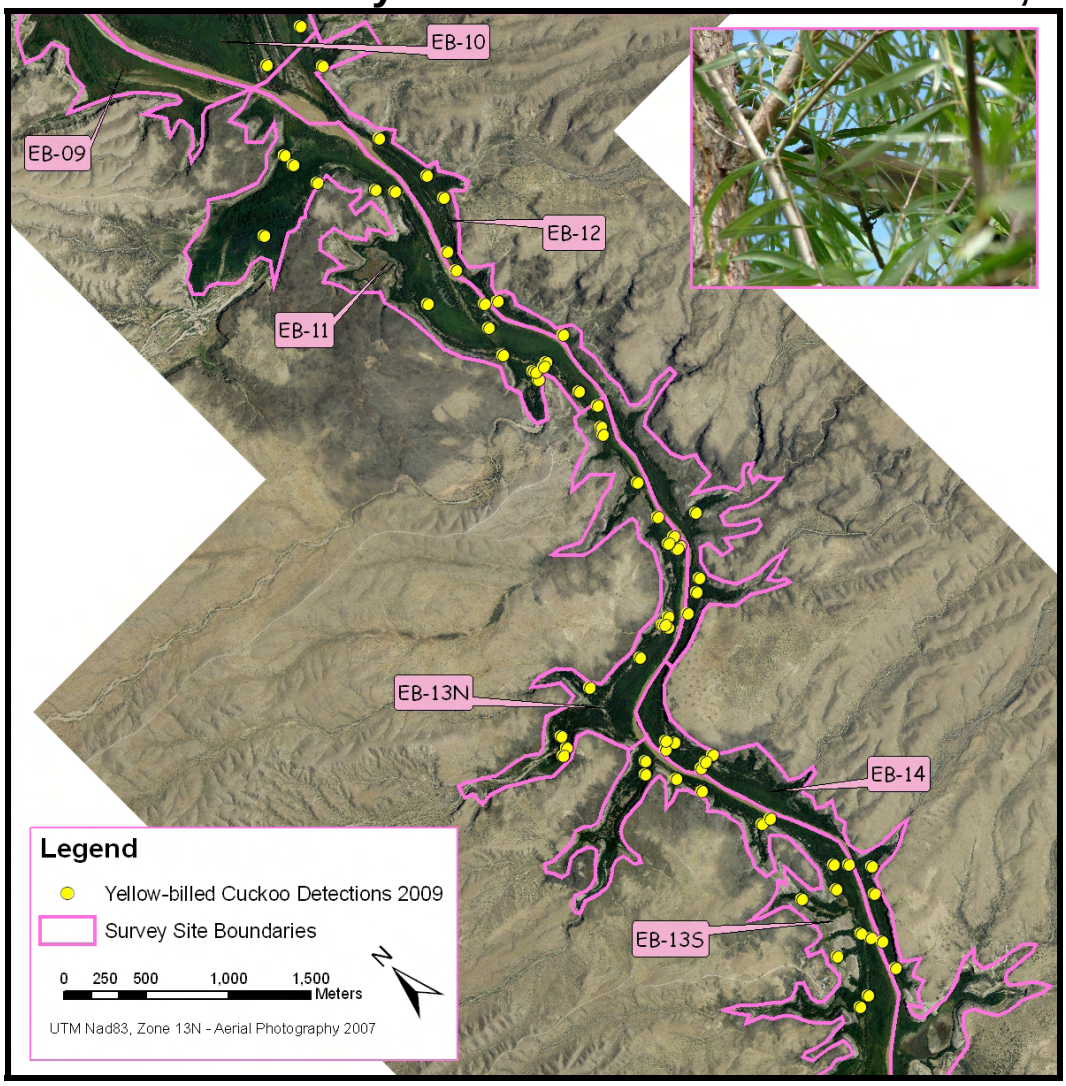
RECLAMATION

Managing Water in the West

Yellow-billed Cuckoo Study Results – 2009

Presence/Absence Surveys within the Middle Rio Grande, NM



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

May 2010

Mission Statements

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

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

Yellow-billed Cuckoo Study Results – 2009

Presence/Absence Surveys within the Middle Rio Grande, NM

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Executive Summary

During the summer of 2009, the U. S. Bureau of Reclamation conducted presence/absence surveys for the Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis* - YBCU) within the Middle Rio Grande, New Mexico. A minimum of four surveys were completed within the Rio Grande riparian zone between Hwy 60 and Elephant Butte Reservoir. All surveys were conducted between June 11th and August 18th. The reach surveyed in 2009 was approximately 144 km in length (89.5 river miles) (i.e. RM 41 to RM 130.5).

