 out of 1433 nests
Percentage of successful nests in Russian olive substrate.	0%	0 out of 1 nest
Percentage of successful nests in other (*Baccharis*/cottonwood) substrate	17%	1 out of 6 nests
Nest Success Per Territory Vegetation Type		
Percentage of successful nests in *Salix*-dominated territories	47%	831 out of 1757 nests
Percentage of successful nests in exotic-dominated territories	40%	136 out of 338 nests
Percentage of successful nests in mixed dominance territories	35%	254 out of 733 nests
Cowbird Parasitism Per Nest Substrate Species		
Percentage of nests parasitized in *Salix* substrate	12%	172 out of 1388 nests parasitized
Percentage of nests parasitized in saltcedar substrate	14%	198 out of 1433 nests parasitized
Percentage of nests parasitized in Russian olive substrate	0%	0 out of 1 nest parasitized
Percentage of nests parasitized in other (*Baccharis*/cottonwood) substrate	17%	1 out of 6 nests parasitized
Cowbird Parasitism Per Territory Vegetation Type		
Percentage of nests parasitized in *Salix*-dominated territories	13%	229 out of 1757 nests
Percentage of nests parasitized in exotic-dominated territories	12%	39 out of 338 nests
Percentage of nests parasitized in mixed dominance territories	14%	103 out of 733 nests
Productivity[(1)] Per Territory Vegetation Type		
Productivity of nests found in *Salix*-dominated territories	2.59/nest	2154 young from 831 nests
Productivity of nests found in exotic-dominated territories	2.43/nest	330 young from 136 nests
Productivity of nests found in mixed dominance territories	2.62/nest	666 young from 254 nests
Productivity[(1)] Per Nest Substrate Species		
Productivity of nests found in *Salix* substrate	2.61/nest	1670 young from 639 nests
Productivity of nests found in saltcedar substrate	2.54/nest	1478 young from 581 nests
Productivity of nests found in Russian olive substrate	N/A	N/A
Productivity[(1)] Compared to Nest Substrate Species and Territory Vegetation Type		
Productivity of nests in *Salix* substrate within *Salix* dominated territories	2.61/nest	1602 young from 613 nests
Productivity of nests in saltcedar substrate within *Salix* dominated territories	2.53/nest	550 young from 217 nests
Productivity of nests in saltcedar substrate within exotic dominated territories	2.43/nest	330 young from 136 nests
Total SWFL nests of known outcomes monitored from 1999-2017	2828	

Historically, native vegetation (i.e., Goodding's willow) has been the primary component of most SWFL territories within Elephant Butte Reservoir. However, over the period of study there has been a gradual increase in the number of territories found in both exotic stands and mixed stands of native and exotic vegetation. In 2002, 100 percent of all SWFL territories (n=54) were found within native-dominated stands; in 2017, 27 percent (n=205) were considered native-dominated (Figure 23). Also, for the past two years, the number of nests in both exotic-dominated (35 percent) and mixed dominance territories (34 percent) outnumbered nests in native-dominated territories. This shift coincides with a slow die-off or senescence of suitable native habitat in the upper reservoir pool, a 2005 river channel degradation event, and the recent drought conditions. Both the channel degradation and drought resulted in a lowering of the water table, depriving some occupied, native-dominated stands of water and favoring the more drought-tolerant saltcedar. Additionally, while SWFLs have always selected saltcedar as nesting substrate at a disproportionate rate (Table 10), in 2017 it was used at a higher rate than any year of this study. In 2002, 29 percent of SWFL nests (n=65) were found in saltcedar, compared to 72 percent (n=205) in 2017. In 2011, the percentage of nests found in saltcedar surpassed the number found in native species (Figure 24). Based on current conditions, this trend in saltcedar encroachment and use by SWFLs within the Elephant Butte Reservoir population will likely continue. However, the expansion of tamarisk beetles into saltcedar-dominated habitat presents an unknown threat to the persistence of this habitat that will play out in the coming years.

The breeding SWFL population within Elephant Butte Reservoir is the largest, and potentially most important, breeding population within the range of the Southwestern Willow Flycatcher. This population acts as a source for colonization of nearby developing habitat, both natural and man-made. Although this population experienced near-exponential growth between 2002 and 2009, it now appears to be on a downward trend (Figure 15). Limiting factors, such as declining habitat quality and increasing nest depredation, are adversely affecting the growth of this population. Conversely, developing habitat in the southern-most sites within the reservoir pool should allow the population in sites EB-15, 16 and 17 to continue to grow. These sites could compensate for habitat declines upstream and continue to be a valuable source population for the surrounding area. However, habitat restoration activities within the Middle Rio Grande should continue in an effort to compensate for the predicted decline in habitat quality and availability during the coming years.

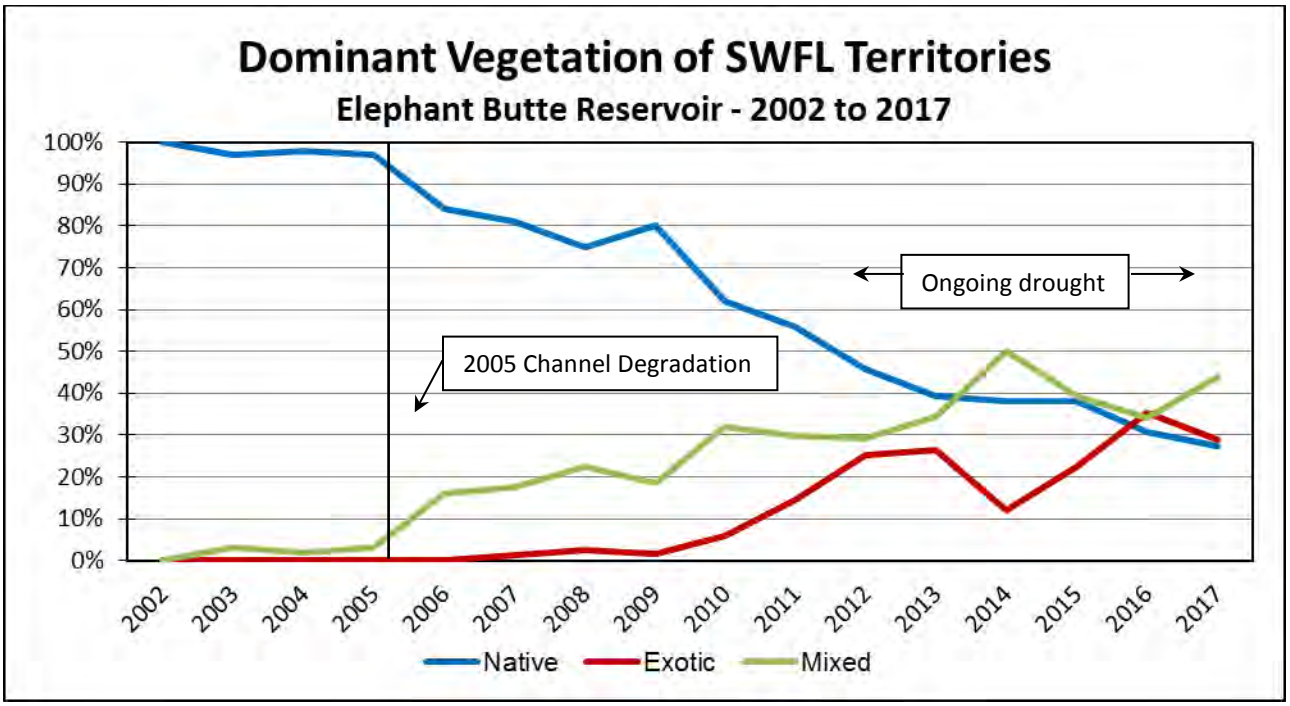


Figure 23. Dominant vegetation within SWFL territories - Elephant Butte Reservoir pool.

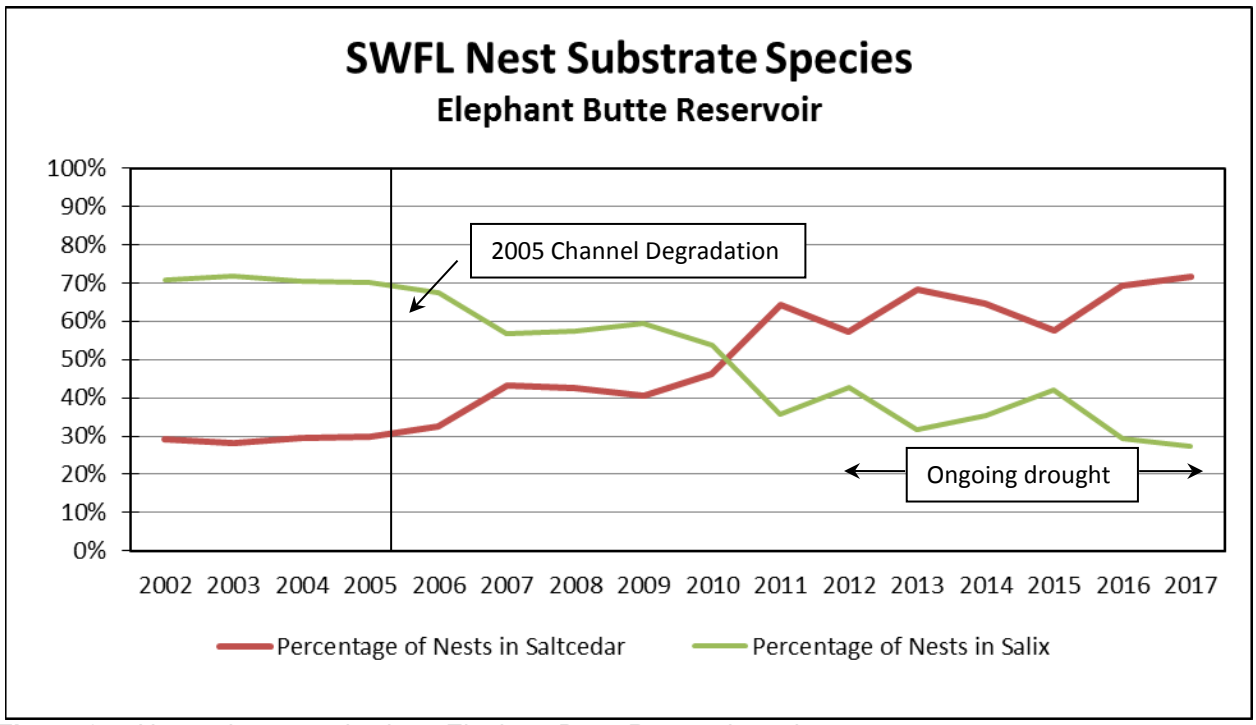


Figure 24. Nest substrate selection - Elephant Butte Reservoir pool.

Tamarisk Beetle

As outlined in previous sections, SWFLs within the Middle Rio Grande nested within native (n=2,011), saltcedar (n=499), and mixed native/exotic habitats (n=978) between 1999 and 2017. They also nest in saltcedar substrate at a disproportionate rate (51 percent of nests between 1999 and 2017). Given these facts, it is necessary to discuss the potential impacts of tamarisk

beetles on occupied SWFL habitat within the Middle Rio Grande. More than 50 percent of SWFL territories within the study area were located in either exotic-dominated or mixed dominance habitat during the past five years. As noted previously, the use of both saltcedar substrate and saltcedar-dominated habitat has dramatically increased during the past several years. In 2017, more than 70 percent of SWFL territories contained a saltcedar component. However, most of the large, monotypic stands of saltcedar in the Middle Rio Grande are not suitable flycatcher breeding habitat and are not occupied by resident flycatchers. Saltcedar-dominated territories occur scattered throughout the study area, interspersed within mixed and native-dominated habitat. These exotic-dominated territories would be adversely impacted by beetle defoliation, as well as mixed territories that contain a significant saltcedar component. Indeed, *Diorhabda* monitoring conducted during 2017 (Dillon and Ahlers 2017) documented negative impacts to occupied SWFL habitat. It seems that these impacts are likely to intensify in future years as tamarisk beetles increase in abundance and spread across the landscape. The location, timing and intensity of defoliation will determine the impacts to SWFLs and their habitat.

In contrast, a significant percentage of SWFLs continue to nest in native-dominated habitat within Elephant Butte Reservoir. In 2017, 56 SWFL nests (27 percent, n=205) were located in habitat consisting of at least 75 percent *Salix*. This habitat will not be adversely impacted by the tamarisk beetle but has been greatly impacted by recent drought conditions. If the above average river flows experienced in 2017 continue into future years, native willows may benefit and expand into areas impacted by tamarisk beetles. Conversely, the combination of persistent drought and tamarisk beetle expansion could devastate the various SWFL-occupied habitat types within the reservoir pool. Continued monitoring of habitat, beetle impacts and SWFL occupancy will determine the fate of this valuable SWFL population.

Hydrology Monitoring

Southwestern Willow Flycatcher habitat can be succinctly described as dense and wet. Hydrology is often the most important factor in the creation and maintenance of high quality SWFL habitat. The hydrology studies conducted by Reclamation during the past 14 years have documented interesting trends within occupied habitat in the Elephant Butte Reservoir pool. For several years, much of this habitat was continually flooded and began to decline in quality presumably due to this prolonged flooding. The photostation study initiated in 2005 documented this phenomenon (Ahlers, in press). Conversely, during the past several years drought conditions have reduced flow in the LFCC that sustains the high quality habitat on the western side of the reservoir pool to the point that this habitat has dried significantly. This has allowed saltcedar to encroach into formerly native-dominated habitat. Although the more drought-tolerant saltcedar can provide refuge for SWFLs during times of drought, if sufficient hydrology is not restored to the native habitat, it will eventually be lost.

Rising reservoir levels and inundation of potential/occupied habitat is another concern regarding hydrology within the reservoir pool. Habitat created by reduced reservoir elevations could be stressed and/or killed if flooded for an extended period (greater than 5 years [Reclamation 2009]). Occupied SWFL habitat within The Narrows and downstream (e.g., sites EB-13 through 17) has already been periodically flooded by a rising reservoir during the past several years. This has only benefitted this habitat so far, as the reservoir level has annually declined and not adversely impacted habitat.

Figure 25 shows the current elevational distribution of SWFL territories within Elephant Butte Reservoir. In 2017, 42 percent of SWFL territories were within seven feet of the spillway elevation within the historic floodplain. This number has decreased during the past several years as suitable SWFL habitat has developed downstream in the reservoir pool (Pages A23 to A28). It is unlikely that habitat within this elevational range would be negatively impacted by reservoir water even at full pool. Annual fluctuation of reservoir elevations, even during average water years, would likely be enough to remove water from this habitat and prevent mortality. Conversely, much of the formerly occupied habitat in this elevational range has become decadent and lost suitability due to its age and the aforementioned flood and drought cycles. Reservoir levels peaked at just under 4,342 feet (ft) in June 2017. This level floods occupied sites below The Narrows (Figure 26) and this occupied habitat is the most susceptible to adverse impacts from a modest rise in reservoir levels (i.e. 20 feet). However, flows of the magnitude sufficient to raise the reservoir significantly would likely improve and/or create flycatcher habitat elsewhere, possibly equating to no net loss of habitat.

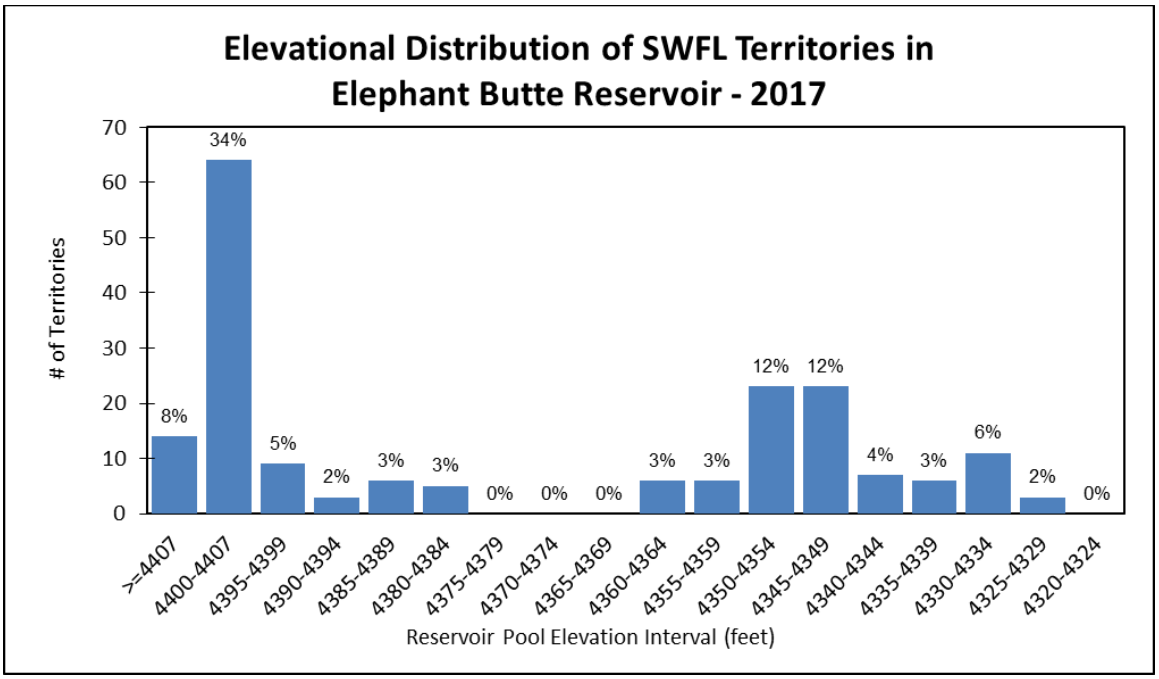


Figure 25. Elevational distribution of SWFL territories within Elephant Butte Reservoir in 2017. Forty-two percent of territories were within seven feet of reservoir spillway elevation.

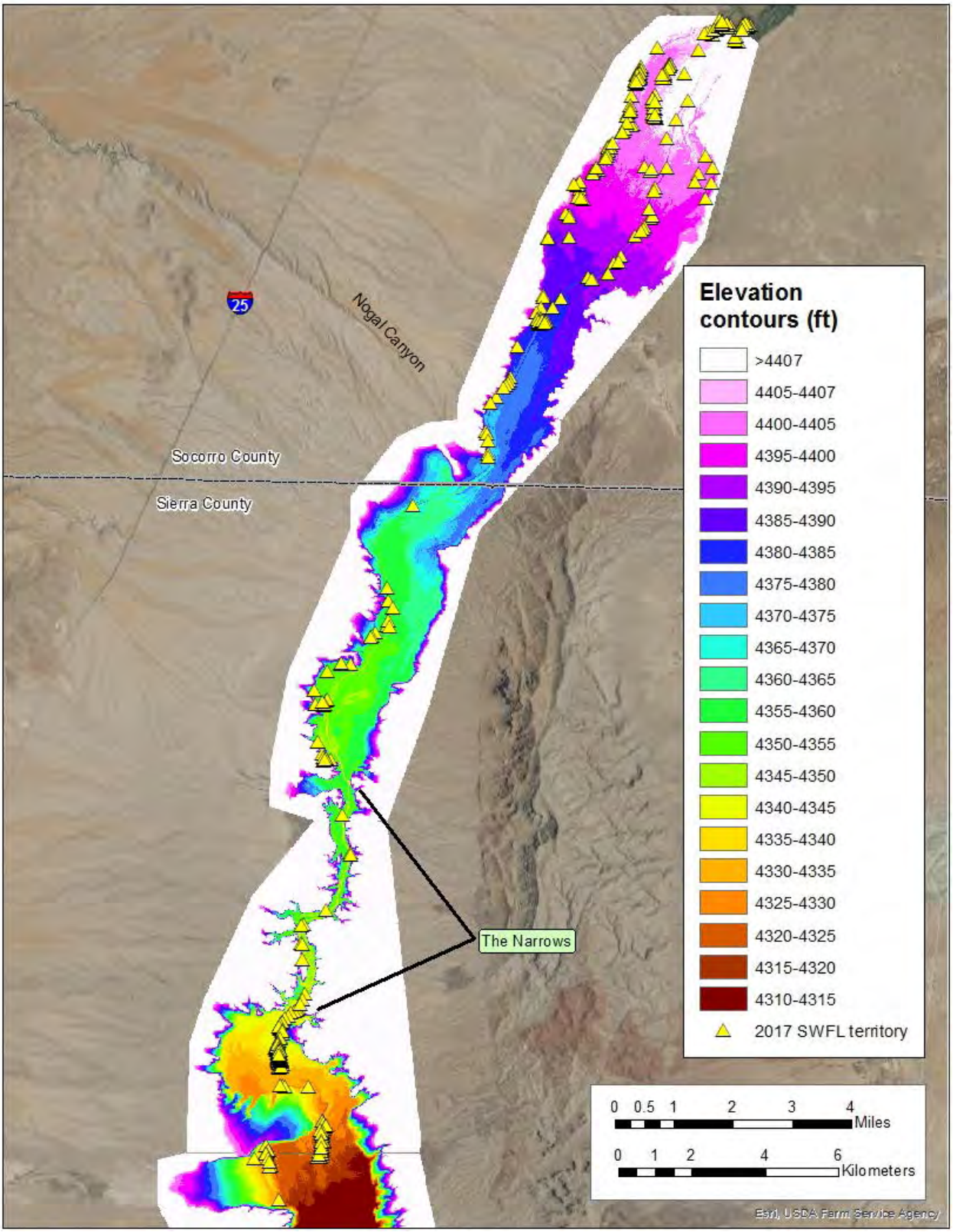


Figure 26. Elevation contours within the delta of Elephant Butte Reservoir. Reservoir levels ranged from 4,325 to 4,342 feet in elevation during the 2017 SWFL survey season. See Attachment for additional years.

Recommendations

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

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

Annual Surveys

- Presence/absence surveys should continue in occupied reaches of the Middle Rio Grande to monitor the status of the SWFL population. These surveys will provide data regarding population trends and colonization of new sites adjacent to occupied sites. Special attention should be given to the populations in the San Marcial, Bosque del Apache, and Belen Reaches.
- Presence/absence surveys should also continue in project-related areas where ESA compliance mandates and within designated critical habitat.
- 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. Focus should be given to areas with potential project/habitat impacts (e.g. San Marcial, Bosque del Apache). These data will provide insight into factors limiting recruitment and population growth such as parasitism and depredation 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.
- Monitoring of tamarisk beetle expansion and impacts should continue in order to determine effects of this biocontrol agent on SWFL habitat.

Periodic Surveys

- Periodic surveys (every 3 to 5 years) by the appropriate land management entity should be performed in suitable/potential habitat within the Middle Rio Grande in order to document any SWFL 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.

Non Survey-related

- The sediment plug monitoring studies within the Bosque del Apache NWR and site EB-09 should be continued in order to monitor potential impacts to these SWFL populations and their habitat. The Bosque del Apache sediment plug study should be modified to monitor impacts associated with the proposed 2018 river channel relocation.

- Habitat monitoring data from the nest vegetation quantification study should be utilized at restoration sites to document the effectiveness of various restoration practices.
- Investigations into the options for water management in the delta of Elephant Butte Reservoir should be conducted in order to determine possible solutions to the flood/drought cycle that has been detrimental to SWFL habitat.

Conclusions

Presence/absence data will be beneficial when ESA compliance is required for river maintenance and/or restoration projects. The data will also 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 Management Unit, a part of the Rio Grande Recovery Unit, extends from just upstream of Cochiti Reservoir to Elephant Butte Dam. The recovery goal for the Middle Rio Grande Management Unit is 100 SWFL territories. This goal has been exceeded for 15 consecutive years. However, recent trends of habitat decline and conversion to saltcedar in combination with the spread of the tamarisk beetle throughout the Middle Rio Grande do not bode well for the persistence of this large population. And, although the recovery goal for the Middle Rio Grande Management Unit has been exceeded, other Management Units and Recovery Units are far from reaching their respective goals, and down listing or delisting appears unlikely in the near future.

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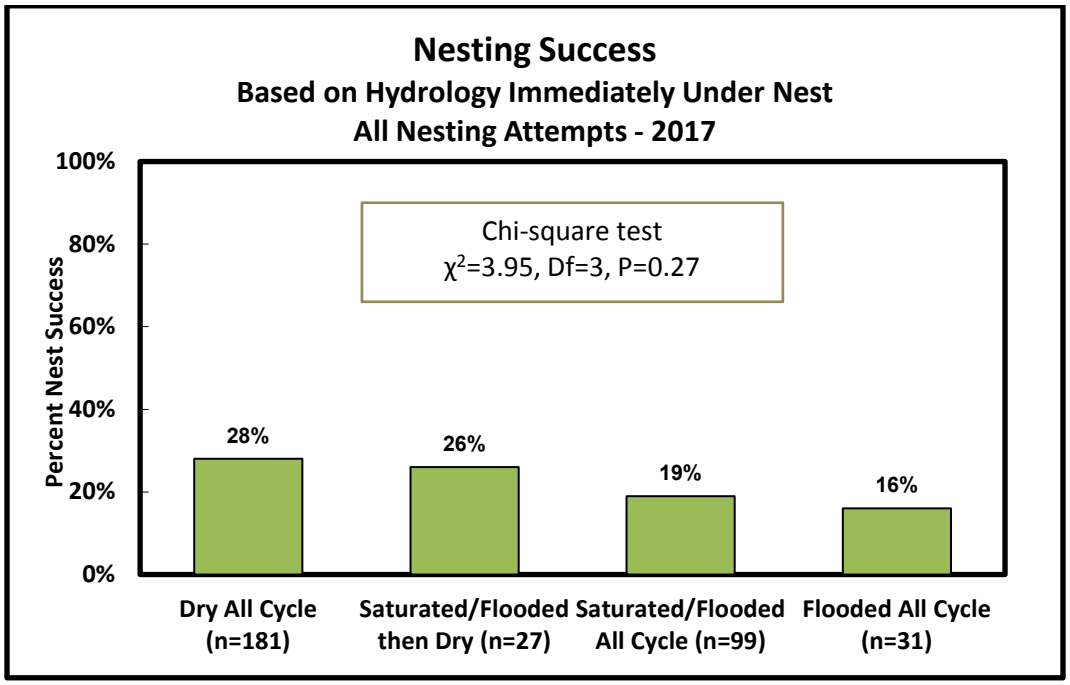
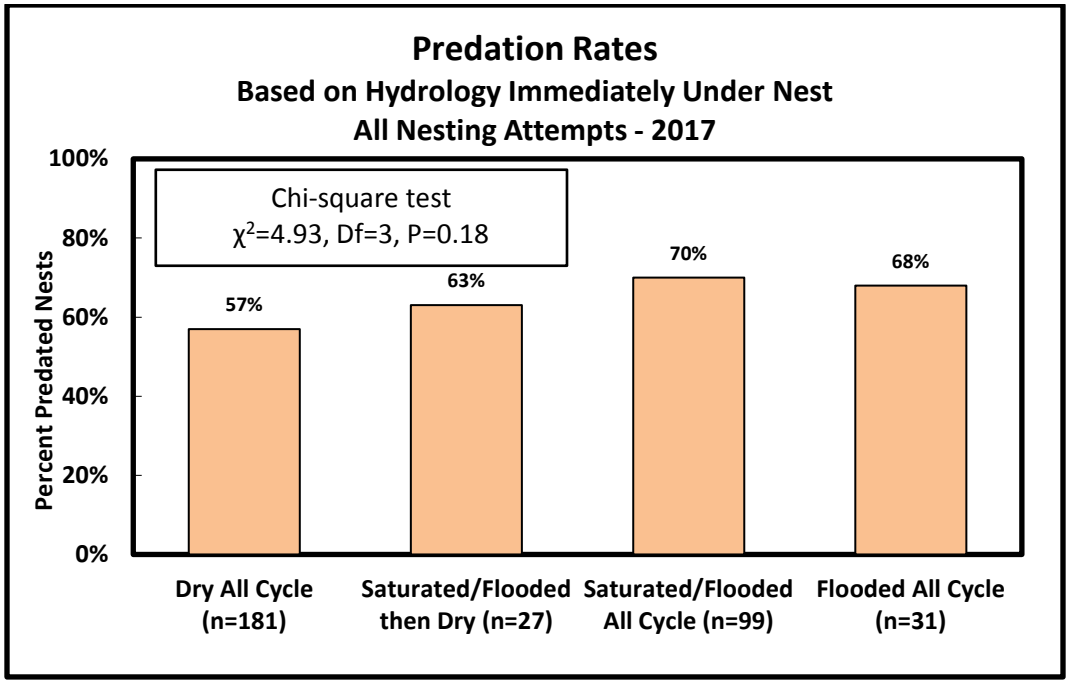
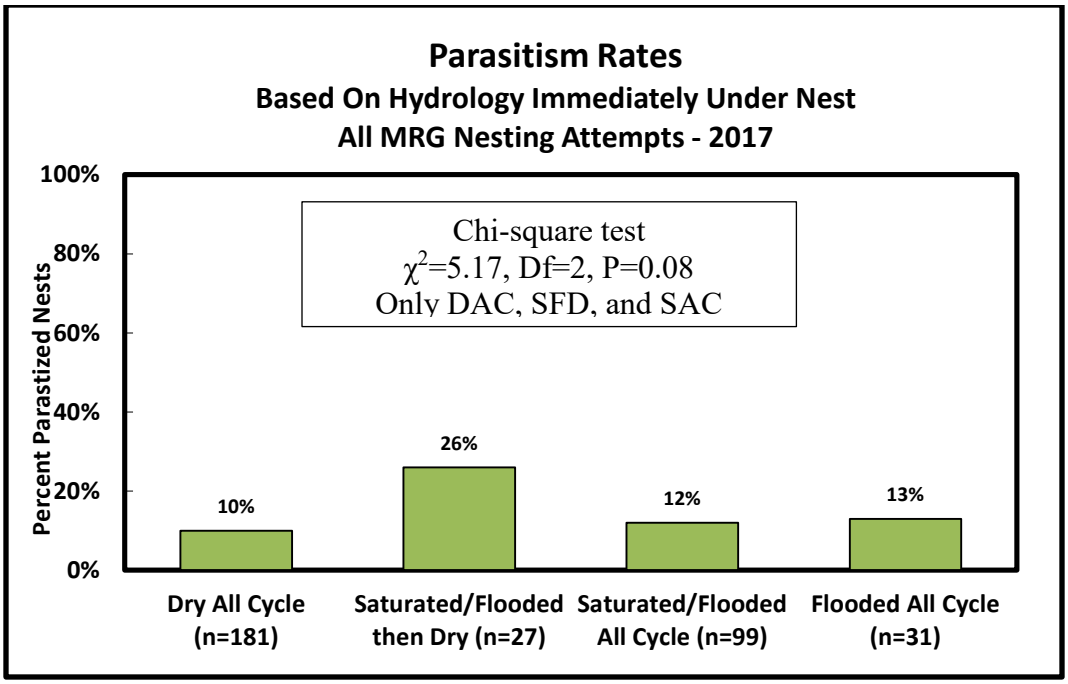
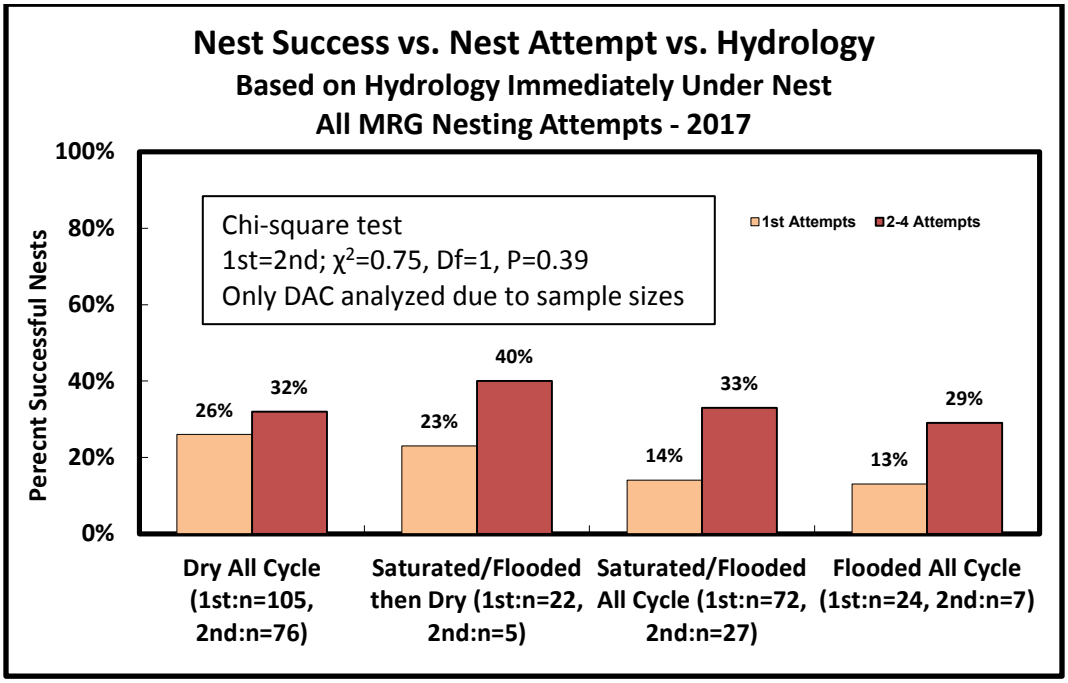
Attachment – Territories, nests, habitat and hydrological analyses

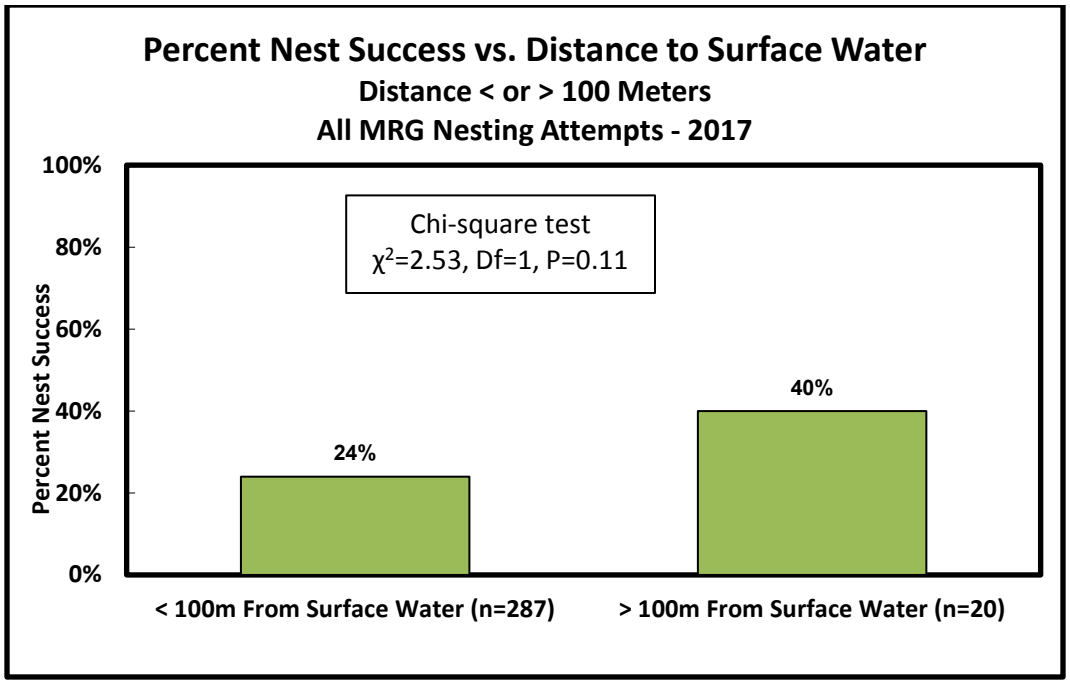
Nesting Variable and Hydrology Comparisons – All Middle Rio Grande Nests 2017

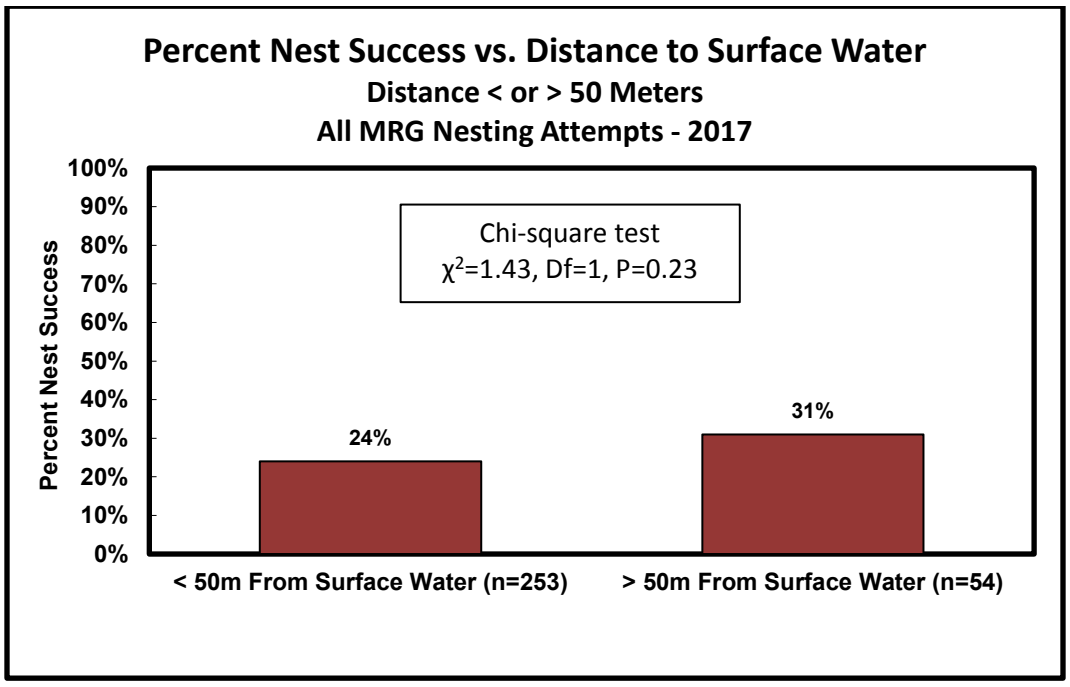


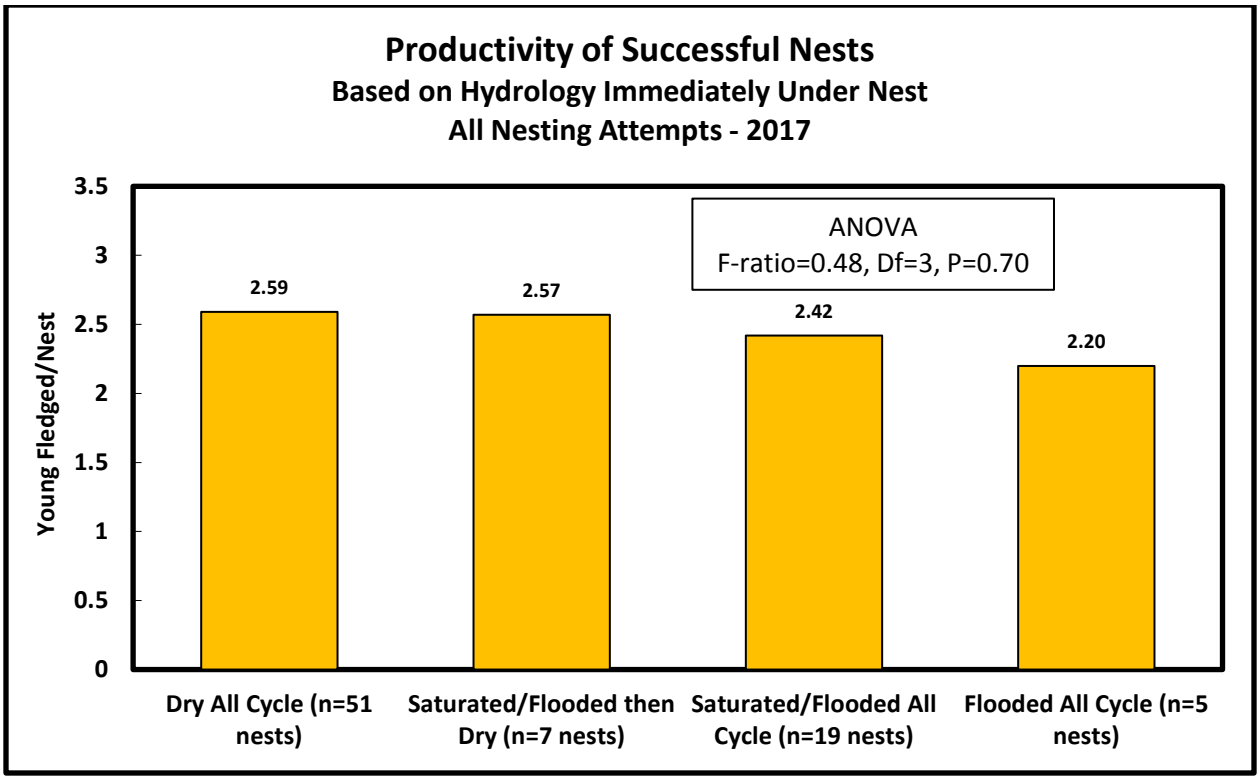


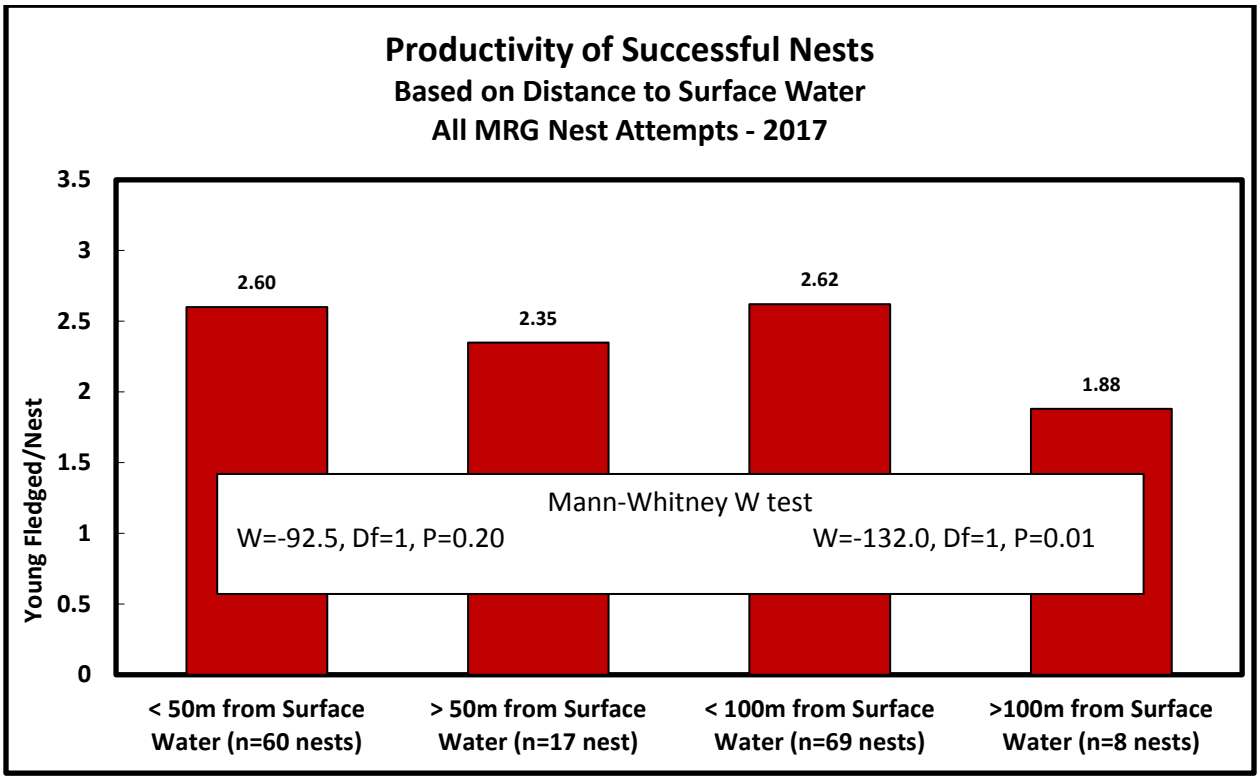

Parasitism Rates
Based On Hydrology Immediately Under Nest
All MRG Nesting Attempts - 2017
Percent Parastized Nests
100%
80%
60%
40%
20%
0%
Chi-square test
χ^2=5.17, Df=2, P=0.08
Only DAC, SFD, and SAC
10%
26%
12%
13%
Dry All Cycle (n=181)
Saturated/Flooded then Dry (n=27)
Saturated/Flooded All Cycle (n=99)
Flooded All Cycle (n=31)


Nest Success vs. Nest Attempt vs. Hydrology
Based on Hydrology Immediately Under Nest
All MRG Nesting Attempts - 2017
Perecnt Successful Nests
100%
80%
60%
40%
20%
0%
Chi-square test
1st=2nd; χ^2=0.75, Df=1, P=0.39
Only DAC analyzed due to sample sizes
1st Attempts
2-4 Attempts
26%
32%
23%
40%
14%
33%
13%
29%
Dry All Cycle (1st:n=105, 2nd:n=76)
Saturated/Flooded then Dry (1st:n=22, 2nd:n=5)
Saturated/Flooded All Cycle (1st:n=72, 2nd:n=27)
Flooded All Cycle (1st:n=24, 2nd:n=7)

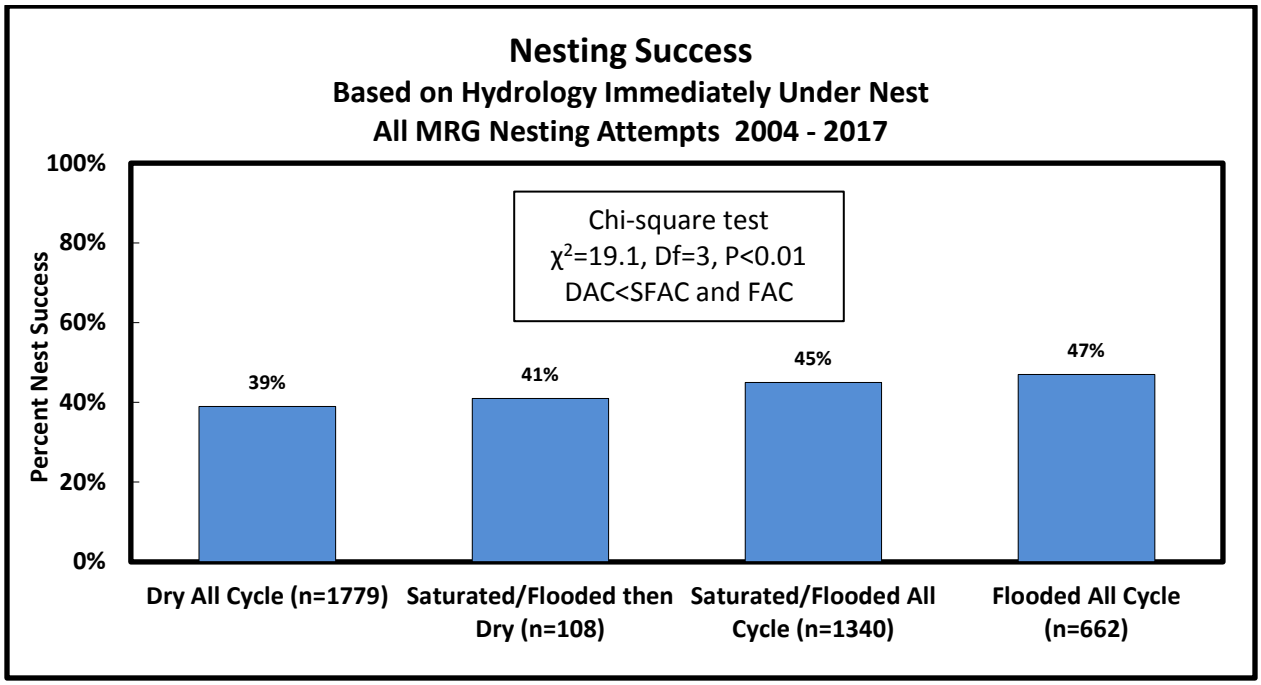

Percent Nest Success vs. Distance to Surface Water
Distance < or > 100 Meters
All MRG Nesting Attempts - 2017
Chi-square test
χ²=2.53, Df=1, P=0.11
Percent Nest Success
100%
80%
60%
40%
20%
0%
24%
40%
< 100m From Surface Water (n=287)
> 100m From Surface Water (n=20)