A total of 356 YBCU detections were documented over the entire four survey periods of 2009. Beginning in 2009, a modified method of delineating "breeding territories" was applied. Survey detections were clumped based on survey specific detection results, habitat availability, breeding biology, and best biological opinion. Based on this delineation technique, an estimated 95 YBCU breeding territories were identified.

Similar to previous years, the San Marcial reach contained the largest breeding population within the study area with an estimated 69 breeding territories. Within the San Marcial reach specifically, the highest densities of YBCUs were found within Elephant Butte Reservoir. Nearly 60 percent of the total detections and territories within the study area were found within Elephant Butte Reservoir. Although a different technique was used prior to 2009 for estimating YBCU territories, there appears to be an increasing trend in YBCU detections and territories since 2006 when formal surveys were initiated. The greatest increase in territory numbers appears to be within the pool of Elephant Butte Reservoir.

In 2009, the survey protocol was slightly altered to increase the detectability of YBCUs. Previous efforts (i.e. 2006 -2008) included a minimum of three surveys; however based on these results a fourth survey was included in 2009. Therefore, Cuckoo detection results are not directly comparable among years; however general detection trends can be derived from the data. In addition to the inclusion of a fourth survey requirement, individual surveys were not conducted pass 11:00 am due to a significant reduction in YBCU detections after this time in previous years.

Introduction

The Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis* – hereafter referred to as YBCU or Cuckoo) is a Neotropical migrant that feeds primarily on large insects. In the Southwestern United States, YBCUs nest in large, dense patches of riparian vegetation, particularly with a cottonwood (*Populus deltoides*)/Goodding's willow (*Salix gooddingii*) overstory (Ehrlich et al. 1988). A dense understory, comprised of either exotic saltcedar (*Tamarix* spp.), or Russian olive (*Elaeagnus angustifolia*) or native vegetation (e.g. *Salix* spp.), also appears to be an important component of territory establishment (Sechrist et al. 2009). Territories range in size from 4 to 40 hectares, are usually in close proximity to water, and are not defended from conspecifics (Halterman 2001). In New Mexico, home range estimates for YBCUs within the San Marcial Reach of the Rio Grande varied from 5 to 282 hectares, and averaged 82 hectares based on their minimum convex polygon (MCP) (Sechrist et al. 2009). Nest heights range from 1.3 to 13 meters (m) and the breeding cycle at each nest is very rapid; from egg laying to fledging takes approximately 17 days (Halterman 2001). In the Southwest, YBCUs typically arrive at breeding grounds by late-May and initiate migration to wintering grounds in Central and South America by mid-August (Halterman et al. 2000).

During the past 80 years, the population of YBCUs has declined dramatically due to habitat loss and modification as well as a reduction of food resources due to pesticides (Gaines and Laymon 1984). Figure 1 illustrates the historic and current breeding range of the Western YBCU. The Rio Grande is considered one of the important strongholds for the YBCU, and historically Cuckoos were "fairly common" along sections of the river (Howe 1986). Based on recent survey results, it appears the San Marcial reach of the Middle Rio Grande currently supports one of the largest remaining YBCU populations in the Southwestern United States.

It has been debated whether the Western YBCU (*C. a. occidentalis*) is a true subspecies of the YBCU. In 2001, the U.S. Fish and Wildlife Service (USFWS) determined that the western population is a Distinct Population Segment (DPS) from the eastern population (*C. a. americanus*) with the division being the continental divide from Montana to central Colorado, the eastern boundary of the Rio Grande drainage from central Colorado to Texas, and the mountain ranges that form a southeastern extension of the Rocky Mountains to the Big Bend area in west Texas (USFWS 2009 – Figure 2). It also concluded that the listing of the Western YBCU as endangered was "warranted, but precluded by higher priority listing actions" (USFWS 2001). In 2005, the USFWS revised the listing priority of the Western DPS of YBCU from 6 to a higher priority of 3 to better reflect the fact that threats are imminent to this population (USFWS 2005). Currently, the YBCU is considered a candidate for listing under the federal Endangered Species Act and is listed as either threatened, endangered, or sensitive by the states of California, Arizona, New Mexico, Colorado, and Utah.