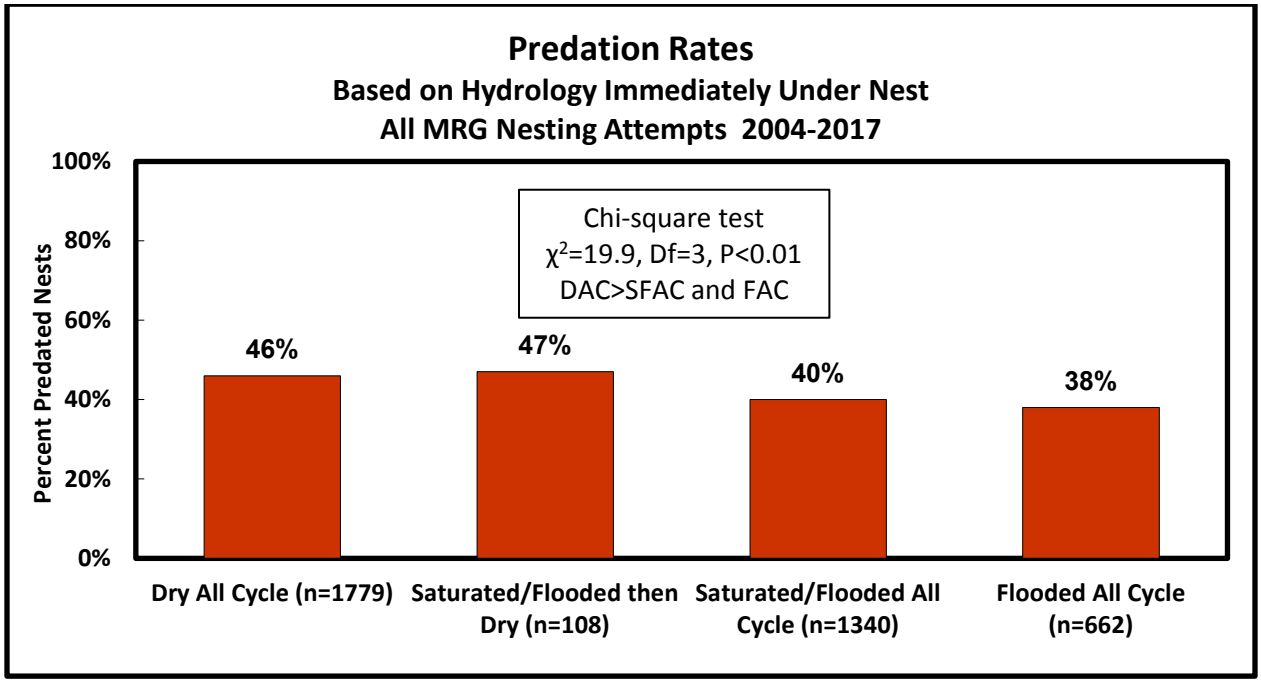

Percent Nest Success vs. Distance to Surface Water
Distance < or > 50 Meters
All MRG Nesting Attempts - 2017
Chi-square test
χ²=1.43, Df=1, P=0.23
Percent Nest Success
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
24%
31%
< 50m From Surface Water (n=253)
> 50m From Surface Water (n=54)

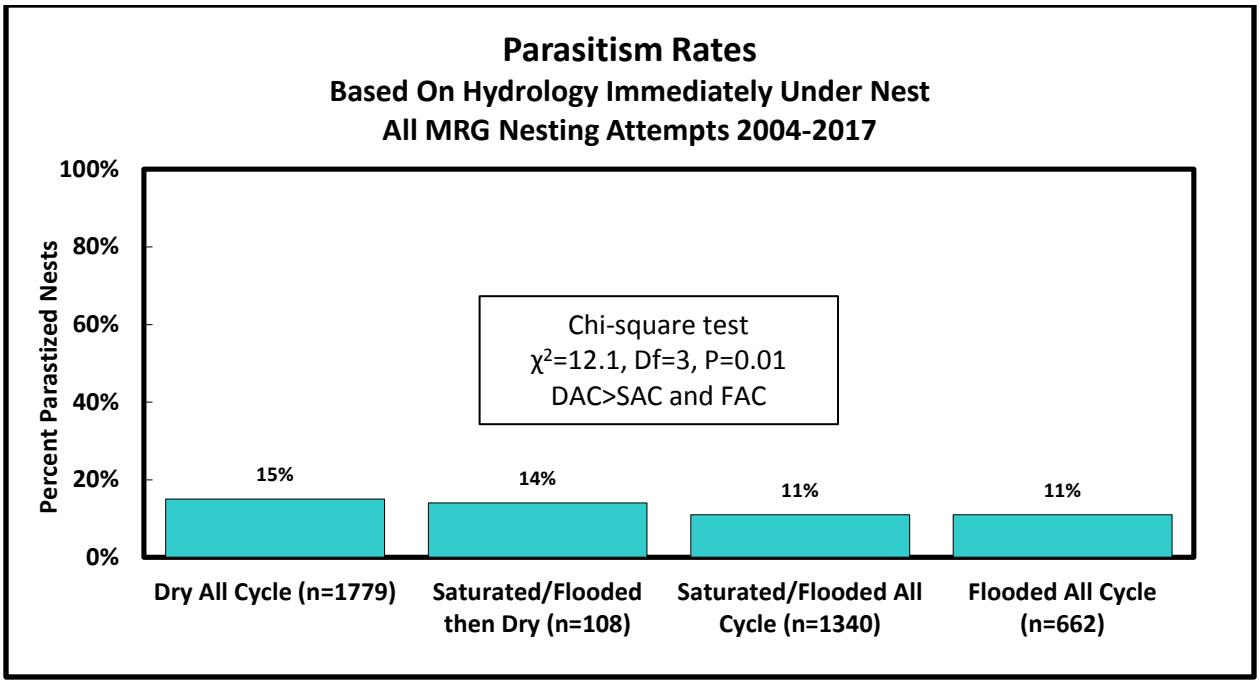

Productivity of Successful Nests
Based on Hydrology Immediately Under Nest
All Nesting Attempts - 2017
Young Fledged/Nest
3.5
3
2.5
2
1.5
1
0.5
0
ANOVA
F-ratio=0.48, Df=3, P=0.70
2.59
2.57
2.42
2.20
Dry All Cycle (n=51 nests)
Saturated/Flooded then Dry (n=7 nests)
Saturated/Flooded All Cycle (n=19 nests)
Flooded All Cycle (n=5 nests)

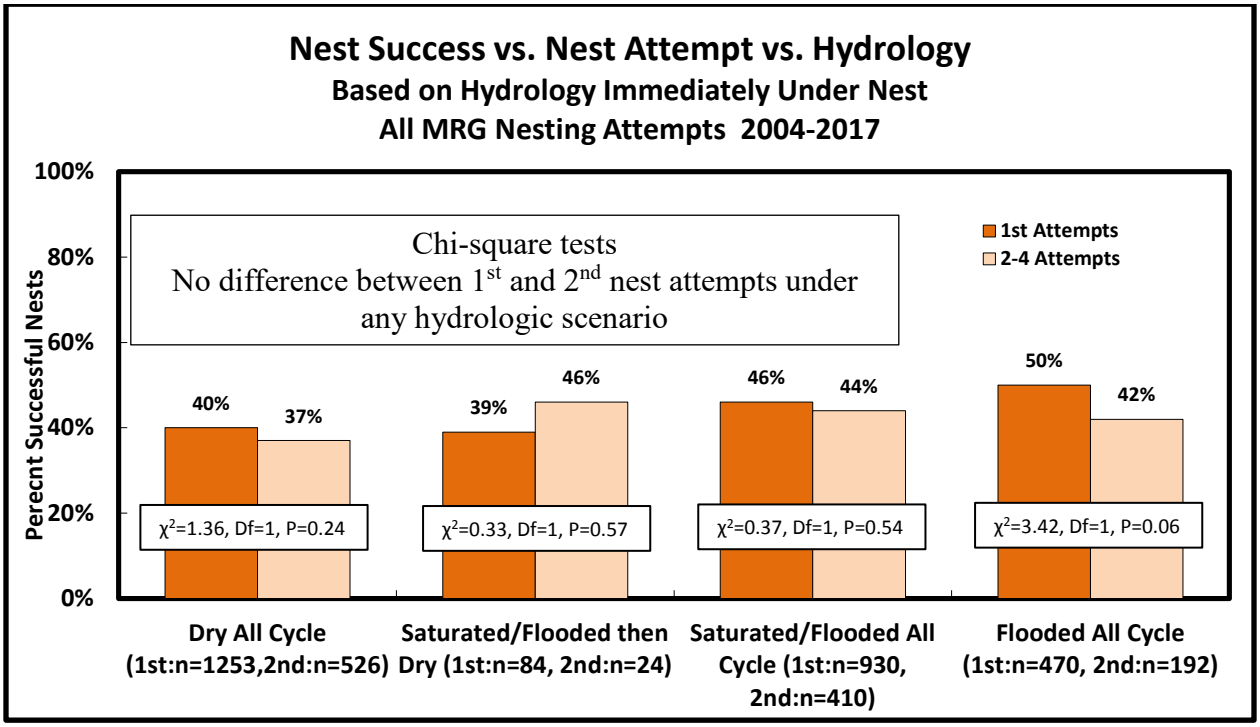

Productivity of Successful Nests
Based on Distance to Surface Water
All MRG Nest Attempts - 2017
Young Fledged/Nest
3.5
3
2.5
2
1.5
1
0.5
0
Mann-Whitney W test
W=-92.5, Df=1, P=0.20
W=-132.0, Df=1, P=0.01
2.60
2.35
2.62
1.88
< 50m from Surface Water (n=60 nests)
> 50m from Surface Water (n=17 nest)
< 100m from Surface Water (n=69 nests)
>100m from Surface Water (n=8 nests)

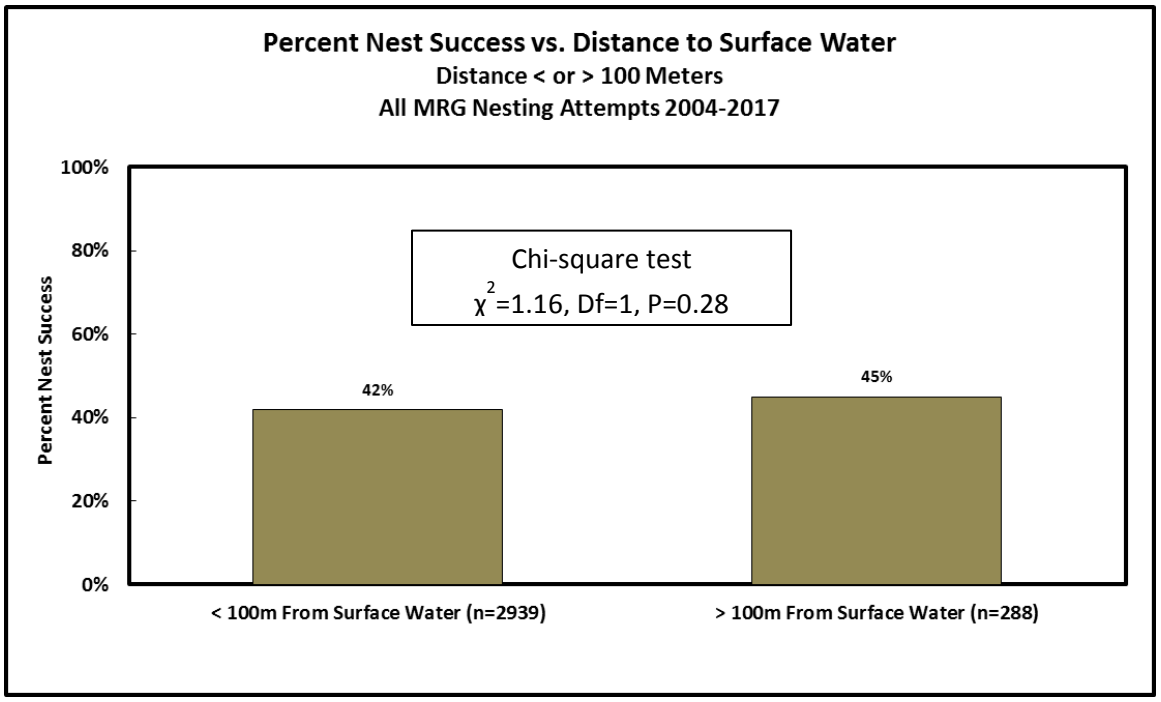
Nesting Variable and Hydrology Comparisons – All Middle Rio Grande Nests 2004 to 2017

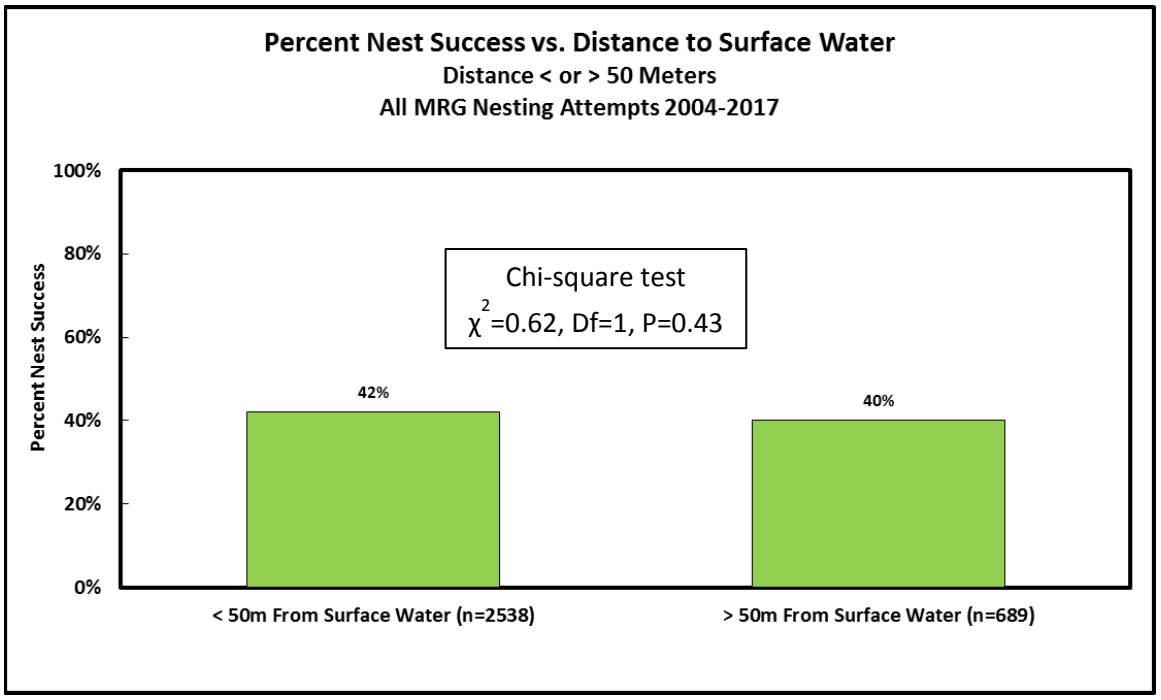


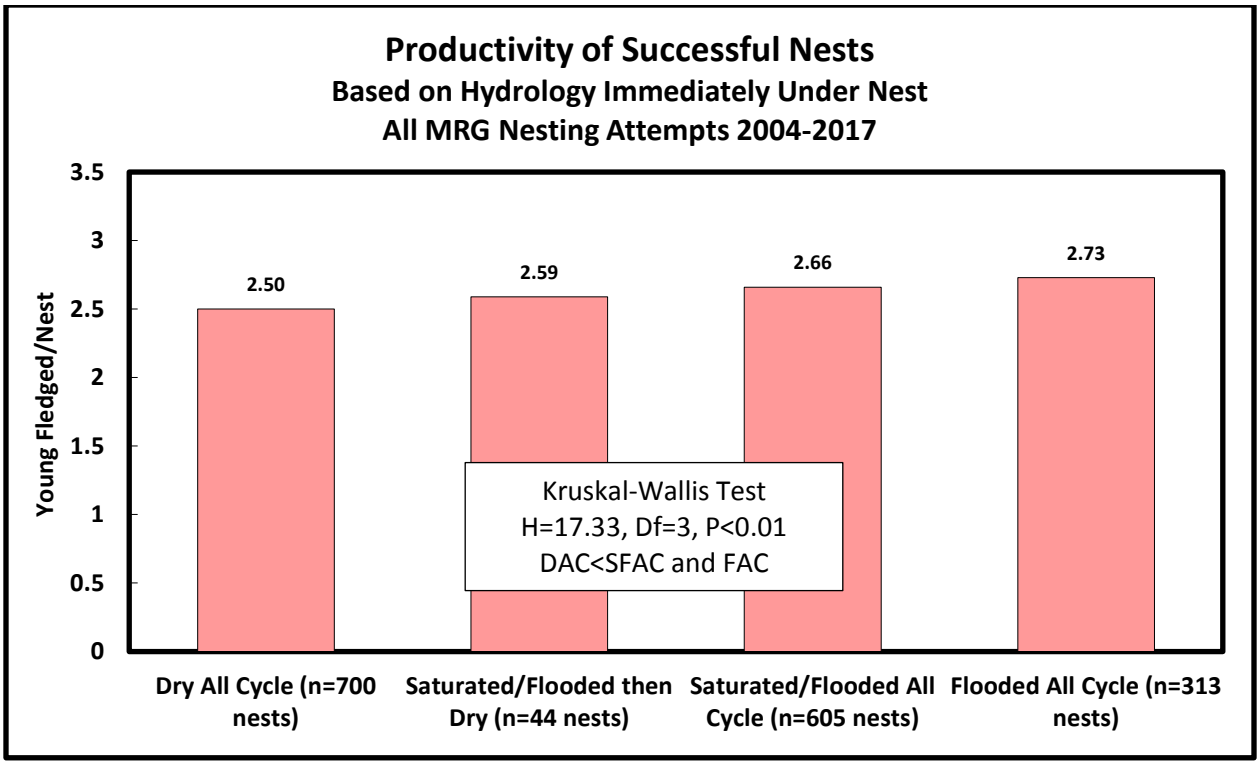


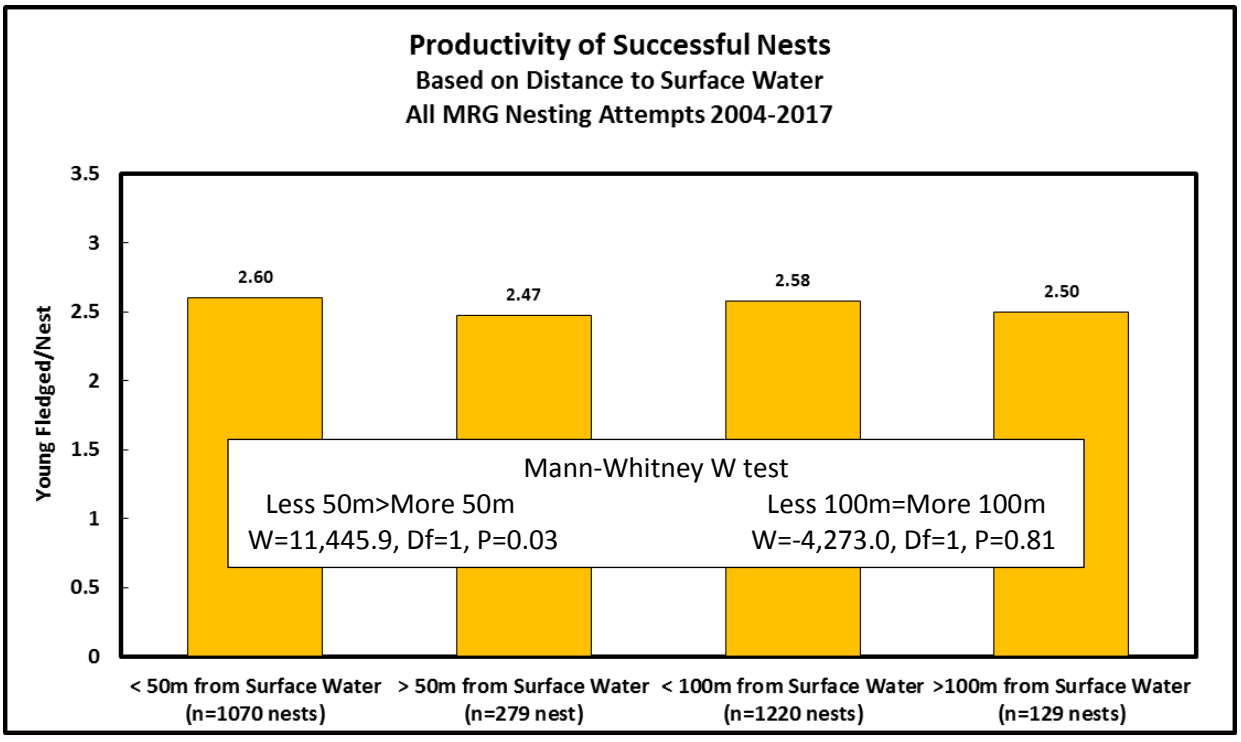

Parasitism Rates
Based On Hydrology Immediately Under Nest
All MRG Nesting Attempts 2004-2017
Percent Parasitized Nests
100%
80%
60%
40%
20%
0%
Chi-square test
χ²=12.1, Df=3, P=0.01
DAC>SAC and FAC
15%
14%
11%
11%
Dry All Cycle (n=1779)
Saturated/Flooded then Dry (n=108)
Saturated/Flooded All Cycle (n=1340)
Flooded All Cycle (n=662)

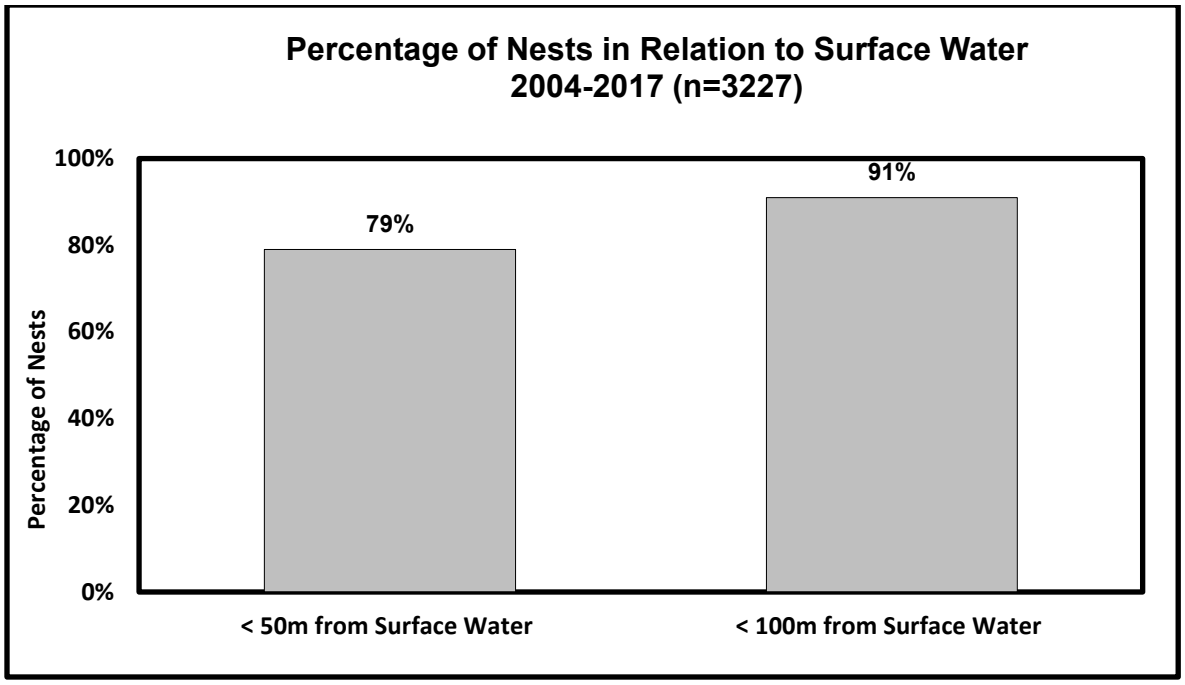

Nest Success vs. Nest Attempt vs. Hydrology
Based on Hydrology Immediately Under Nest
All MRG Nesting Attempts 2004-2017
Perecnt Successful Nests
100%
80%
60%
40%
20%
0%
Chi-square tests
No difference between 1st and 2nd nest attempts under any hydrologic scenario
1st Attempts
2-4 Attempts
40%
37%
39%
46%
46%
44%
50%
42%
χ²=1.36, Df=1, P=0.24
χ²=0.33, Df=1, P=0.57
χ²=0.37, Df=1, P=0.54
χ²=3.42, Df=1, P=0.06
Dry All Cycle (1st:n=1253,2nd:n=526)
Saturated/Flooded then Dry (1st:n=84, 2nd:n=24)
Saturated/Flooded All Cycle (1st:n=930, 2nd:n=410)
Flooded All Cycle (1st:n=470, 2nd:n=192)


Percent Nest Success vs. Distance to Surface Water
Distance < or > 100 Meters
All MRG Nesting Attempts 2004-2017
100%
80%
60%
40%
20%
0%
Percent Nest Success
Chi-square test
χ2=1.16, Df=1, P=0.28
42%
45%
< 100m From Surface Water (n=2939)
> 100m From Surface Water (n=288)

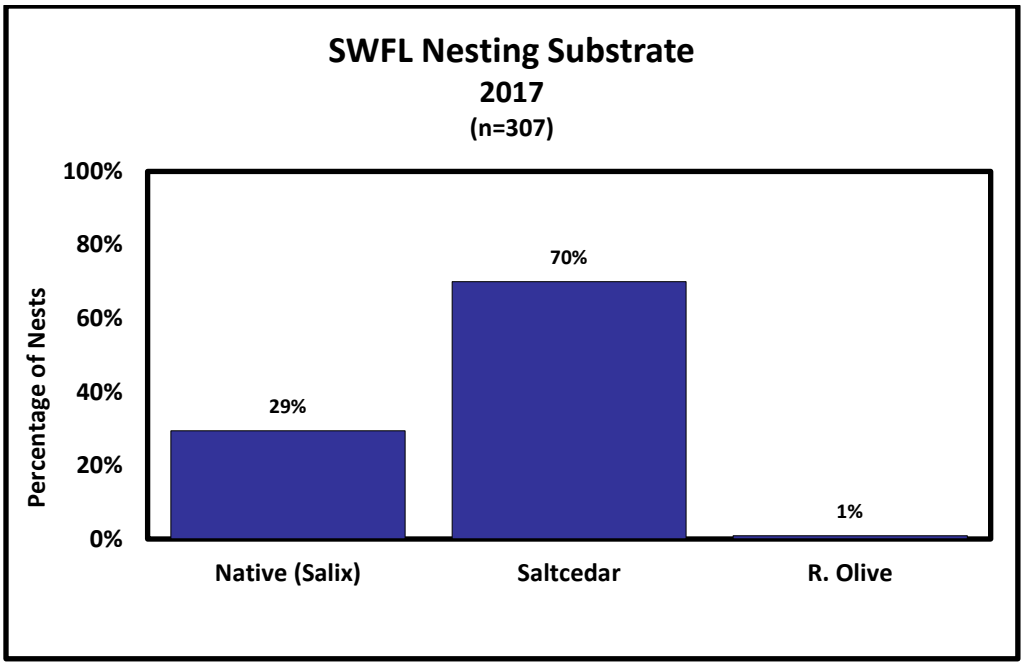

Percent Nest Success vs. Distance to Surface Water
Distance < or > 50 Meters
All MRG Nesting Attempts 2004-2017
100%
80%
60%
40%
20%
0%
Percent Nest Success
Chi-square test
χ2=0.62, Df=1, P=0.43
42%
40%
< 50m From Surface Water (n=2538)
> 50m From Surface Water (n=689)

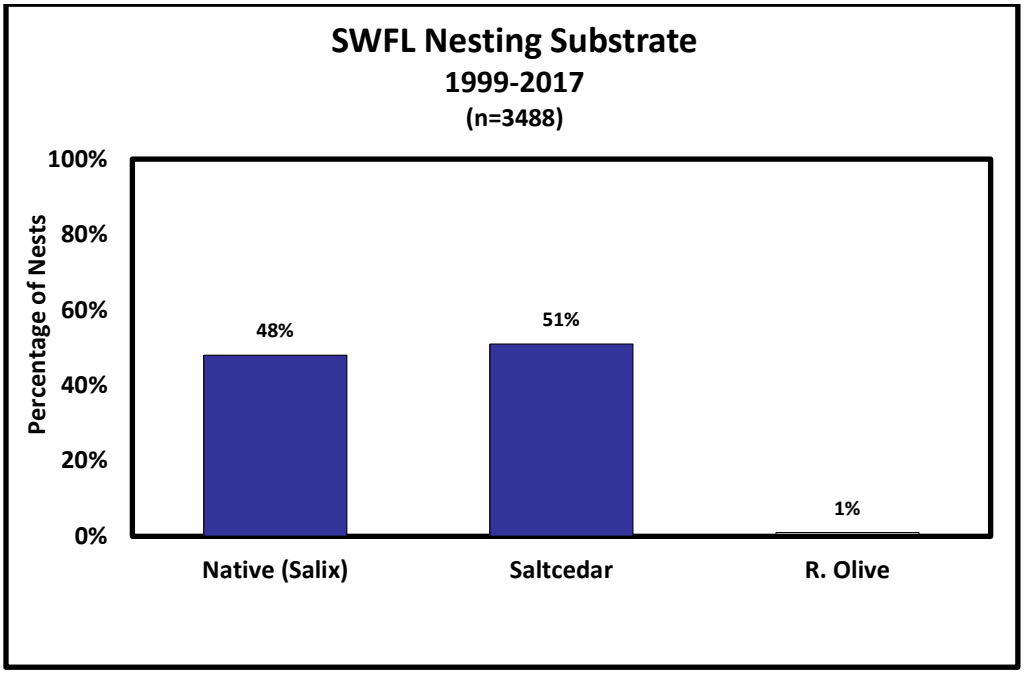

Productivity of Successful Nests
Based on Hydrology Immediately Under Nest
All MRG Nesting Attempts 2004-2017
Young Fledged/Nest
3.5
3
2.5
2
1.5
1
0.5
0
2.50
2.59
2.66
2.73
Kruskal-Wallis Test
H=17.33, Df=3, P<0.01
DAC<SFAC and FAC
Dry All Cycle (n=700 nests)
Saturated/Flooded then Dry (n=44 nests)
Saturated/Flooded All Cycle (n=605 nests)
Flooded All Cycle (n=313 nests)

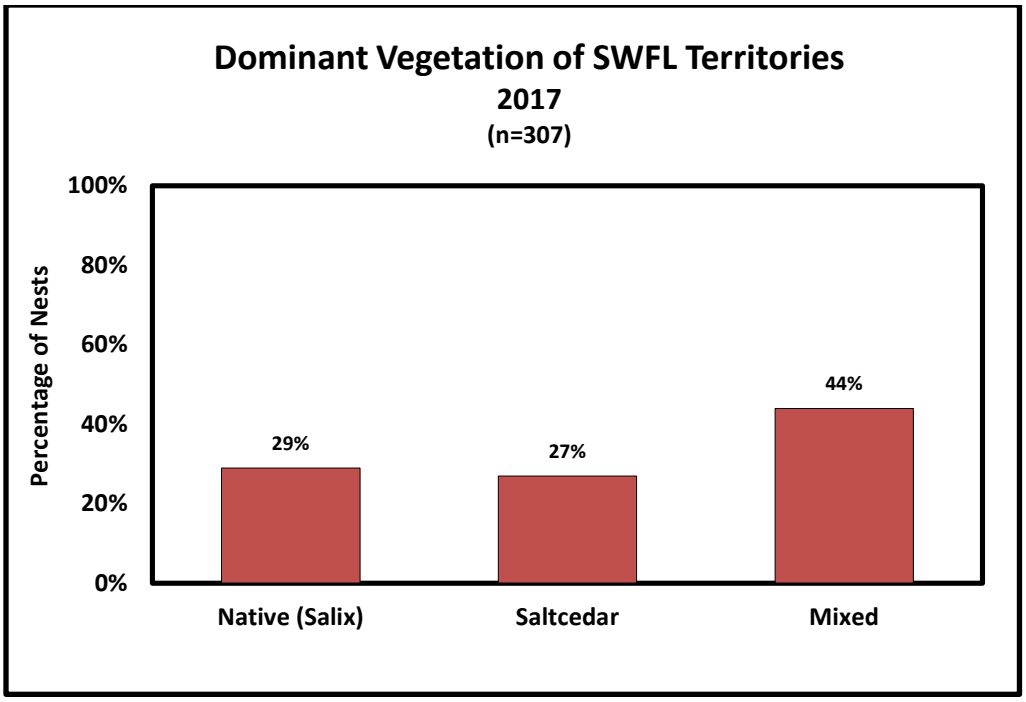

Productivity of Successful Nests
Based on Distance to Surface Water
All MRG Nesting Attempts 2004-2017
Young Fledged/Nest
3.5
3
2.5
2
1.5
1
0.5
0
2.60
2.47
2.58
2.50
Mann-Whitney W test
Less 50m>More 50m
W=11,445.9, Df=1, P=0.03
Less 100m=More 100m
W=-4,273.0, Df=1, P=0.81
< 50m from Surface Water (n=1070 nests)
> 50m from Surface Water (n=279 nest)
< 100m from Surface Water (n=1220 nests)
>100m from Surface Water (n=129 nests)

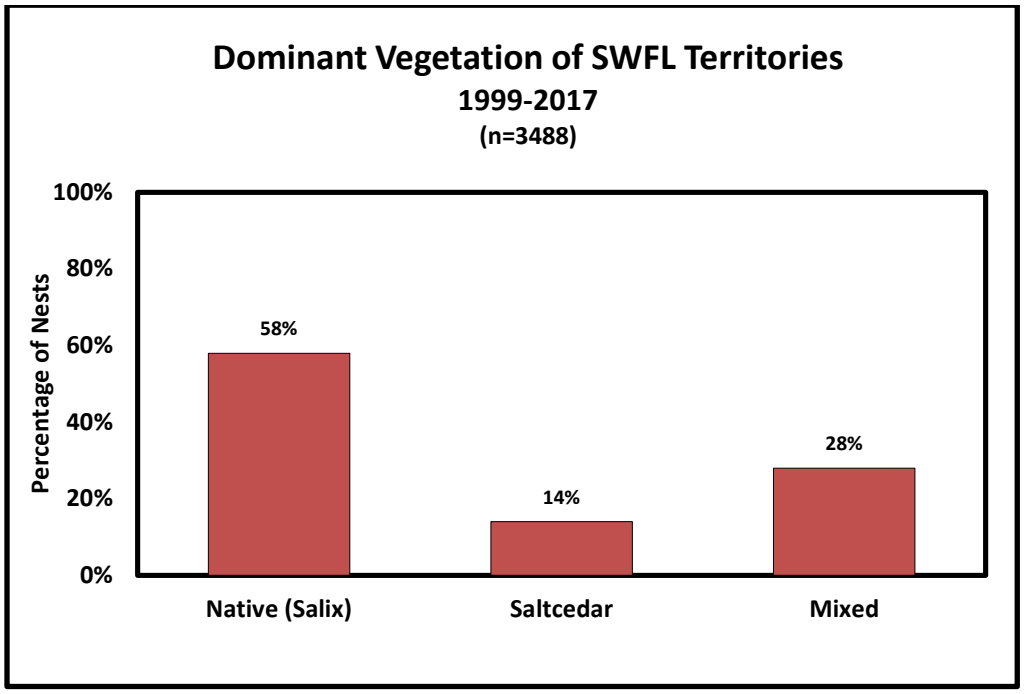

Percentage of Nests in Relation to Surface Water
2004-2017 (n=3227)
100%
80%
60%
40%
20%
0%
Percentage of Nests
79%
91%
< 50m from Surface Water
< 100m from Surface Water

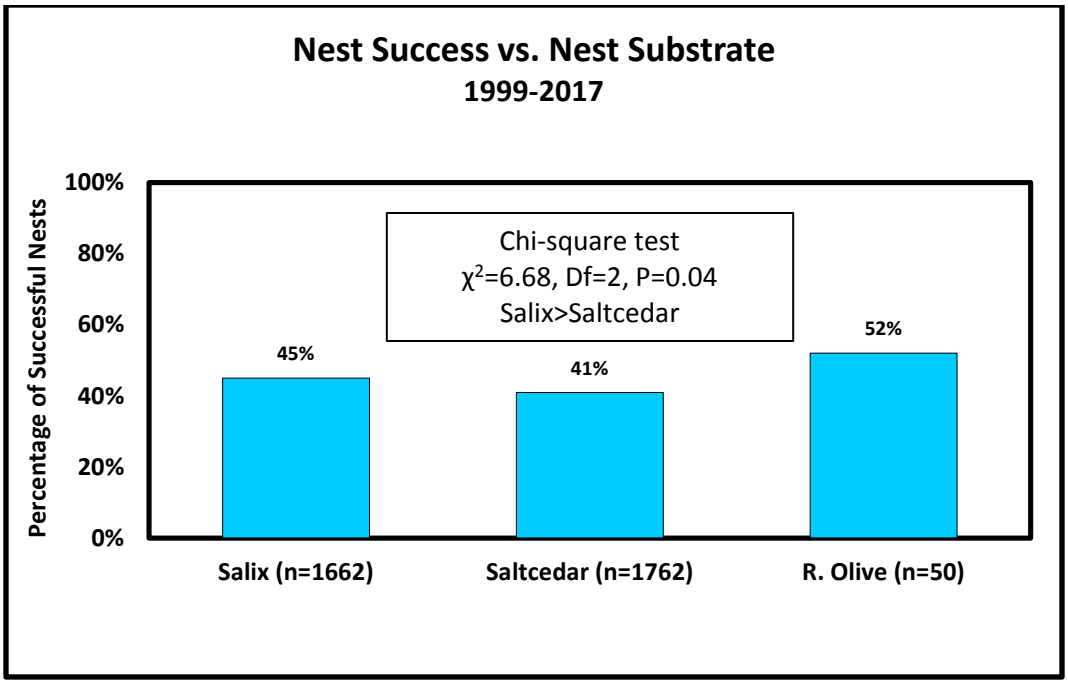
Nesting Variable and Habitat Comparisons – All Middle Rio Grande Nests

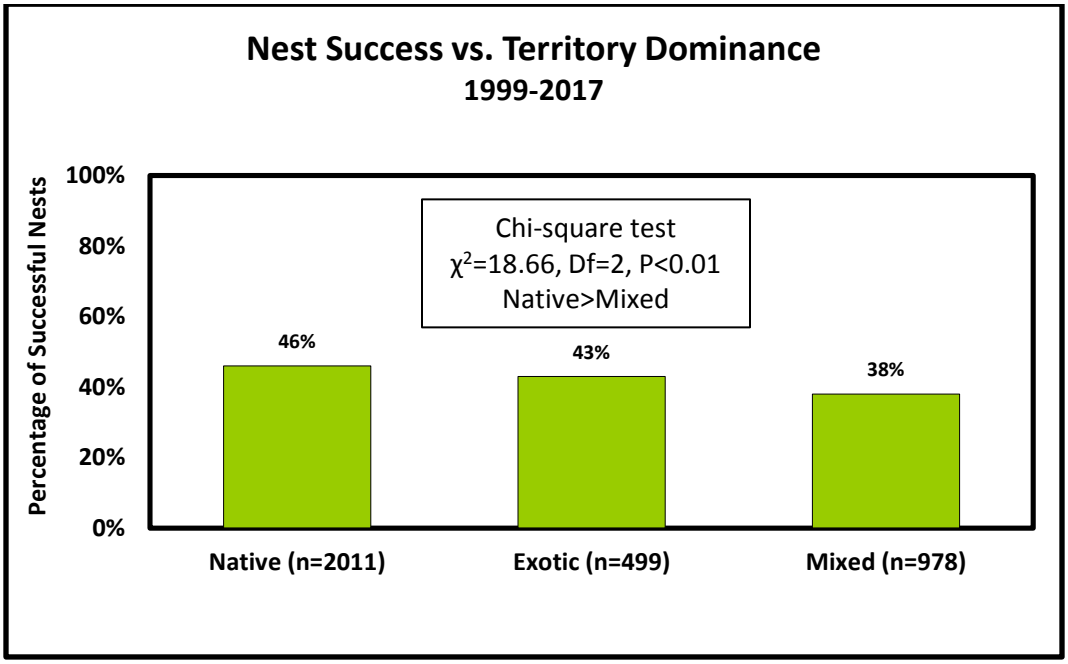


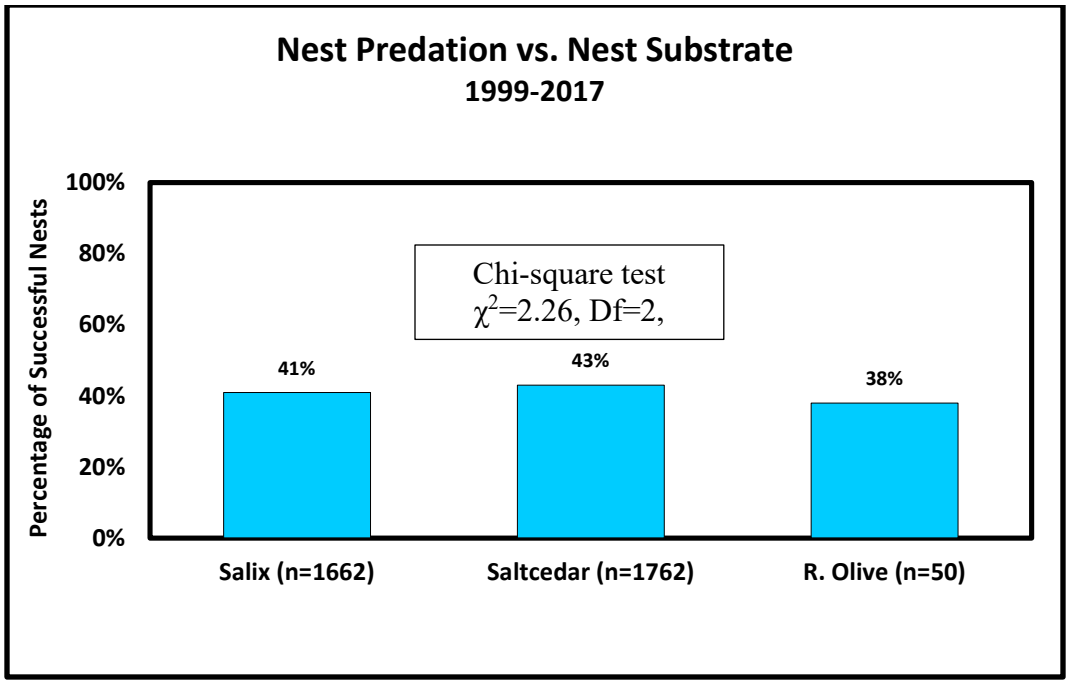


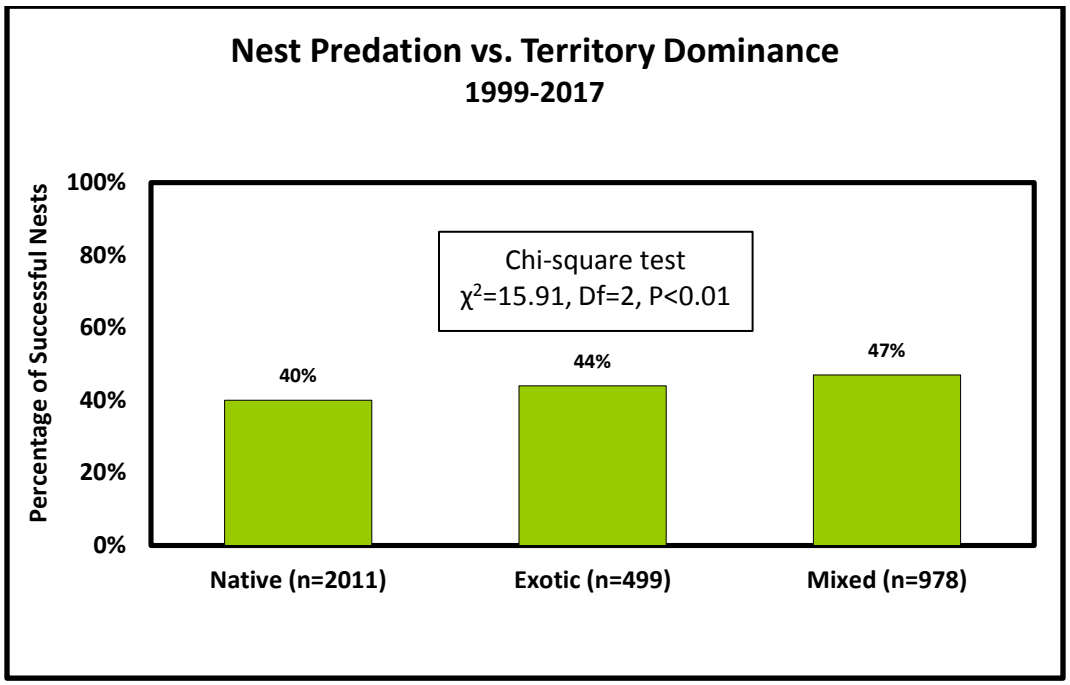

Dominant Vegetation of SWFL Territories
2017
(n=307)
Percentage of Nests
100%
80%
60%
40%
20%
0%
29%
27%
44%
Native (Salix)
Saltcedar
Mixed

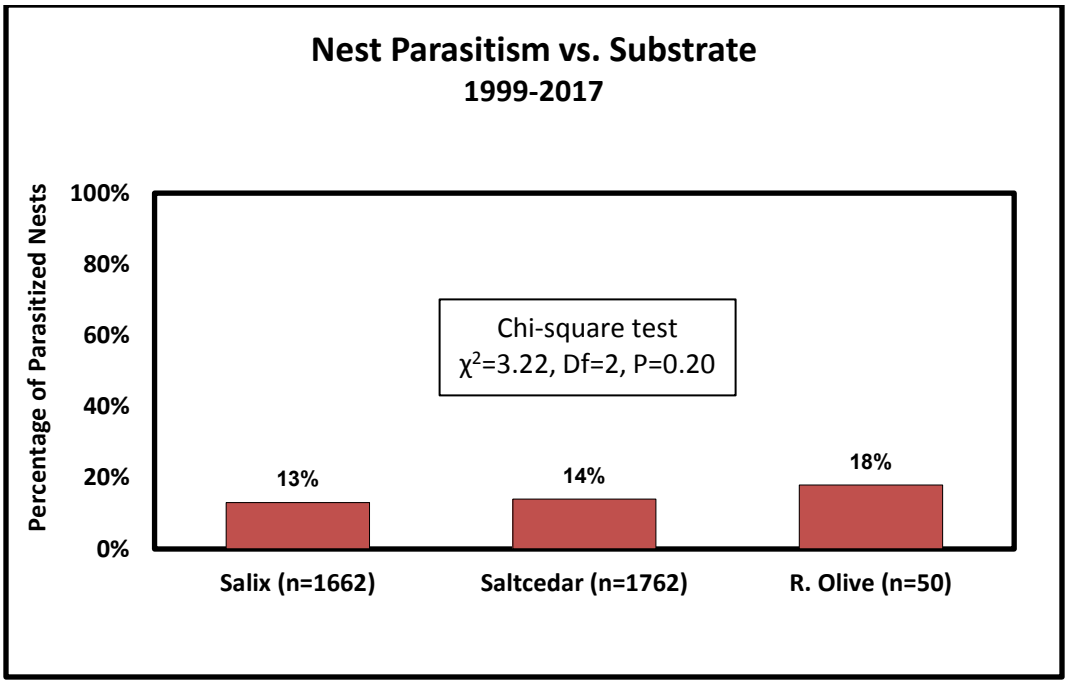

Dominant Vegetation of SWFL Territories
1999-2017
(n=3488)
Percentage of Nests
100%
80%
60%
40%
20%
0%
58%
14%
28%
Native (Salix)
Saltcedar
Mixed