From 1998 through 2005, U. S. Bureau of Reclamation (Reclamation) collected incidental YBCU detection data within the Middle Rio Grande while conducting Southwestern Willow Flycatcher (*Empidonax traillii extimus* - SWFL) surveys. However, in 2006 Reclamation initiated formal presence/absence surveys to more accurately determine the distribution and

Figure 1. Historic and current breeding range of the Western YBCU (adapted from Laymon and Halterman 1987).

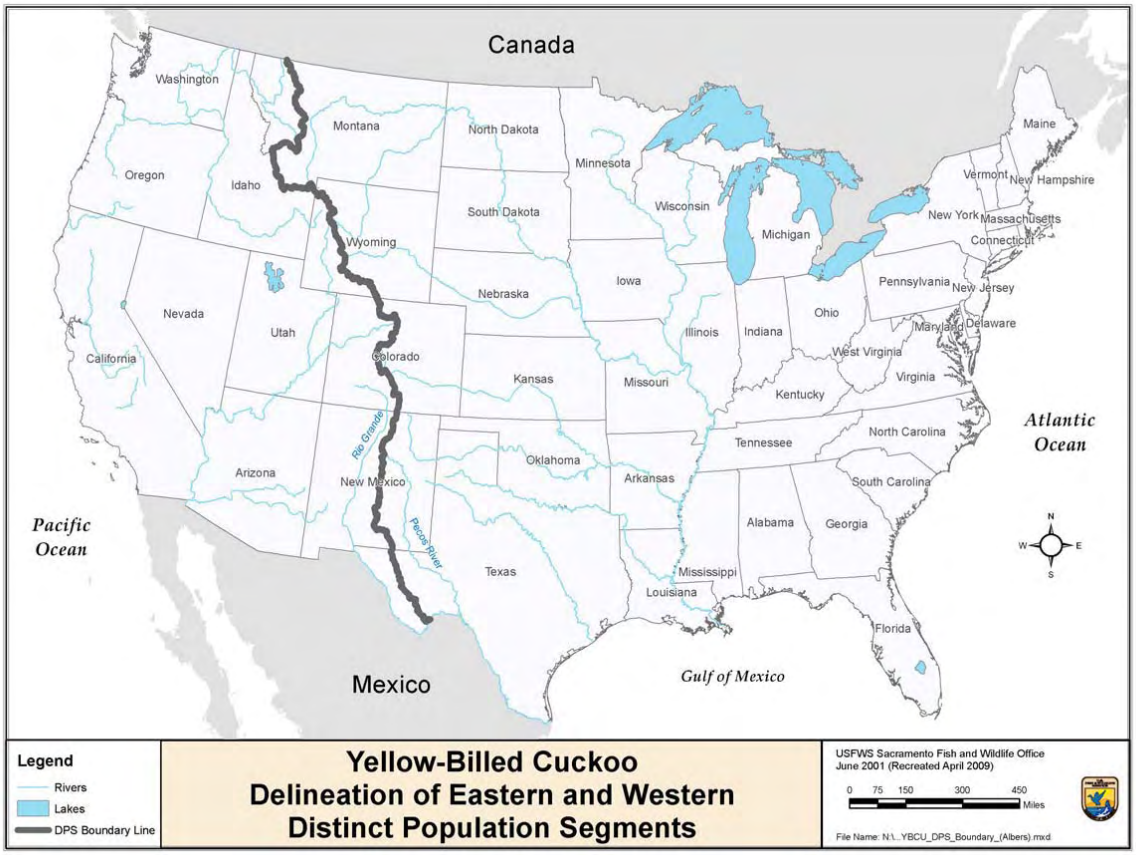

Figure 2. Delineation of distinct population segments of YBCUs (USFWS 2009).

abundance of YBCUs. In 2006, approximately 57 km (35.5 river miles) of the Rio Grande were surveyed. The extent of Reclamation's survey effort increased each year and, in 2009, approximately 144 km (89.5 river miles) were surveyed. Not only did the survey area increase from 2006, but the number of individual surveys during each breeding season also increased from a minimum of three surveys (2006 to 2008) to a minimum of four surveys (2009).

From 2006 through 2008, Reclamation utilized a Geographic Information Systems (GIS) -based model to estimate the number of breeding YBCU territories. However, in 2009 this method was modified to achieve a more accurate estimation of breeding territories. YBCU detections were clumped based on survey specific detection results, habitat availability, breeding biology, and best biological opinion.