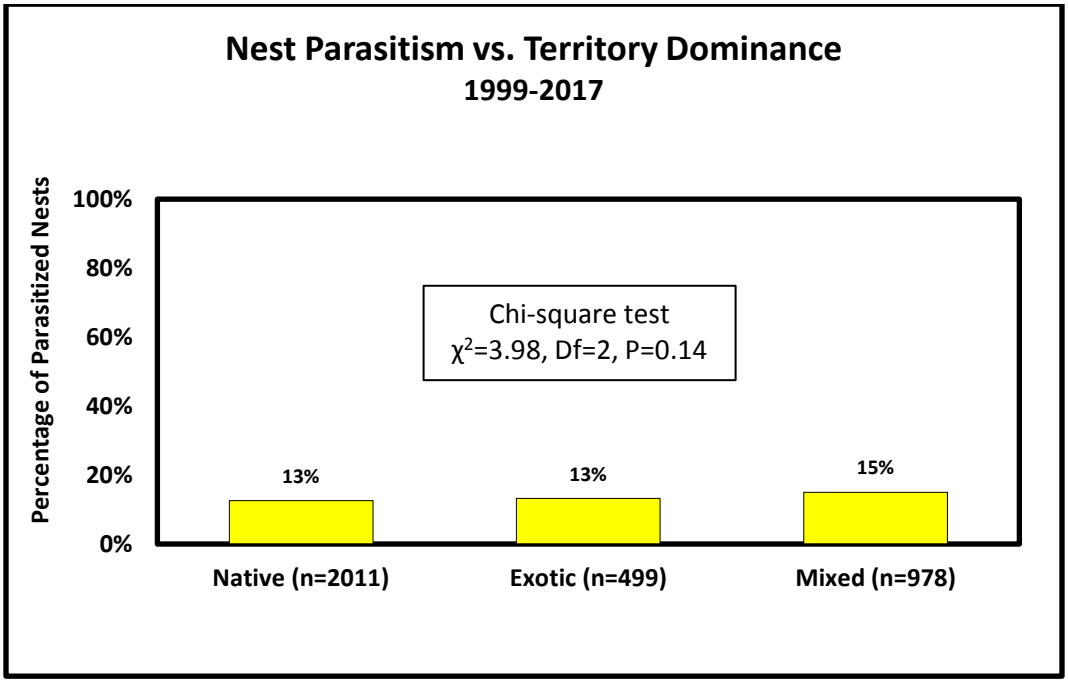

Nest Success vs. Nest Substrate
1999-2017
Percentage of Successful Nests
100%
80%
60%
40%
20%
0%
Chi-square test
χ²=6.68, Df=2, P=0.04
Salix>Saltcedar
45%
41%
52%
Salix (n=1662)
Saltcedar (n=1762)
R. Olive (n=50)

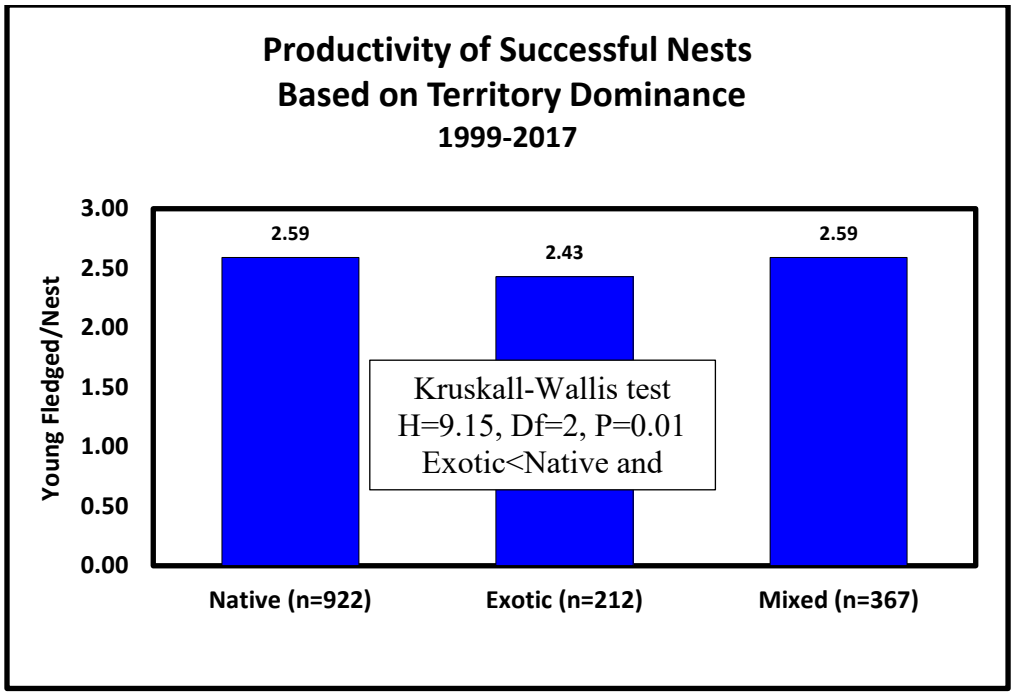

Nest Success vs. Territory Dominance
1999-2017
Percentage of Successful Nests
100%
80%
60%
40%
20%
0%
Chi-square test
χ²=18.66, Df=2, P<0.01
Native>Mixed
46%
43%
38%
Native (n=2011)
Exotic (n=499)
Mixed (n=978)

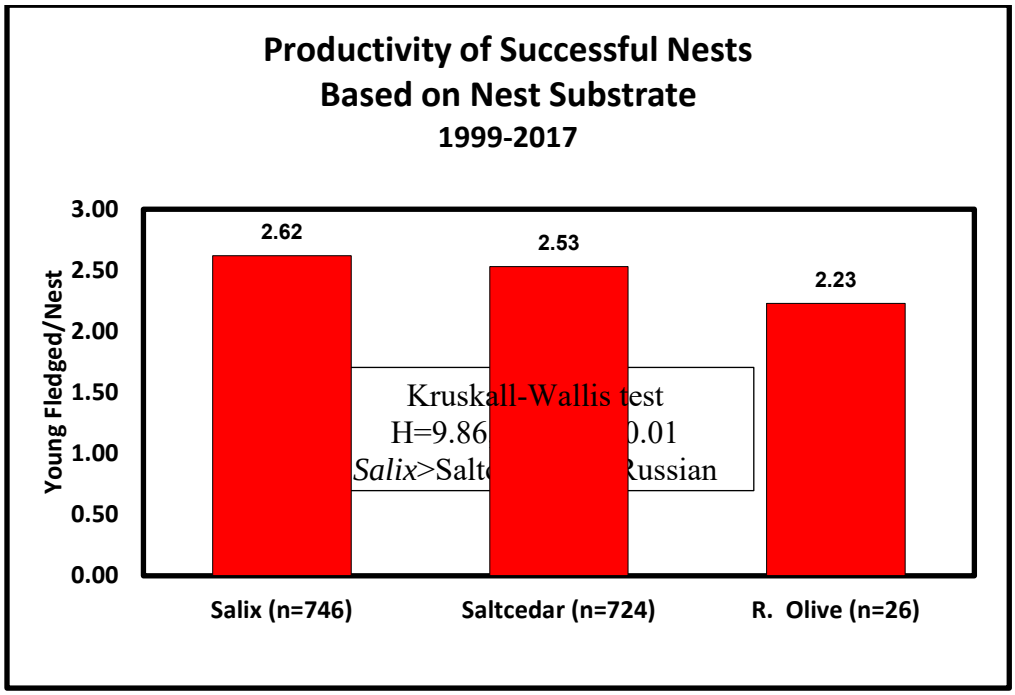

Nest Predation vs. Nest Substrate
1999-2017
Percentage of Successful Nests
100%
80%
60%
40%
20%
0%
Chi-square test
χ2=2.26, Df=2,
41%
43%
38%
Salix (n=1662)
Saltcedar (n=1762)
R. Olive (n=50)


Nest Predation vs. Territory Dominance
1999-2017
Percentage of Successful Nests
100%
80%
60%
40%
20%
0%
Chi-square test
χ2=15.91, Df=2, P<0.01
40%
44%
47%
Native (n=2011)
Exotic (n=499)
Mixed (n=978)

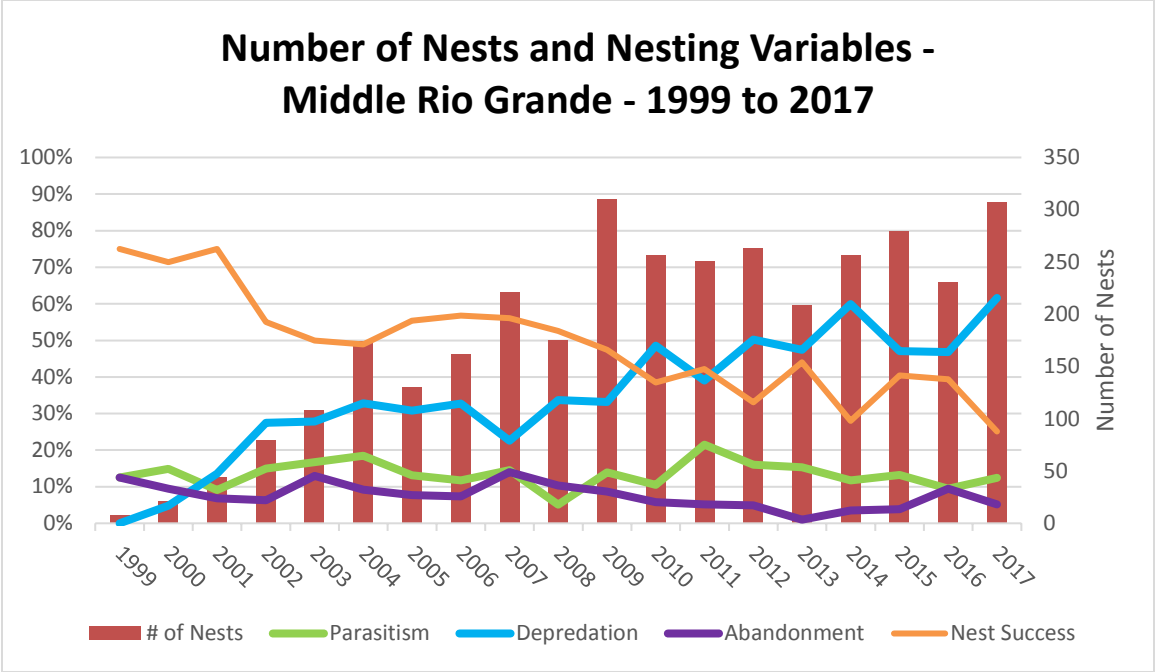

Nest Parasitism vs. Substrate
1999-2017
Percentage of Parasitized Nests
100%
80%
60%
40%
20%
0%
Chi-square test
χ²=3.22, Df=2, P=0.20
13%
14%
18%
Salix (n=1662)
Saltcedar (n=1762)
R. Olive (n=50)

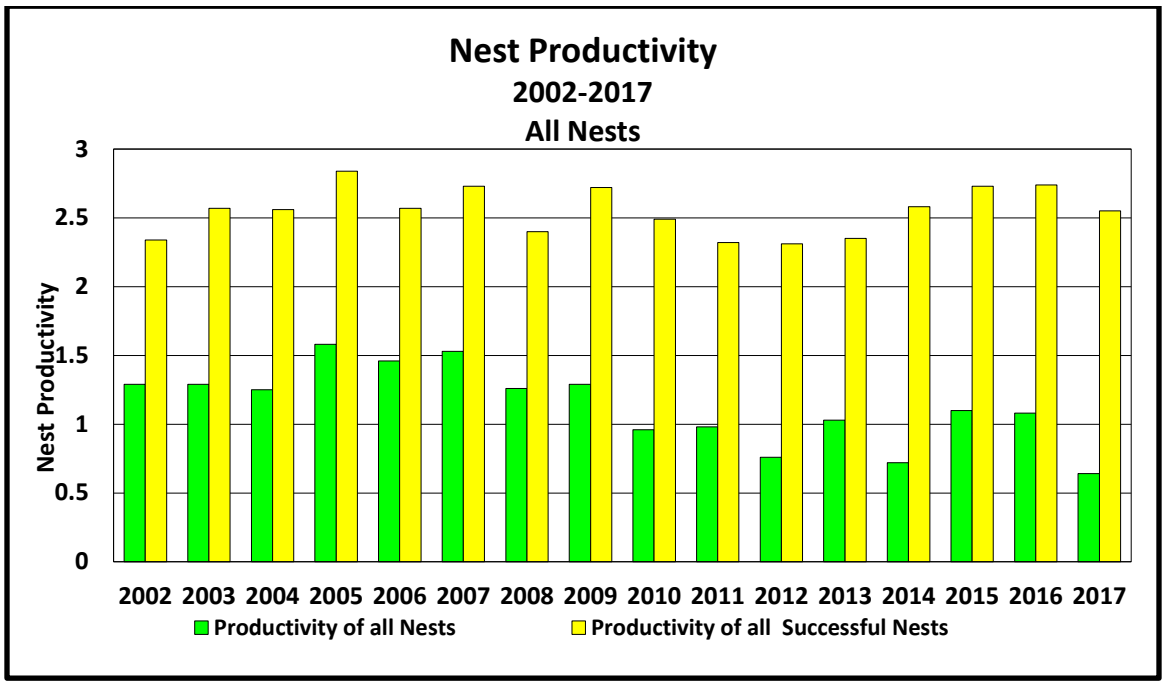

Nest Parasitism vs. Territory Dominance
1999-2017
Percentage of Parasitized Nests
100%
80%
60%
40%
20%
0%
Chi-square test
χ²=3.98, Df=2, P=0.14
13%
13%
15%
Native (n=2011)
Exotic (n=499)
Mixed (n=978)


Productivity of Successful Nests
Based on Territory Dominance
1999-2017
Young Fledged/Nest
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2.59
2.43
2.59
Kruskall-Wallis test
H=9.15, Df=2, P=0.01
Exotic<Native and
Native (n=922)
Exotic (n=212)
Mixed (n=367)

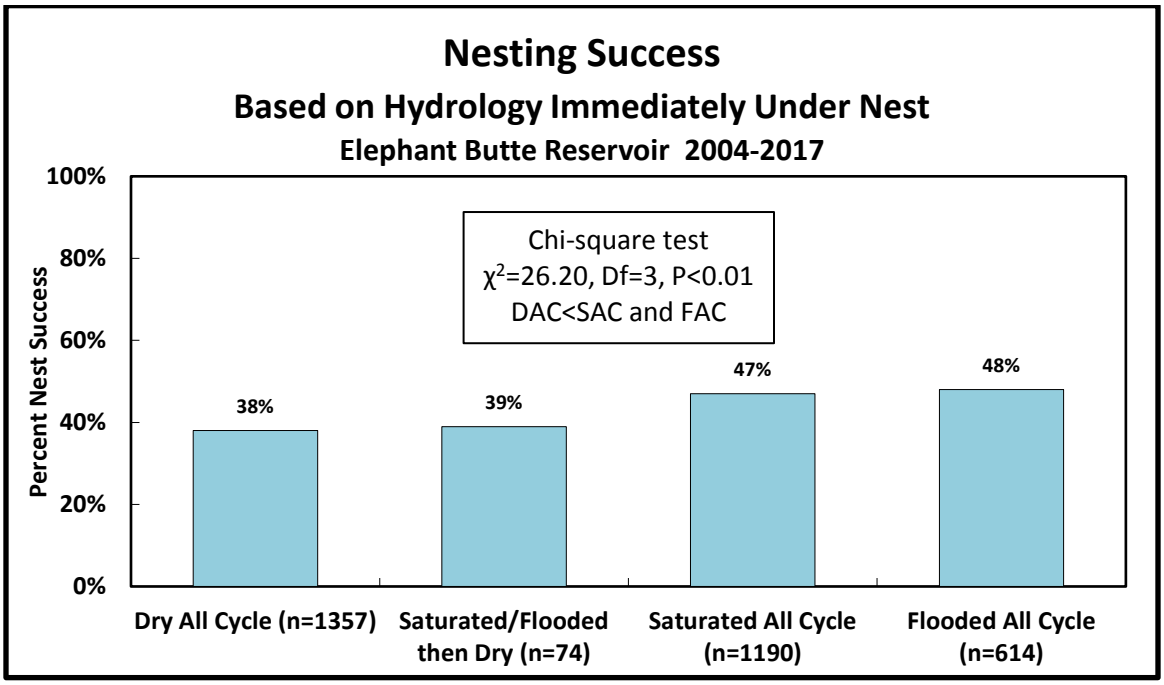

Productivity of Successful Nests
Based on Nest Substrate
1999-2017
Young Fledged/Nest
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2.62
2.53
2.23
Kruskall-Wallis test
H=9.86
0.01
Salix>Salt
Russian
Salix (n=746)
Saltcedar (n=724)
R. Olive (n=26)

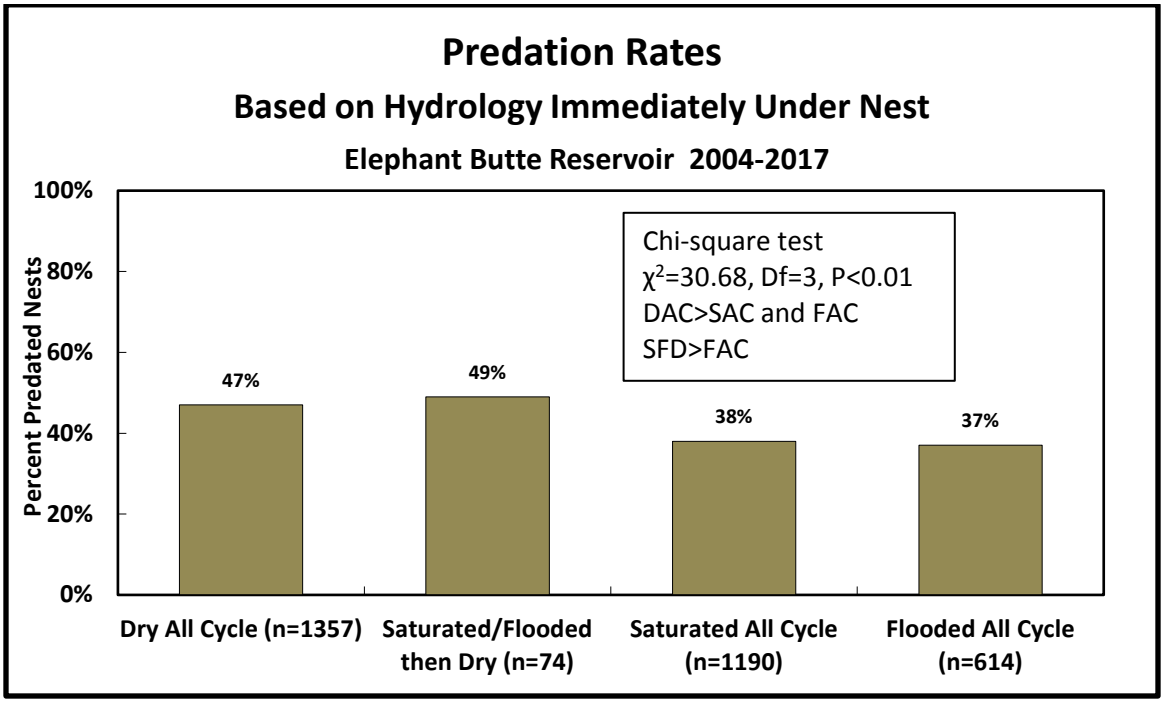
General Nesting Variable Charts – Middle Rio Grande

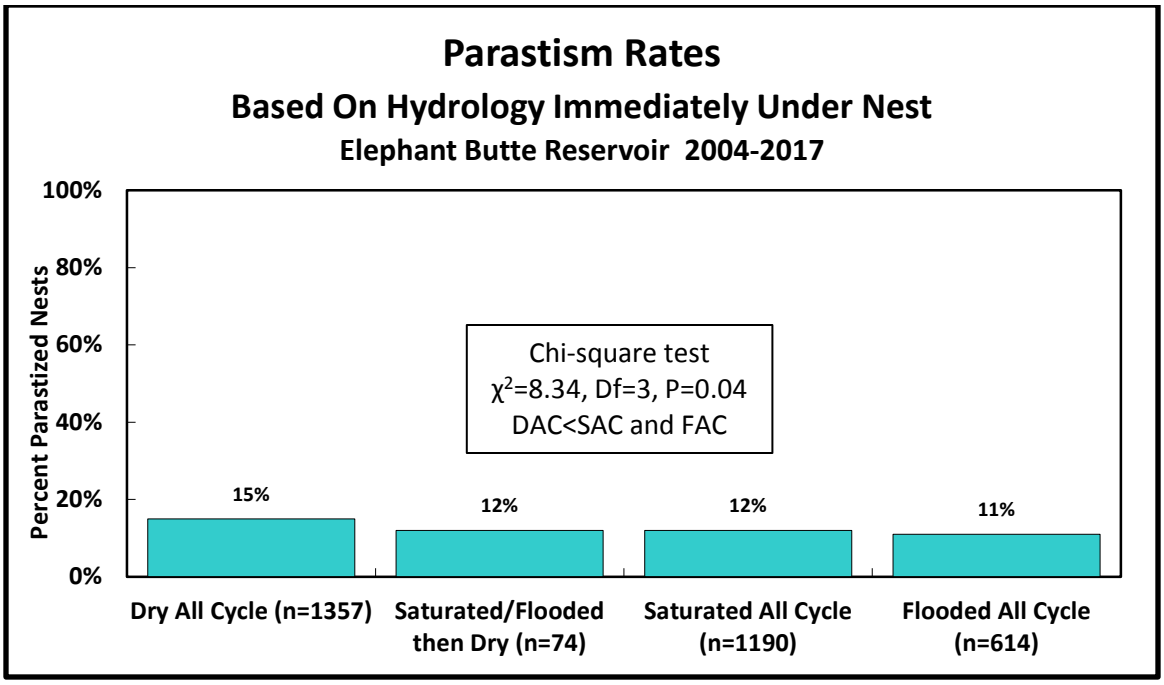


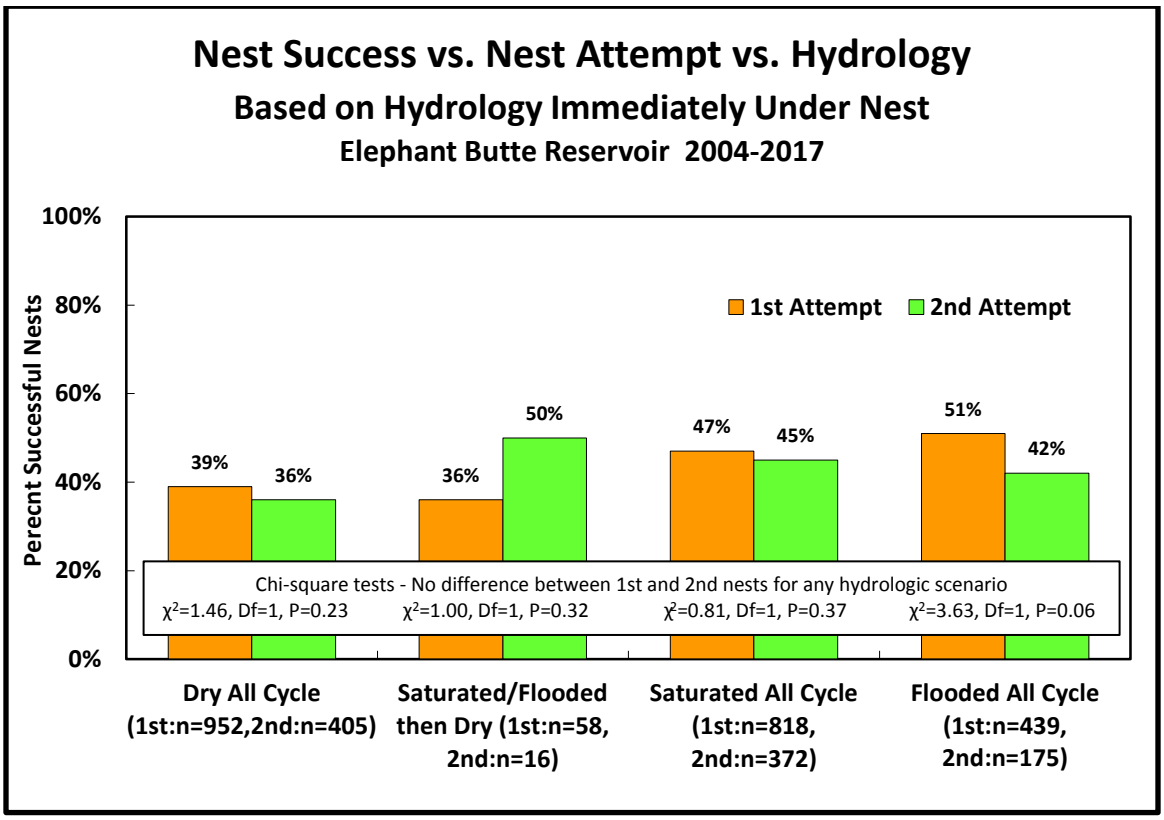


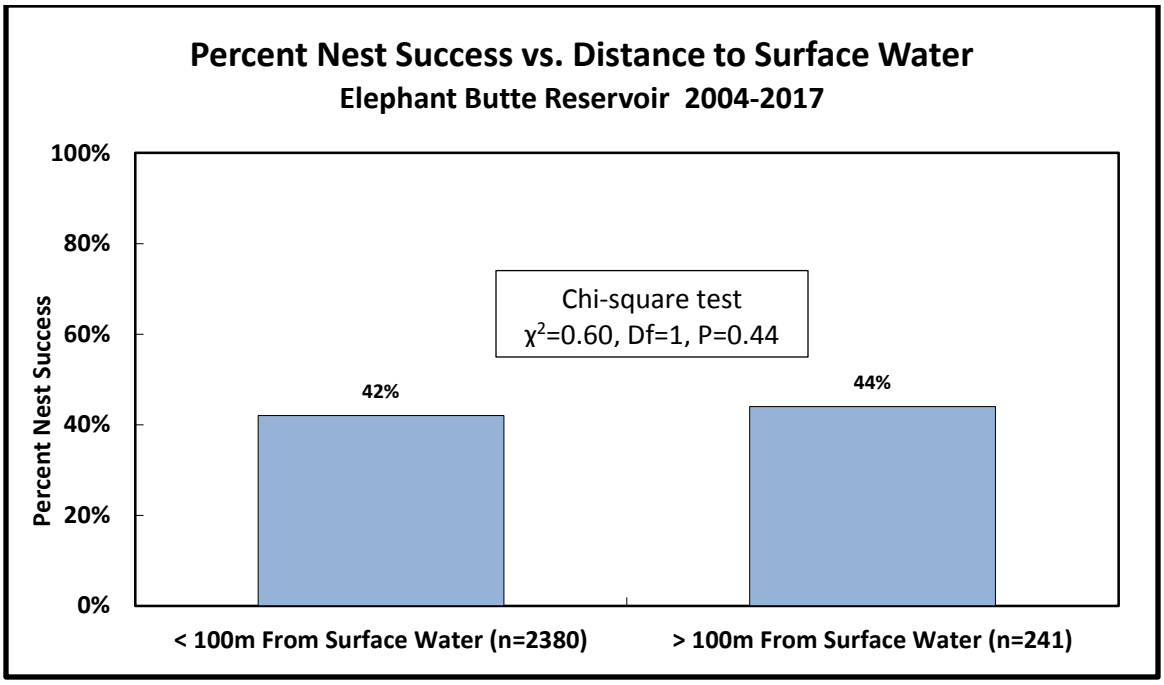
Nesting Variable and Hydrology Comparisons – Elephant Butte Reservoir Nests 2004 to 2017

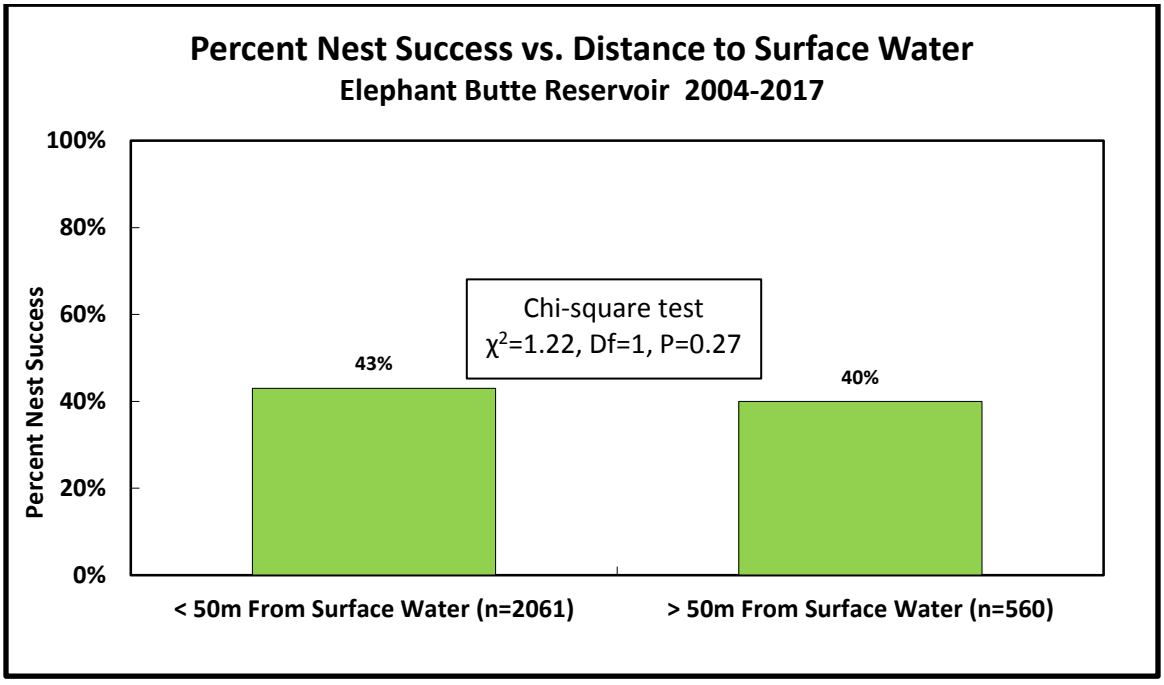


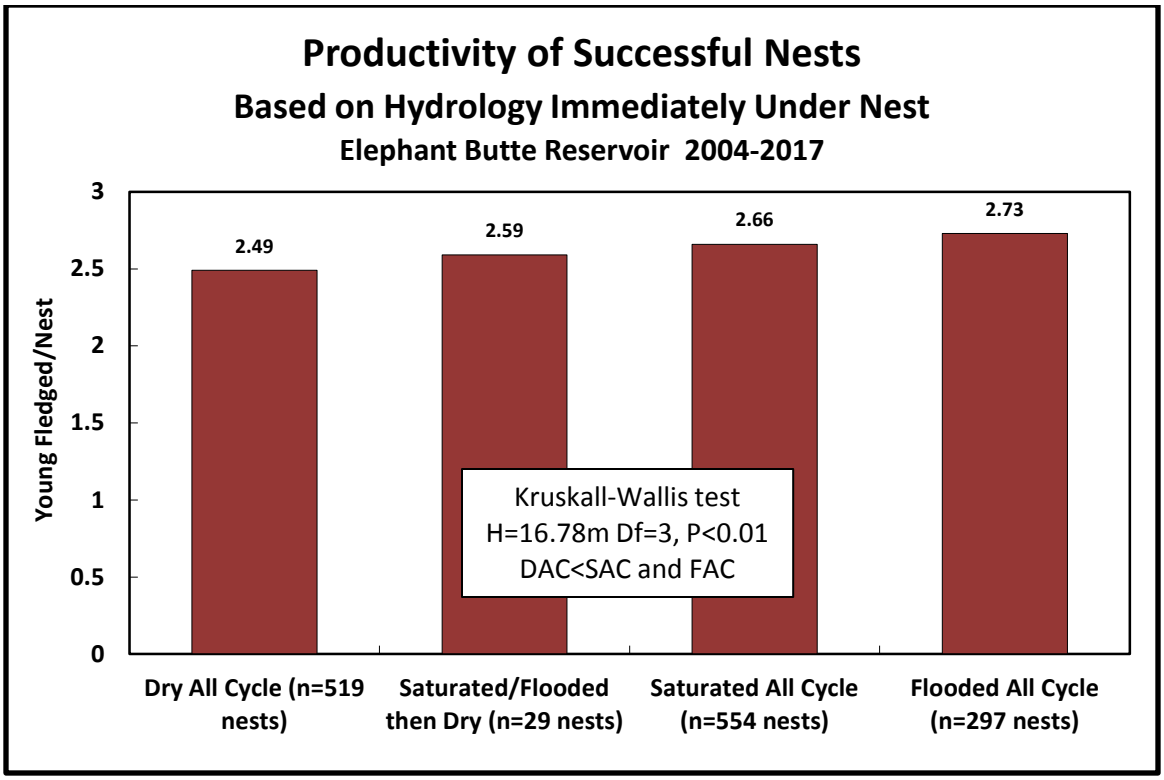


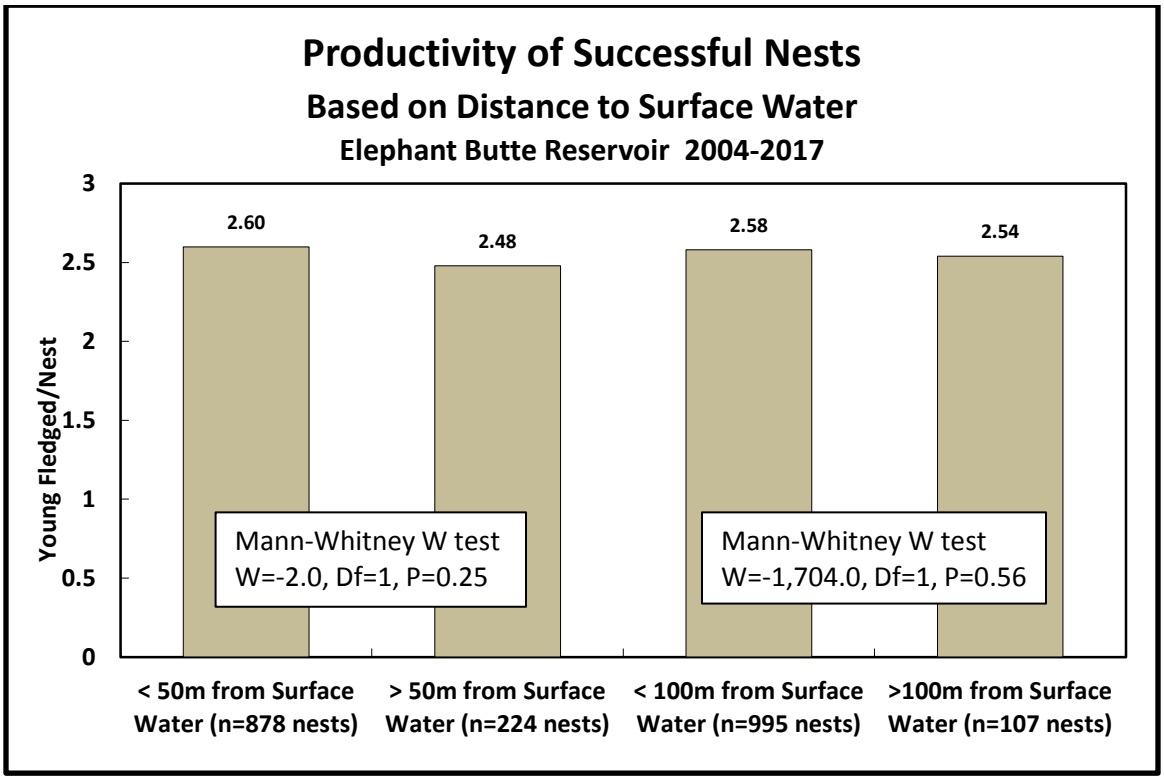

Parastism Rates
Based On Hydrology Immediately Under Nest
Elephant Butte Reservoir 2004-2017
Percent Parastized Nests
100%
80%
60%
40%
20%
0%
Chi-square test
χ²=8.34, Df=3, P=0.04
DAC<SAC and FAC
15%
12%
12%
11%
Dry All Cycle (n=1357)
Saturated/Flooded then Dry (n=74)
Saturated All Cycle (n=1190)
Flooded All Cycle (n=614)

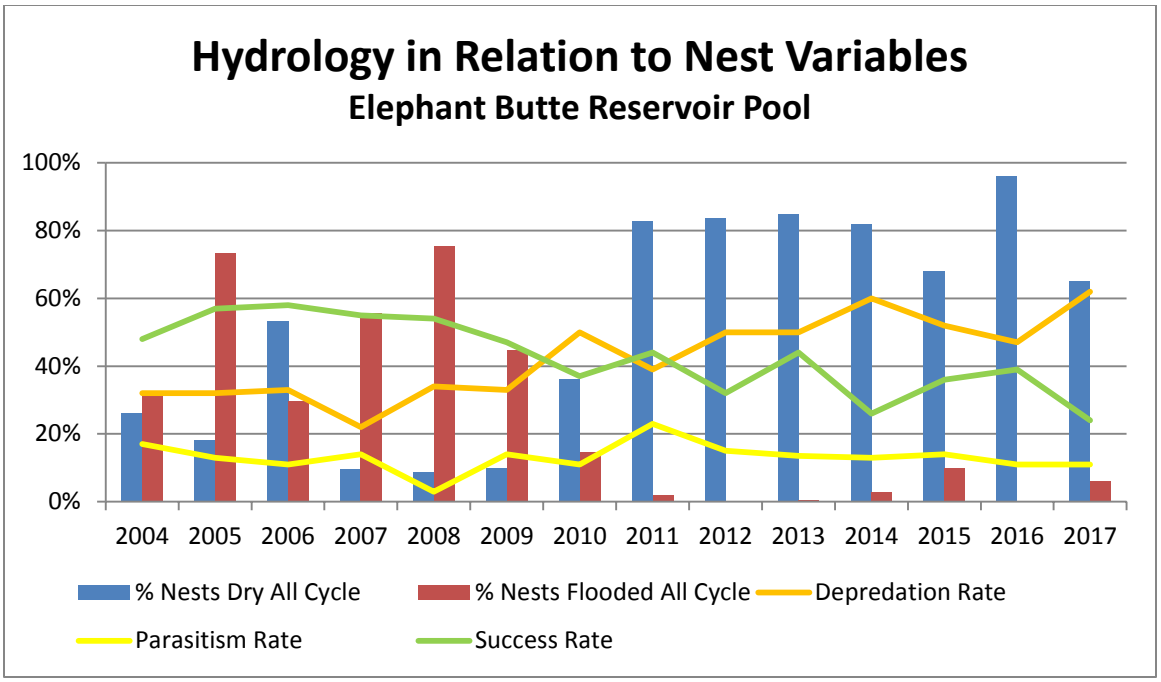

Nest Success vs. Nest Attempt vs. Hydrology
Based on Hydrology Immediately Under Nest
Elephant Butte Reservoir 2004-2017
Perecnt Successful Nests
100%
80%
60%
40%
20%
0%
1st Attempt
2nd Attempt
39%
36%
36%
50%
47%
45%
51%
42%
Chi-square tests - No difference between 1st and 2nd nests for any hydrologic scenario
χ²=1.46, Df=1, P=0.23
χ²=1.00, Df=1, P=0.32
χ²=0.81, Df=1, P=0.37
χ²=3.63, Df=1, P=0.06
Dry All Cycle (1st:n=952,2nd:n=405)
Saturated/Flooded then Dry (1st:n=58, 2nd:n=16)
Saturated All Cycle (1st:n=818, 2nd:n=372)
Flooded All Cycle (1st:n=439, 2nd:n=175)

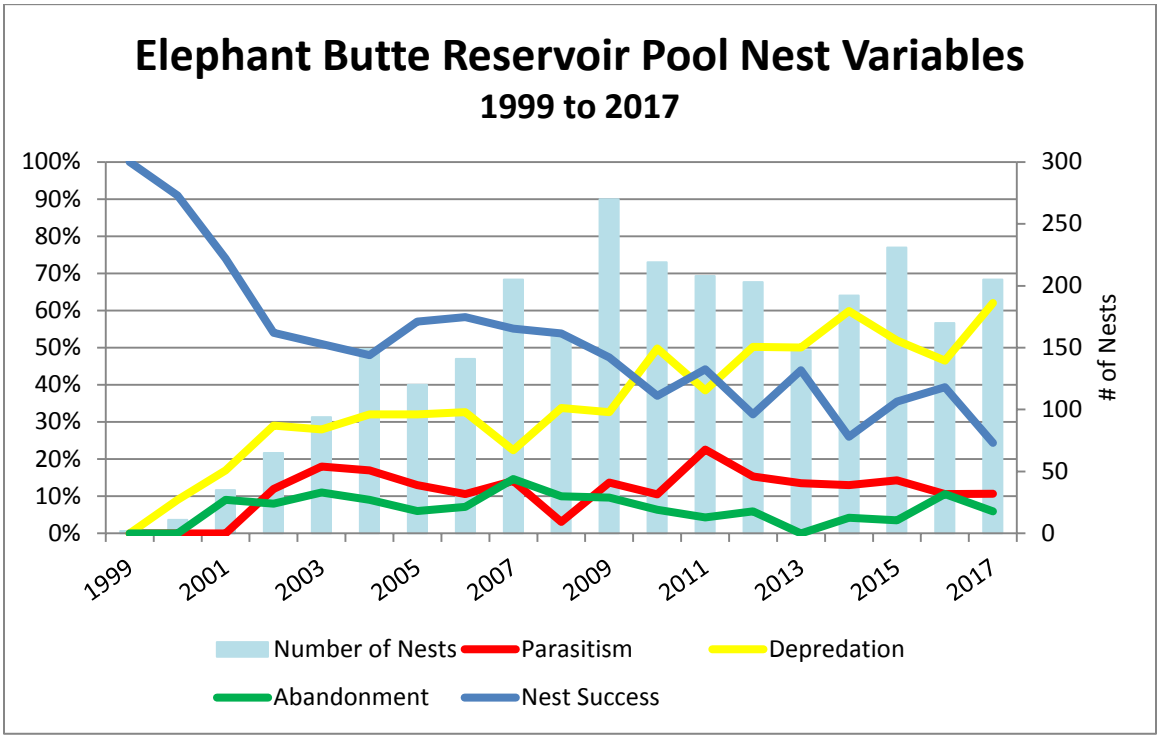

Percent Nest Success vs. Distance to Surface Water
Elephant Butte Reservoir 2004-2017
100%
80%
60%
40%
20%
0%
Percent Nest Success
Chi-square test
χ2=0.60, Df=1, P=0.44
42%
44%
< 100m From Surface Water (n=2380)
> 100m From Surface Water (n=241)

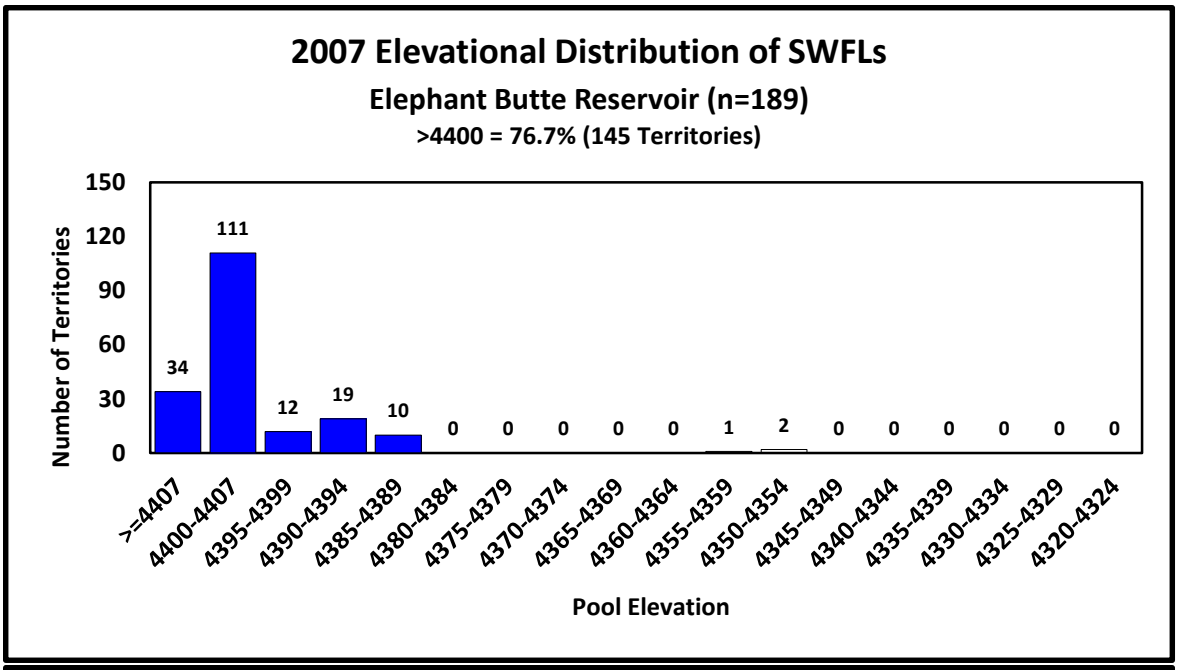

Percent Nest Success vs. Distance to Surface Water
Elephant Butte Reservoir 2004-2017
100%
80%
60%
40%
20%
0%
Percent Nest Success
Chi-square test
χ2=1.22, Df=1, P=0.27
43%
40%
< 50m From Surface Water (n=2061)
> 50m From Surface Water (n=560)


Productivity of Successful Nests
Based on Hydrology Immediately Under Nest
Elephant Butte Reservoir 2004-2017
Young Fledged/Nest
3
2.5
2
1.5
1
0.5
0
2.49
2.59
2.66
2.73
Kruskall-Wallis test
H=16.78m Df=3, P<0.01
DAC<SAC and FAC
Dry All Cycle (n=519 nests)
Saturated/Flooded then Dry (n=29 nests)
Saturated All Cycle (n=554 nests)
Flooded All Cycle (n=297 nests)


Productivity of Successful Nests
Based on Distance to Surface Water
Elephant Butte Reservoir 2004-2017
Young Fledged/Nest
3
2.5
2
1.5
1
0.5
0
2.60
2.48
2.58
2.54
Mann-Whitney W test
W=-2.0, Df=1, P=0.25
Mann-Whitney W test
W=-1,704.0, Df=1, P=0.56
< 50m from Surface Water (n=878 nests)
> 50m from Surface Water (n=224 nests)
< 100m from Surface Water (n=995 nests)
>100m from Surface Water (n=107 nests)


Hydrology in Relation to Nest Variables
Elephant Butte Reservoir Pool
100%
80%
60%
40%
20%
0%
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
% Nests Dry All Cycle
% Nests Flooded All Cycle
Depredation Rate
Parasitism Rate
Success Rate


Elephant Butte Reservoir Pool Nest Variables
1999 to 2017
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
300
250
200
150
100
50
0
# of Nests
1999 2001 2003 2005 2007 2009 2011 2013 2015 2017
Number of Nests
Parasitism
Depredation
Abandonment
Nest Success


2007 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=189)
>4400 = 76.7% (145 Territories)
Number of Territories
150
120
90
60
30
0
34
111
12
19
10
0
0
0
0
0
1
2
0
0
0
0
0
0
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
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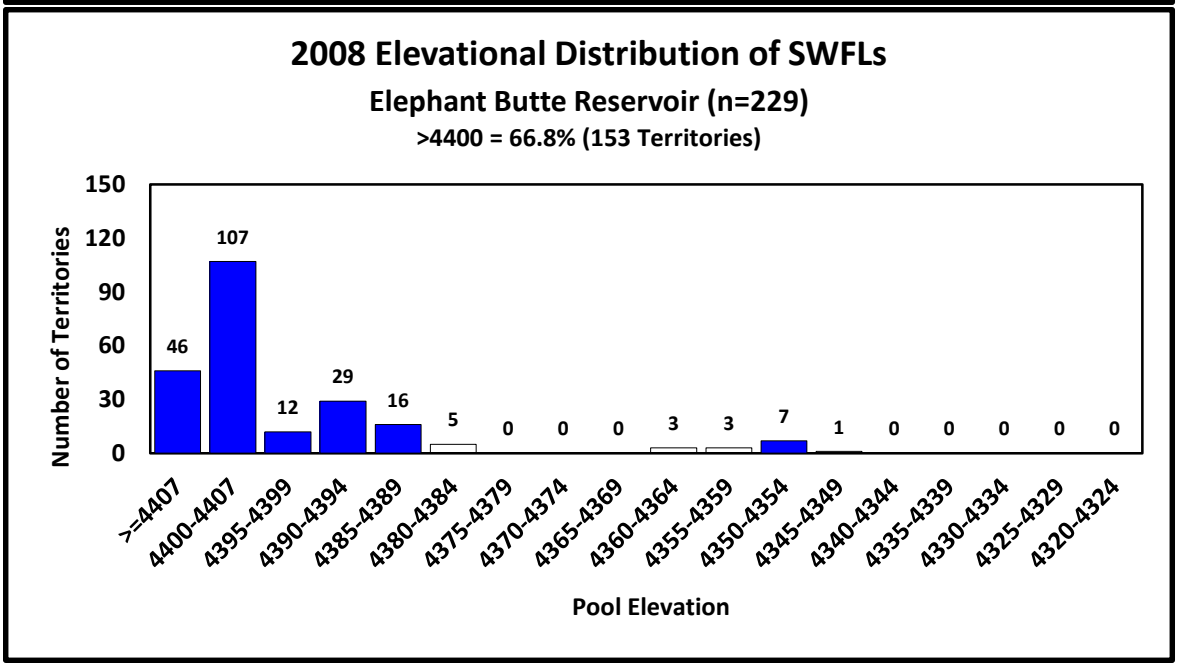
4330-4334
4325-4329
4320-4324
Pool Elevation