Methods

Study Area

In 2009, approximately 144 km (89.5 river miles) of the Rio Grande riparian corridor from Hwy 60 downstream to Elephant Butte Reservoir were surveyed. This area was divided into seven different river reaches (Figure 3). All reaches were subdivided into survey sites. Survey sites were sized to be thoroughly surveyed by one person in a single day. All sites, with the exception of the LFCC sites in the San Marcial reach, were within the active floodplain. Riparian vegetation dominated most sites and was comprised of native willows and cottonwoods or exotic saltcedar and Russian olive in a variety of height, age and structure classes. The following is a reach-by-reach description of the study area.

The Belen reach was the northernmost reach in the study area, extending a short 6.5 km (4 river miles) downstream from Hwy 60 to the confluence of the Rio Grande and Rio Puerco (Table 1). Cuckoo surveys were first conducted in this reach in 2009. Vegetation was highly variable but was dominated by exotic saltcedar and Russian olive. Native canopy covered only about 6 percent of the total survey area (Table 2). Most of this habitat was sparse, particularly away from the active river channel. Much of the reach was subjected to infrequent overbank flooding and therefore was relatively dry. However, a few low lying areas did experience annual overbank flooding and typically supported native vegetation. The limited patches of young native habitat within this reach (16 percent) were comprised of regenerating cottonwood and coyote willow (*Salix exigua*) on lower river bars and terraces where hydrology was suitable. Nearly half (49 percent) of the vegetation within this reach was classified as understory exotic vegetation less than 6 m in height.

The Sevilleta National Wildlife Refuge (NWR)/La Joya reach was relatively narrow and constrained by levees on both sides of the Rio Grande. This reach extended downstream from the confluence of the Rio Grande and Rio Puerco to San Acacia Diversion Dam for approximately 17 km (10.5 river miles) (Table 1). Formal YBCU surveys were conducted for the first time in 2009. The riparian habitat within this reach was very similar to that found within the Belen reach. Exotic vegetation was dominant, particularly farther from the river, and occurred in a variety of heights and densities. Native canopy comprised only about 4 percent of the area, while 44 percent of the vegetation within this reach was classified as understory exotic vegetation less than 6 m in height (Table 2). Monotypic stands of saltcedar and Russian olive were common. A few stands of young native vegetation existed primarily on river bars and lower terraces adjacent to the active channel where overbank flooding occurred on a regular basis.

The San Acacia reach extended downstream from San Acacia Diversion Dam to the Escondida Bridge, a length of approximately 19 km (12 river miles) (Table 1). This reach was long and narrow and dominated by a mixture of native and exotic vegetation. Vegetation was typically sparse saltcedar and/or Russian olive with occasional New Mexico olive (*Forestiera pubescens*). There were several large cottonwood galleries within this reach. Native canopy covered

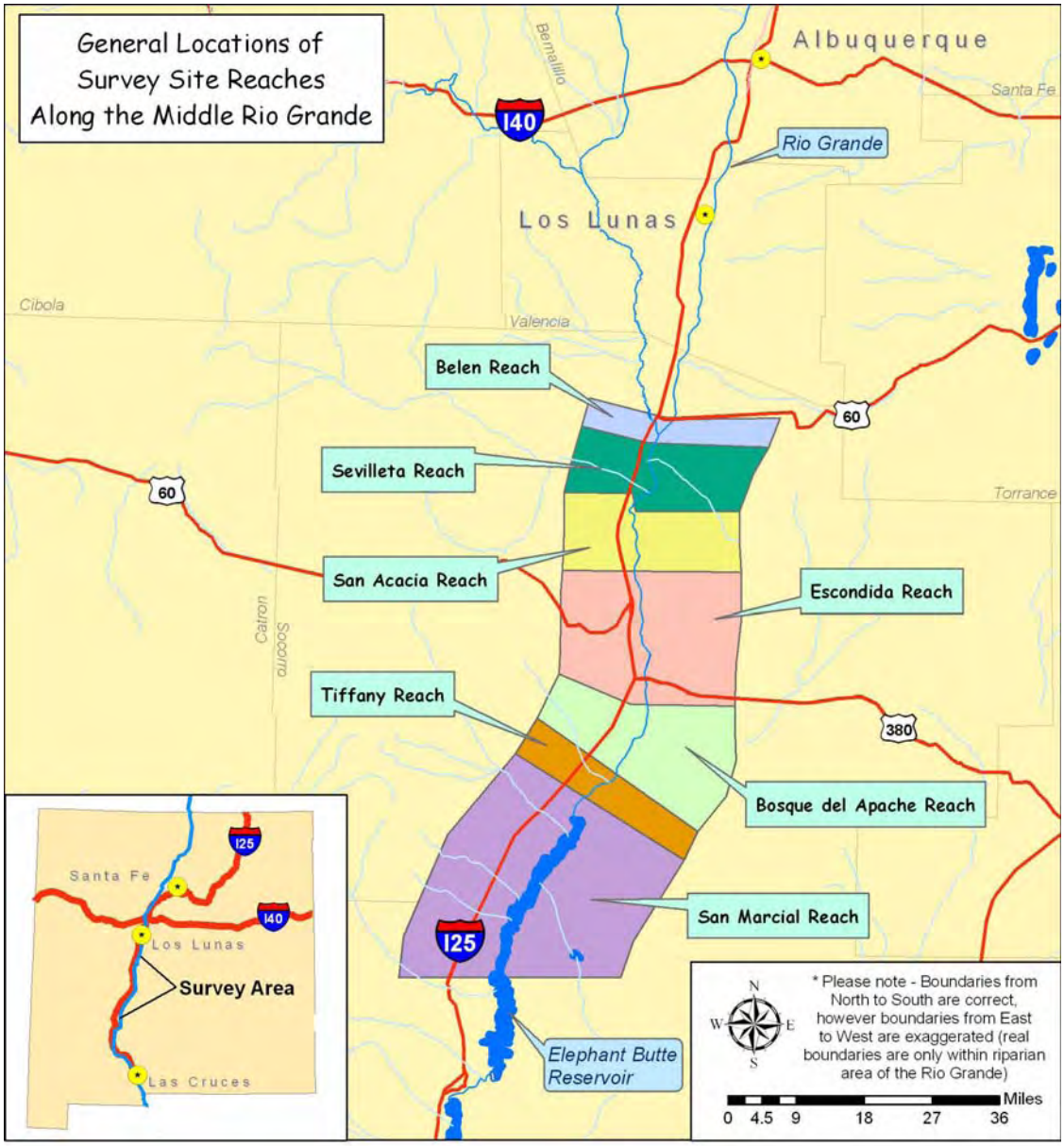

Figure 3. Middle Rio Grande Study Area

Table 1. River reaches included in the 2009 survey area.

River Reach	River Miles	Length
Belen	130.5 to 126.5	6.5 km/4.0 river miles
Sevilleta NWR/La Joya	126.5 to116.0	17 km/10.5 river miles
San Acacia	116.0 to 104.0	19 km/12.0 river miles
Escondida	104.0 to 84.0	32 km/20.0 river miles
Bosque del Apache NWR	84.0 to 74.0	16 km/10.0 river miles
Tiffany	74.0 to 68.5	9 km/5.5 river miles
San Marcial	68.5 to 38.5	44 km/27.5 river miles
Total	**130.5 to 41.0**	**144 km/89.5 river miles**

Table 2. Major vegetation community types within respective river reaches.

Riparian Community Type	Acres/River Reach													
	Belen		Sevilleta NWR/La Joya		San Acacia		Escondida		Bosque del Apache NWR		Tiffany		San Marcial	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Native Canopy/Native Understory	0	0%	2	0%	0	0%	26	1%	0	0%	4	0%	1471	10%
Native Canopy/Mixed Understory	0	0%	9	0%	228	10%	460	10%	310	10%	140	5%	1125	8%
Native Canopy/Exotic Understory	53	5%	16	1%	213	10%	297	6%	460	14%	376	12%	1611	11%
Mixed Canopy/Native Understory	21	2%	74	3%	169	8%	111	2%	80	2%	0	0%	0	0%
Mixed Canopy/Mixed Understory	11	1%	77	4%	189	9%	169	4%	111	3%	11	0%	88	1%
Mixed Canopy/Exotic Understory	35	4%	233	11%	60	3%	84	2%	172	5%	108	3%	0	0%
Exotic Canopy/Native Understory	1	0%	47	2%	26	1%	9	0%	0	0%	0	0%	0	0%
Exotic Canopy/Mixed Understory	1	0%	20	1%	0	0%	49	1%	60	2%	0	0%	0	0%
Exotic Canopy/Exotic Understory	115	12%	282	13%	40	2%	438	9%	325	10%	71	2%	1049	7%
Native Canopy – No Understory	10	1%	62	3%	135	6%	128	3%	44	1%	5	0%	1004	7%
Mixed Canopy – No Understory	25	3%	53	2%	0	0%	48	1%	0	0%	31	1%	0	0%
Exotic Canopy – No Understory	6	1%	75	4%	57	3%	355	8%	32	1%	480	16%	1114	8%
No Canopy - Native Understory	153	16%	100	5%	177	8%	157	3%	313	10%	56	2%	393	3%
No Canopy - Mixed Understory	65	7%	134	6%	208	9%	711	15%	628	19%	12	0%	1665	12%
No Canopy - Exotic Understory	477	49%	941	44%	710	32%	1587	34%	712	22%	1801	58%	4606	33%
TOTALS	**973**		**2125**		**2212**		**4629**		**3247**		**3095**		**14126**	