2008 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=229)
>4400 = 66.8% (153 Territories)
Number of Territories
150
120
90
60
30
0
46
107
12
29
16
5
0
0
0
3
3
7
1
0
0
0
0
0
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
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4330-4334
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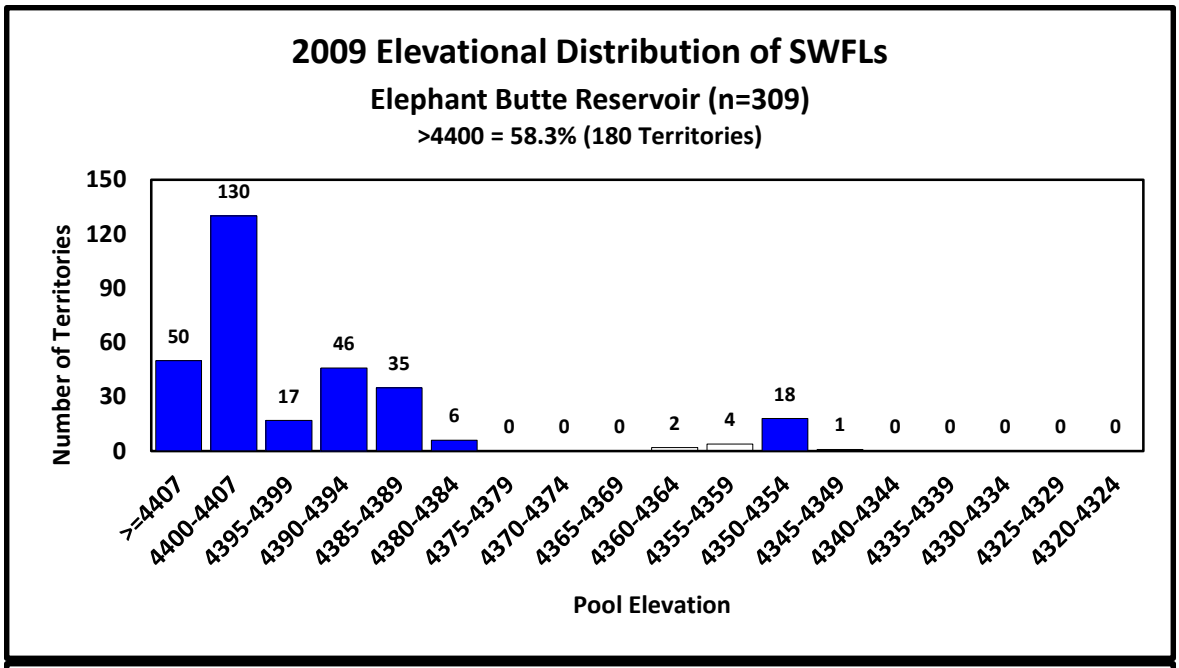
4320-4324
Pool Elevation


2009 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=309)
>4400 = 58.3% (180 Territories)
Number of Territories
150
120
90
60
30
0
50
130
17
46
35
6
0
0
0
2
4
18
1
0
0
0
0
0
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
4355-4359
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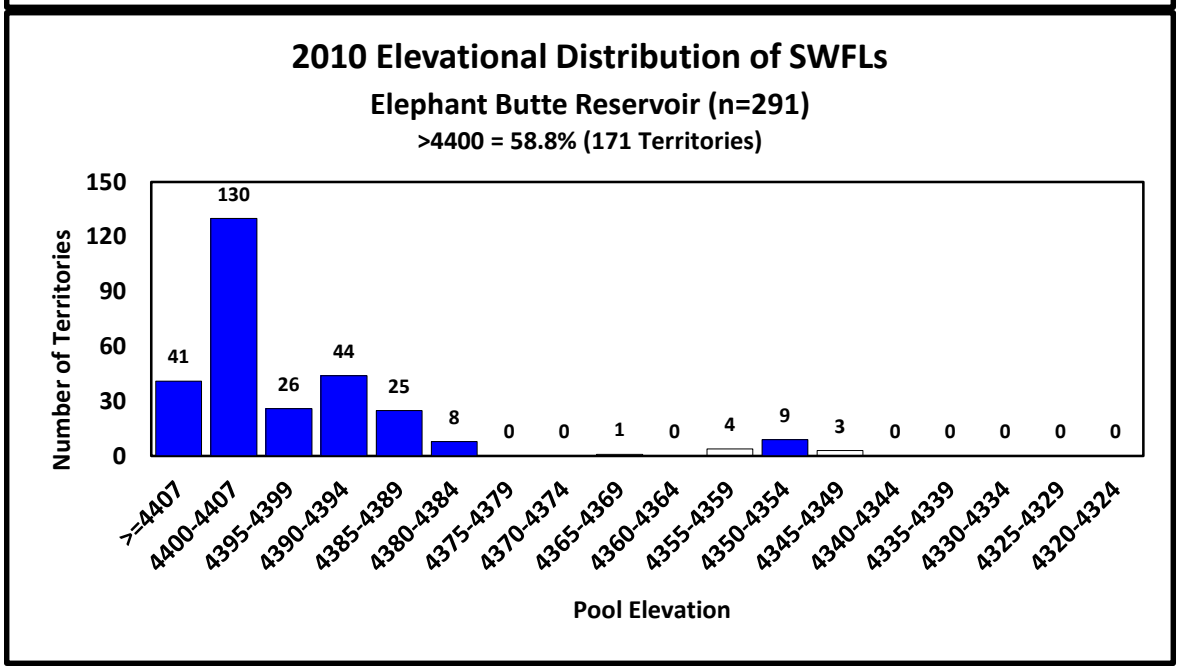
4345-4349
4340-4344
4335-4339
4330-4334
4325-4329
4320-4324
Pool Elevation


2010 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=291)
>4400 = 58.8% (171 Territories)
Number of Territories
150
120
90
60
30
0
41
130
26
44
25
8
0
0
1
0
4
9
3
0
0
0
0
0
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
4355-4359
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4330-4334
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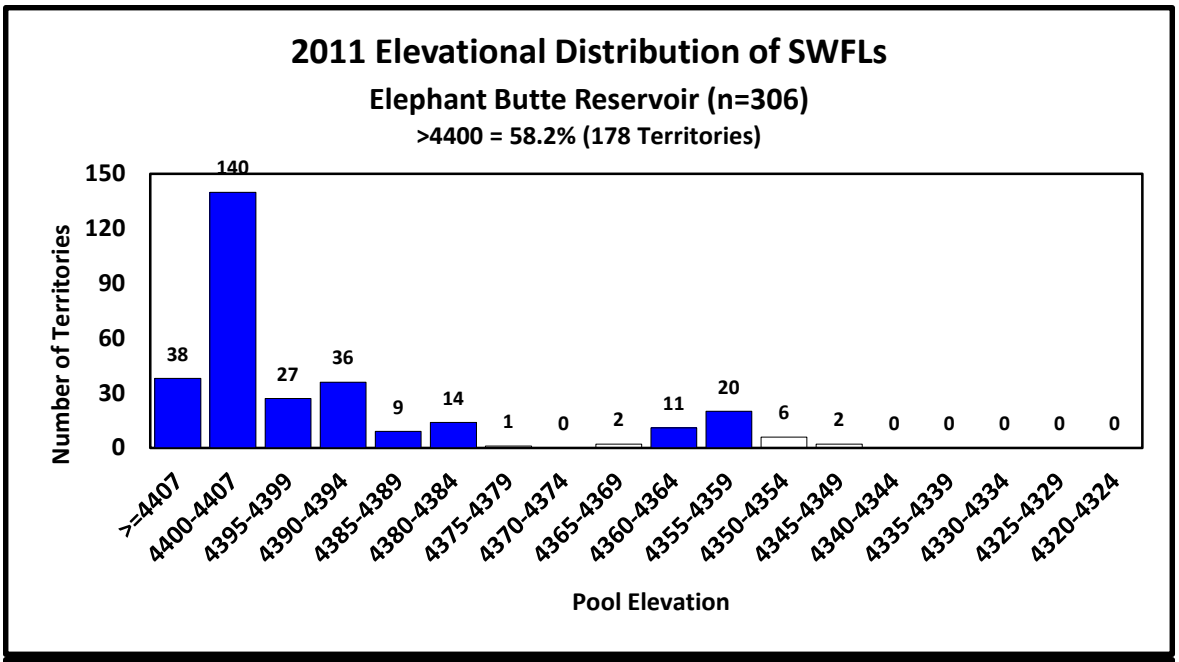
4320-4324
Pool Elevation


2011 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=306)
>4400 = 58.2% (178 Territories)
Number of Territories
150
120
90
60
30
0
38
140
27
36
9
14
1
0
2
11
20
6
2
0
0
0
0
0
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
4355-4359
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4345-4349
4340-4344
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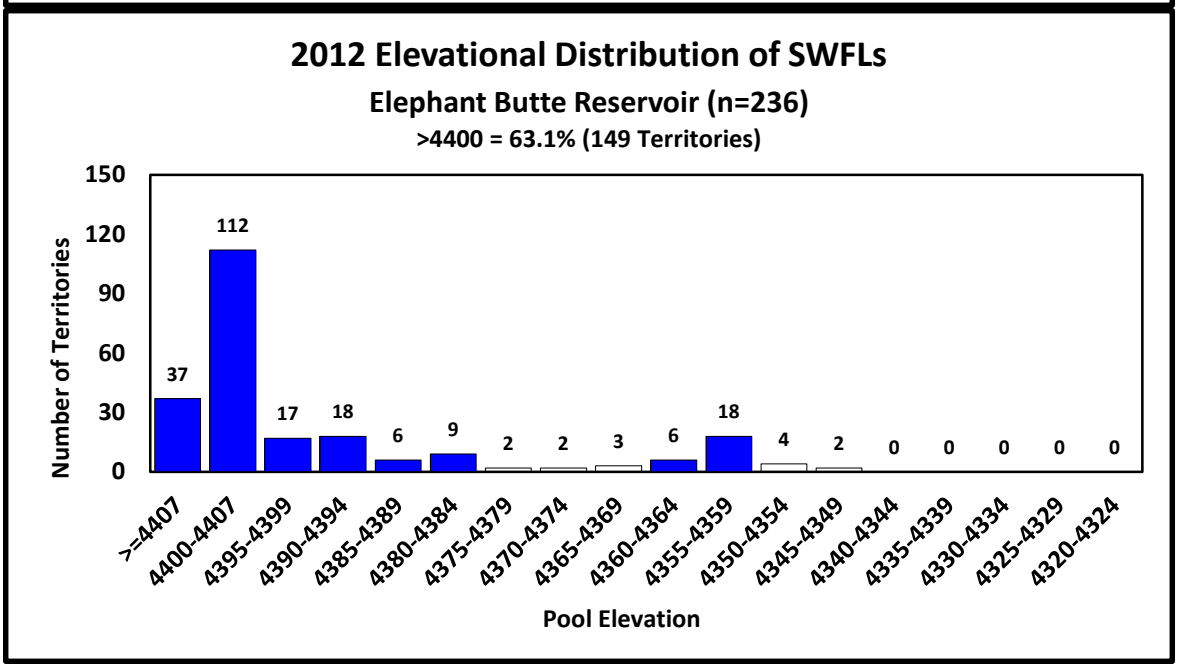
4330-4334
4325-4329
4320-4324
Pool Elevation


2012 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=236)
>4400 = 63.1% (149 Territories)
Number of Territories
150
120
90
60
30
0
37
112
17
18
6
9
2
2
3
6
18
4
2
0
0
0
0
0
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
4355-4359
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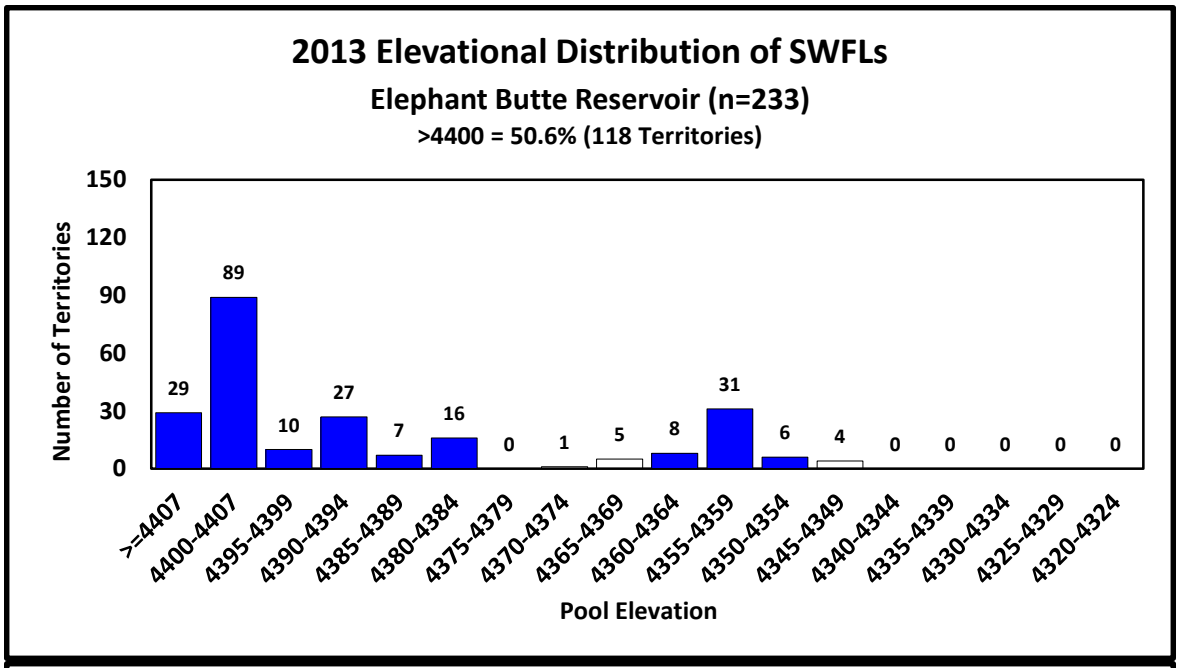
4345-4349
4340-4344
4335-4339
4330-4334
4325-4329
4320-4324
Pool Elevation


2013 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=233)
>4400 = 50.6% (118 Territories)
Number of Territories
150
120
90
60
30
0
29
89
10
27
7
16
0
1
5
8
31
6
4
0
0
0
0
0
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
4355-4359
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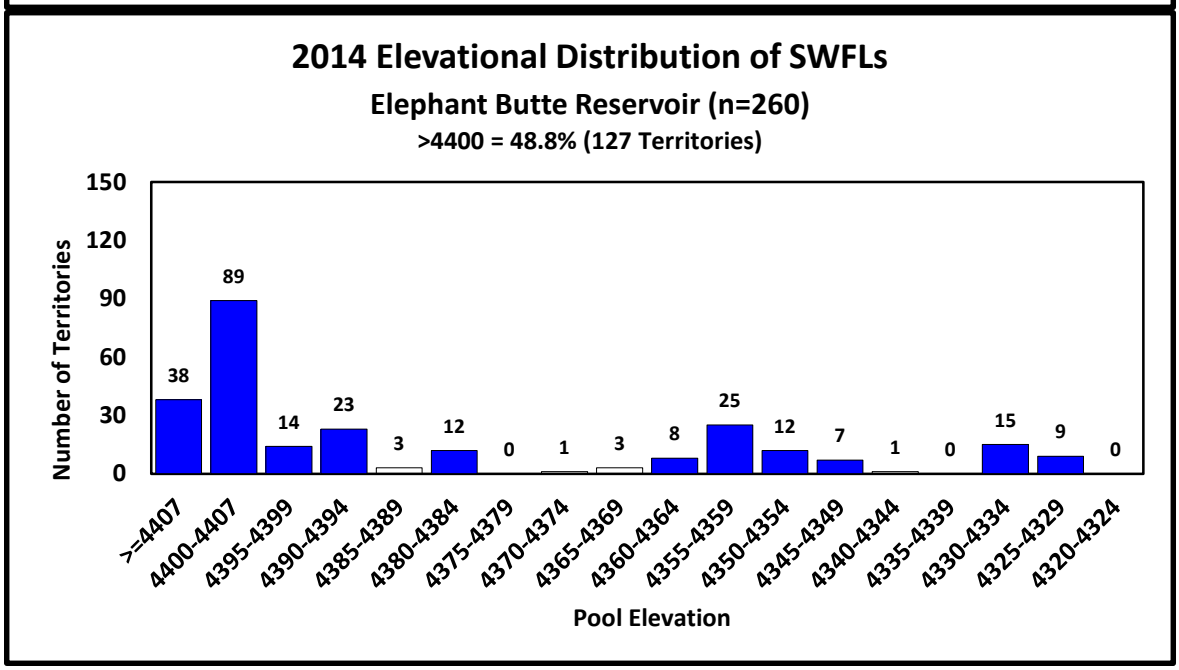
4345-4349
4340-4344
4335-4339
4330-4334
4325-4329
4320-4324
Pool Elevation


2014 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=260)
>4400 = 48.8% (127 Territories)
Number of Territories
150
120
90
60
30
0
38
89
14
23
3
12
0
1
3
8
25
12
7
1
0
15
9
0
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
4355-4359
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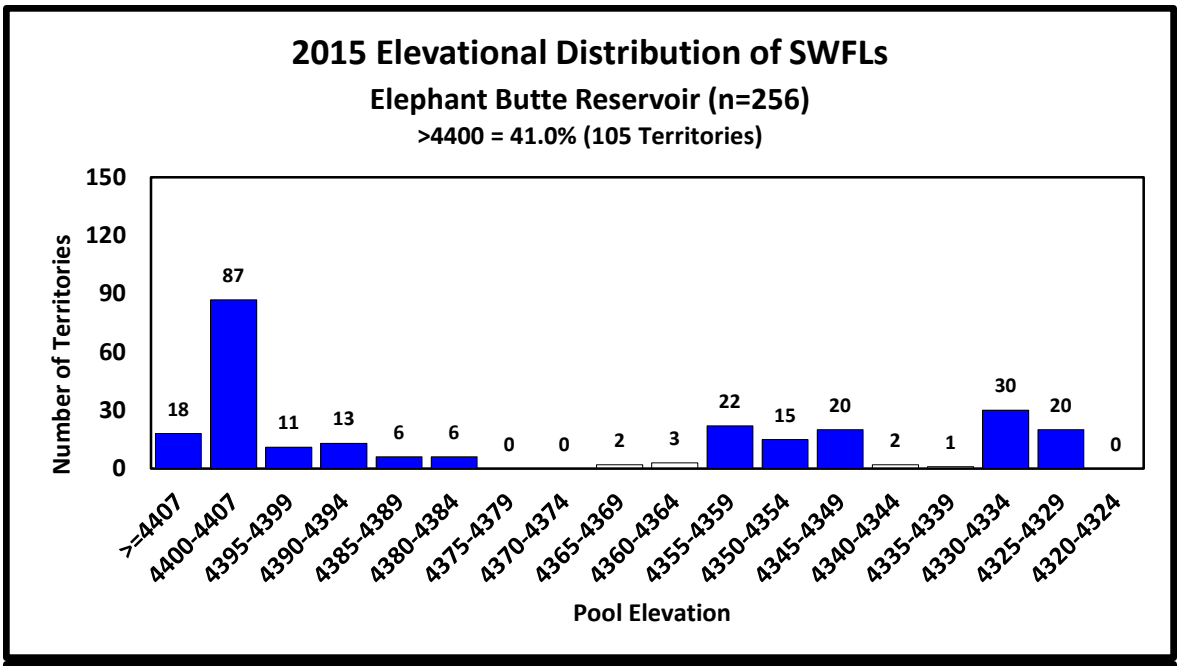
4320-4324
Pool Elevation


2015 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=256)
>4400 = 41.0% (105 Territories)
Number of Territories
150
120
90
60
30
0
18
87
11
13
6
6
0
0
2
3
22
15
20
2
1
30
20
0
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
4355-4359
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4335-4339
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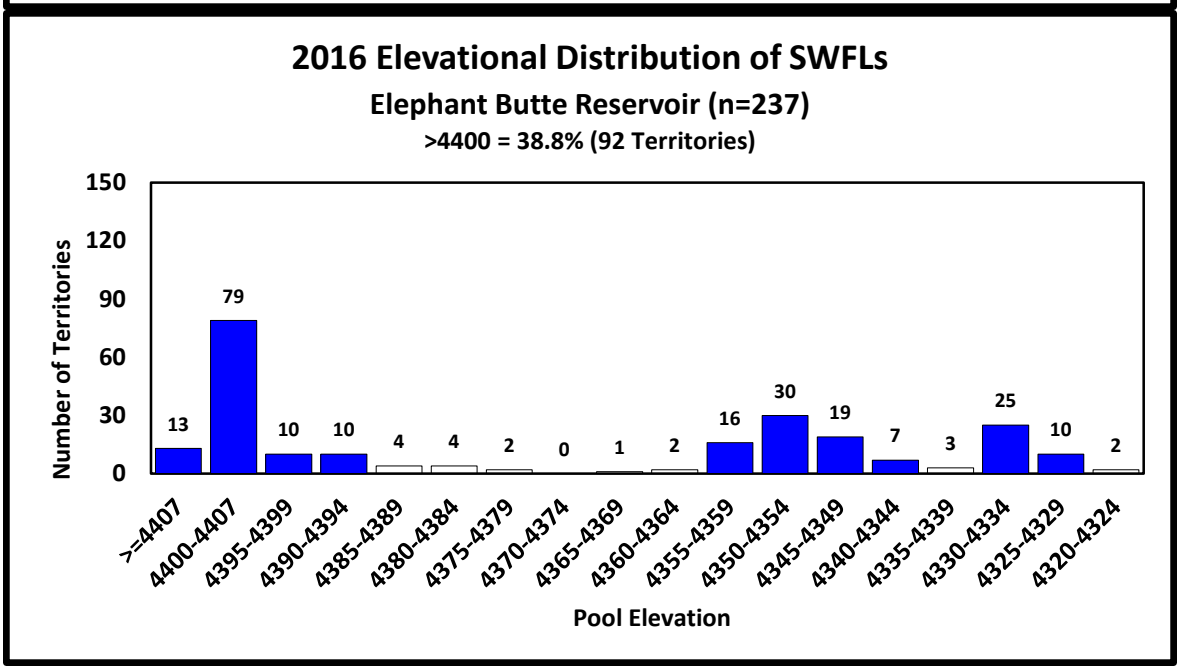
4325-4329
4320-4324
Pool Elevation


2016 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=237)
>4400 = 38.8% (92 Territories)
Number of Territories
150
120
90
60
30
0
13
79
10
10
4
4
2
0
1
2
16
30
19
7
3
25
10
2
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
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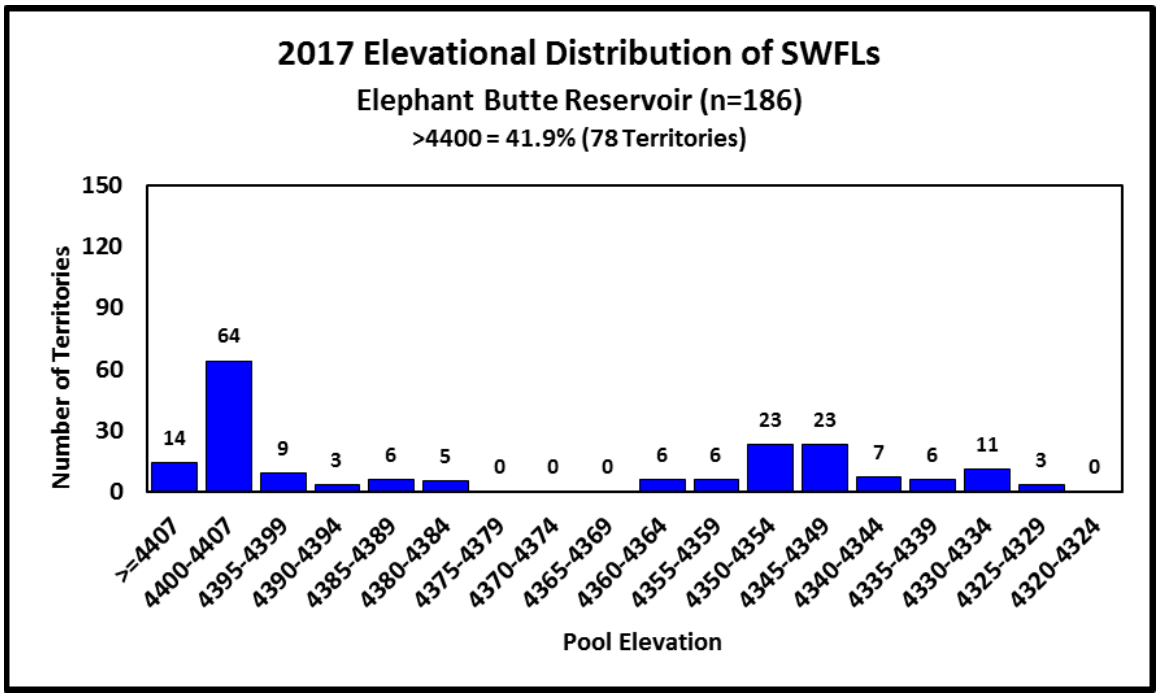
4325-4329
4320-4324
Pool Elevation