Canopy = vegetation greater than 6 m in height
Understory = vegetation less than 6 m in height

26 percent of the area, however vegetation less than 6 m in height (i.e. understory) covered approximately 50 percent of the reach (Table 2). Several patches of higher quality YBCU habitat could be found on lower terraces and river bars. This reach was immediately downstream of San Acacia Diversion Dam; consequently the river channel was incised which limited the potential for overbank flooding. This reach was also first surveyed in 2009.

The Escondida reach extended 32 km (20 river miles) downstream from the Escondida Bridge to the north boundary of the Bosque del Apache NWR (Table 1). Similar to the upstream reaches, the higher quality native YBCU habitat was primarily on the river bars and lower terraces. This area received periodic overbank flooding and supported a higher water table, which allowed dense stands of coyote willow, Goodding's willow, cottonwood and Russian olive to thrive in some areas. The drier portions of this reach supported sparse, shrubby saltcedar and seep willow (*Baccharis* spp.) with an occasional overstory of cottonwoods. Over 50 percent of this reach lacked an overstory component (Table 2). This reach has been surveyed at least in part since 2007.

The Bosque del Apache NWR reach fell entirely within the active floodplain of the Bosque del Apache NWR and was approximately 16 km (10 river miles) in length (Table 1). Several large patches of native riparian habitat were flooded during high flows on an annual basis. Native canopy community types covered 25 percent of the active floodplain within this reach (Table 2). These flooded, native overstory stands were attractive to both SWFLs and Cuckoos. The remaining habitat within this reach was a mixture of saltcedar, Russian olive, seep willow, *Salix* spp., and cottonwood, which was less attractive to Cuckoos due to its lack of height, vertical structure and/or density. This reach has been surveyed in its entirety since 2007.

The Tiffany reach was a relatively short reach of the Rio Grande (9 km/5.5 river miles), extending downstream from the south boundary of the Bosque del Apache NWR to the north boundary of Elephant Butte Project Lands (Table 1). Riparian habitat within this reach was dominated (58 percent) by shrubby exotic saltcedar less than 6 m in height (i.e. understory). Over 75 percent of the reach was dominated by various age classes of saltcedar (Table 2). Small patches of Russian olive, Goodding's willow, coyote willow and cottonwood could also be found within this reach. During high Rio Grande flows, portions of this reach were periodically inundated. Patches of suitable YBCU habitat existed in the form of overstory cottonwood or Goodding's willow, with an understory comprised of Russian olive, saltcedar and coyote willow. YBCU surveys have been conducted within this reach since 2006.

The San Marcial reach was by far the longest (44 km/27.5 river miles) and contained the greatest abundance of suitable YBCU habitat compared to all other reaches in the study area (Table 1 and Table 2). This reach encompassed sites within and outside the conservation pool of Elephant Butte Reservoir. Over 35 percent of the reach was covered by native dominated canopy, while exotic or mixed canopy dominated areas accounted for only 16 percent of the area. Vegetation in the upstream portion of the reach and outside the active floodplain consisted almost entirely of decadent stands of saltcedar. Also upstream of the reservoir, but within the active floodplain, the vegetation was increasingly decadent and dominated by exotics. These areas, which once supported vigorous stands of native coyote and Goodding's willow, had recently converted to saltcedar with overbank flooding essentially nonexistent. The portion of this reach that lies

within the reservoir pool was dominated by native vegetation, particularly to the west of the Rio Grande pilot channel which