2017 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=186)
>4400 = 41.9% (78 Territories)
Number of Territories
150
120
90
60
30
0
14
64
9
3
6
5
0
0
0
6
6
23
23
7
6
11
3
0
>=4407
4400-4407
4395-4399
4390-4394
4385-4389
4380-4384
4375-4379
4370-4374
4365-4369
4360-4364
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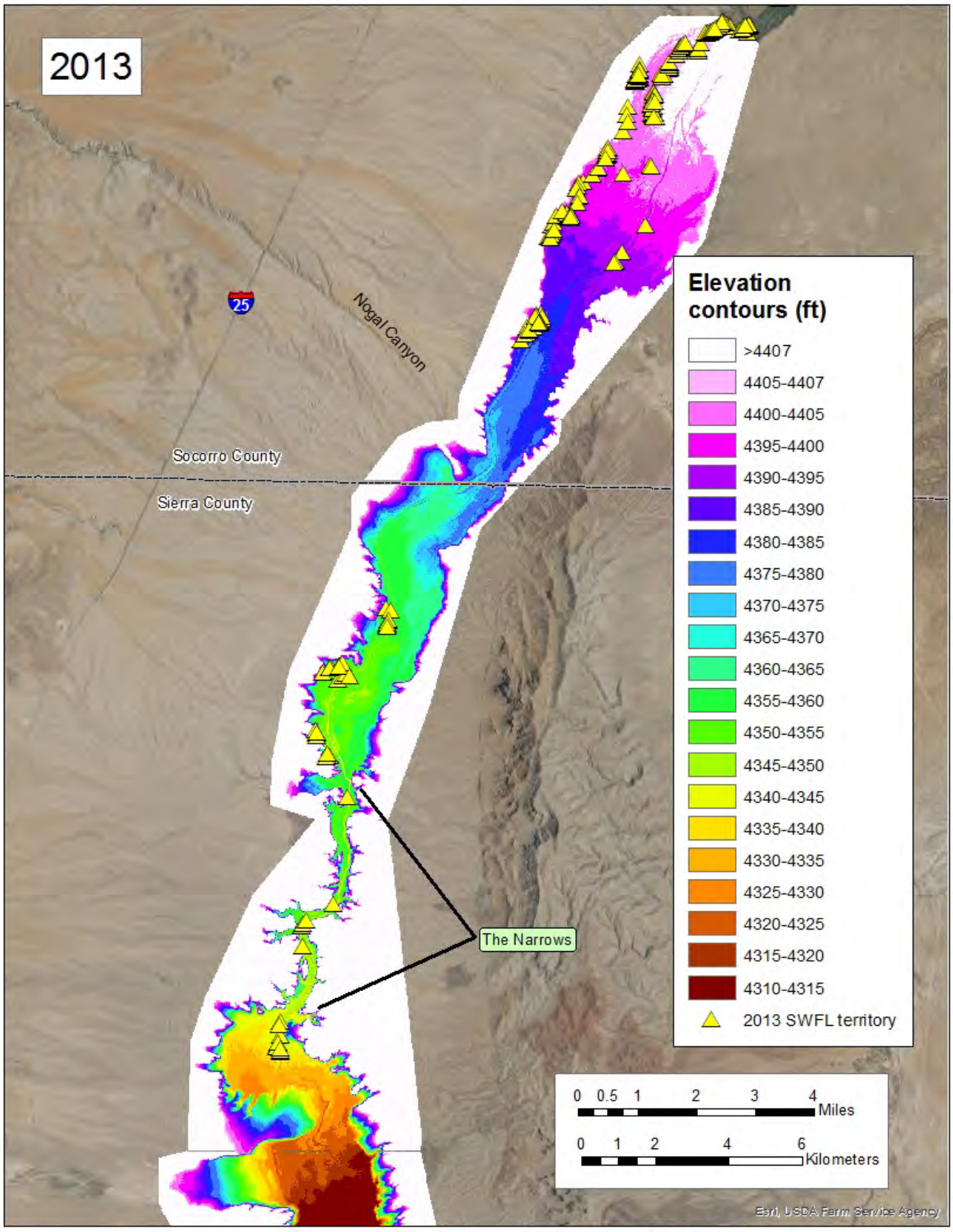
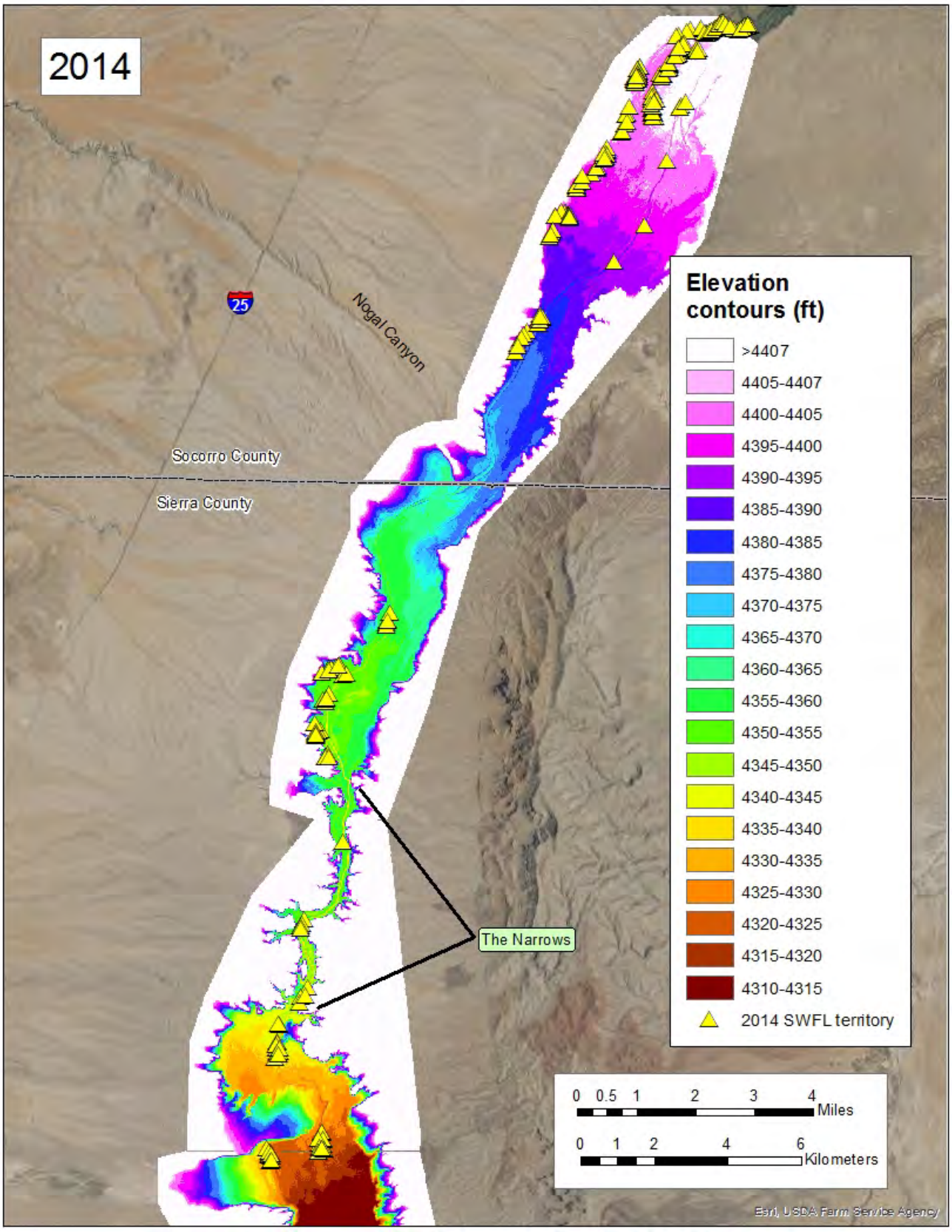
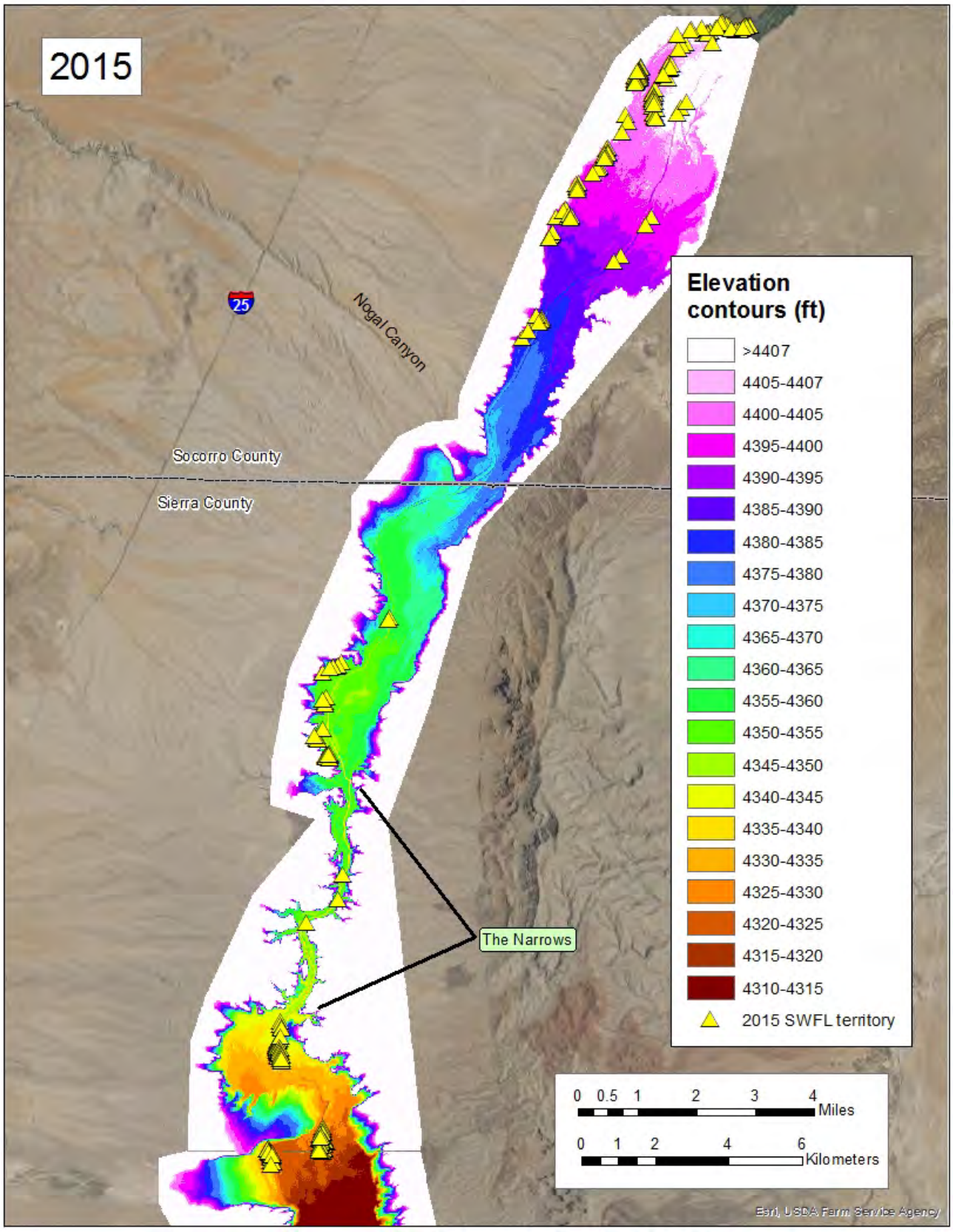
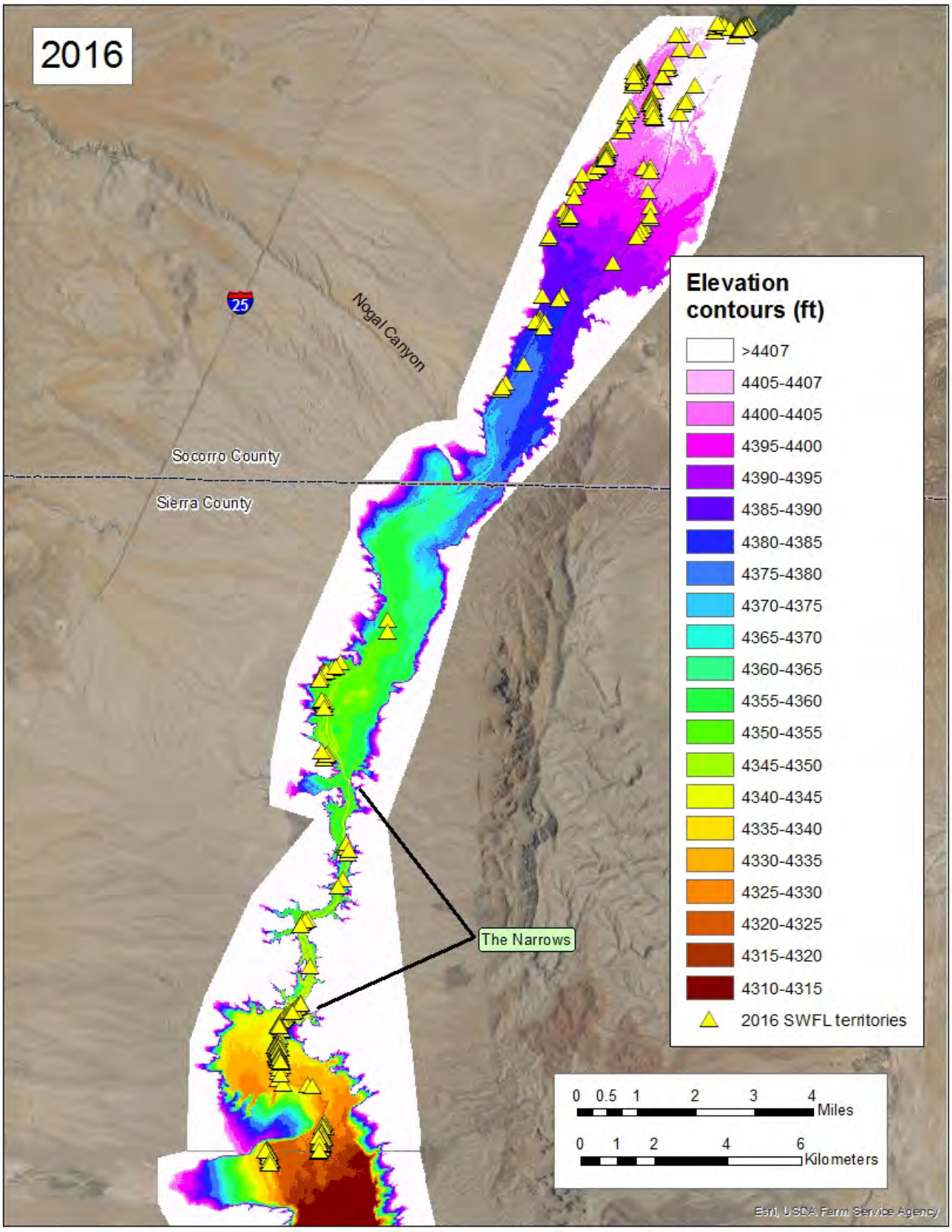
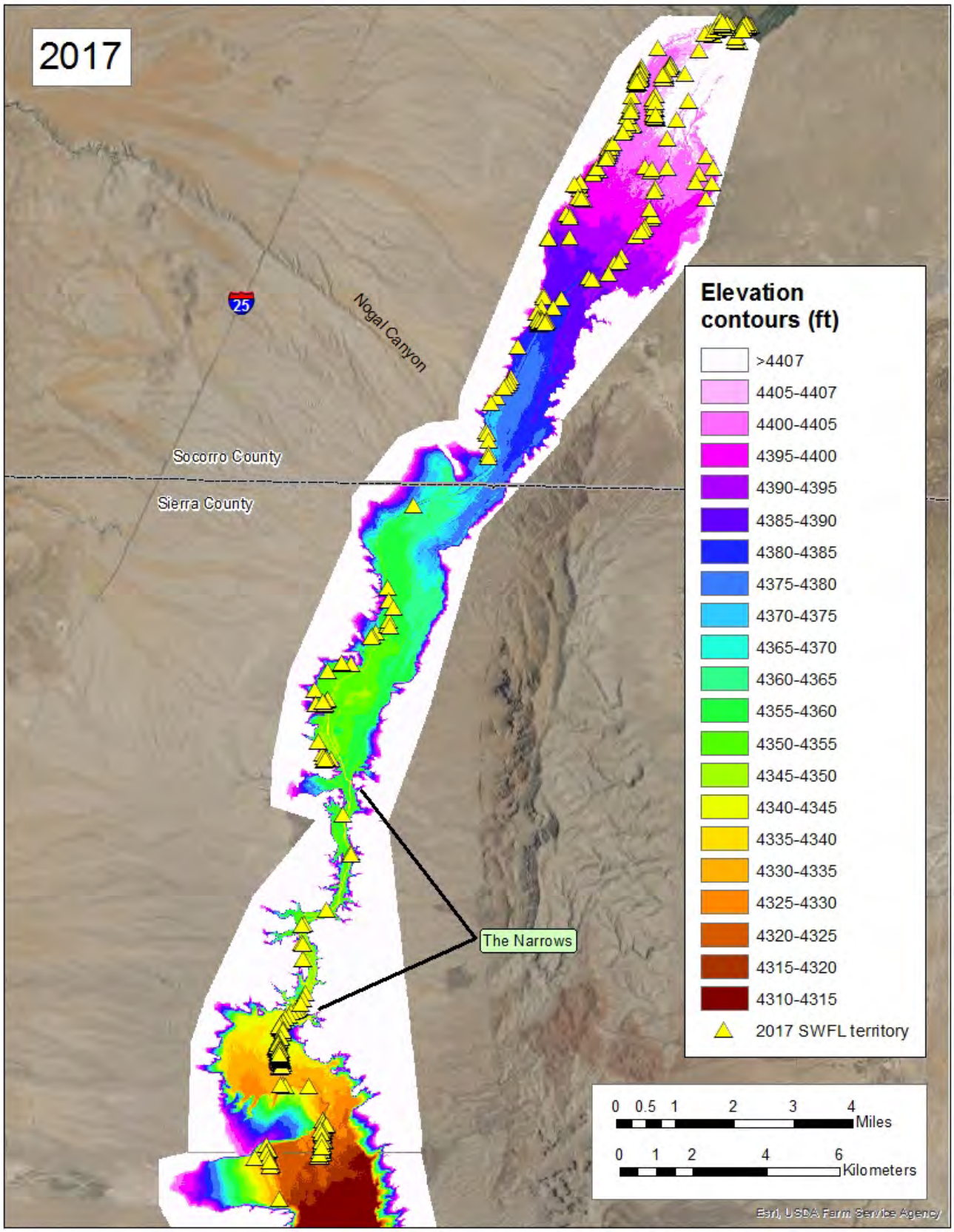
4325-4329
4320-4324
Pool Elevation


2013
25
Nogal Canyon
Socorro County
Sierra County
The Narrows
Elevation contours (ft)
>4407
4405-4407
4400-4405
4395-4400
4390-4395
4385-4390
4380-4385
4375-4380
4370-4375
4365-4370
4360-4365
4355-4360
4350-4355
4345-4350
4340-4345
4335-4340
4330-4335
4325-4330
4320-4325
4315-4320
4310-4315
2013 SWFL territory
0 0.5 1 2 3 4
Miles
0 1 2 4 6
Kilometers
Esri, USDA Farm Service Agency


2014
25
Nogal Canyon
Socorro County
Sierra County
The Narrows
Elevation contours (ft)
>4407
4405-4407
4400-4405
4395-4400
4390-4395
4385-4390
4380-4385
4375-4380
4370-4375
4365-4370
4360-4365
4355-4360
4350-4355
4345-4350
4340-4345
4335-4340
4330-4335
4325-4330
4320-4325
4315-4320
4310-4315
2014 SWFL territory
0 0.5 1 2 3 4 Miles
0 1 2 4 6 Kilometers
Esri, USDA Farm Service Agency


2015
25
Nogal Canyon
Socorro County
Sierra County
The Narrows
Elevation contours (ft)
>4407
4405-4407
4400-4405
4395-4400
4390-4395
4385-4390
4380-4385
4375-4380
4370-4375
4365-4370
4360-4365
4355-4360
4350-4355
4345-4350
4340-4345
4335-4340
4330-4335
4325-4330
4320-4325
4315-4320
4310-4315
2015 SWFL territory
0 0.5 1 2 3 4 Miles
0 1 2 4 6 Kilometers
Esri, USDA Farm Service Agency


2016
25
Nogal Canyon
Socorro County
Sierra County
The Narrows
Elevation contours (ft)
>4407
4405-4407
4400-4405
4395-4400
4390-4395
4385-4390
4380-4385
4375-4380
4370-4375
4365-4370
4360-4365
4355-4360
4350-4355
4345-4350
4340-4345
4335-4340
4330-4335
4325-4330
4320-4325
4315-4320
4310-4315
2016 SWFL territories
0 0.5 1 2 3 4
Miles
0 1 2 4 6
Kilometers
Esri, USDA Farm Service Agency


2017
25
Nogal Canyon
Socorro County
Sierra County
The Narrows
Elevation contours (ft)
>4407
4405-4407
4400-4405
4395-4400
4390-4395
4385-4390
4380-4385
4375-4380
4370-4375
4365-4370
4360-4365
4355-4360
4350-4355
4345-4350
4340-4345
4335-4340
4330-4335
4325-4330
4320-4325
4315-4320
4310-4315
2017 SWFL territory
0 0.5 1 2 3 4 Miles
0 1 2 4 6 Kilometers
Esri, USDA Farm Service Agency

PEER REVIEW DOCUMENTATION

PROJECT AND DOCUMENT INFORMATION

Project Name Southwestern Willow Flycatcher Surveys and Nest Monitoring WOID FA464

Document 2017 Middle Rio Grande Southwestern Willow Flycatcher Study Results: Selected Sites along the Rio Grande from Bandelier National Monument to Elephant Butte Reservoir.

Document Date January 2018

Team Leader David Moore, 86-68290, Wildlife Biologist

Document Author(s)/Preparer(s) D. Moore and D. Ahlers

Peer Reviewer Kristen Dillon, 86-68290, Biologist

Peer Reviewer _____

REVIEW REQUIREMENT

Part A: Document Does Not Require Peer Review

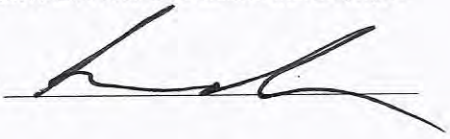
Explain _____

Part B: Document Requires Peer Review: SCOPE OF PEER REVIEW

Peer Review restricted to the following Items/Section(s):	Reviewer:
Complete Document Subject to Review	K. Dillon

REVIEW CERTIFICATION

Peer Reviewer - I have reviewed the assigned Items/Section(s) noted for the above document and believe them to be in accordance with the project requirements, standards of the profession, and Reclamation policy.

Reviewer: Kristen Dillon Review Date: January 2018 Signature: 

Reviewer: _____ Review Date: _____ Signature: _____

I have discussed the above document and review requirements with the Peer Reviewer and believe that this review is completed, and that the document will meet the requirements of the project.

Team Leader: David Moore Date: April 4, 2018 Signature: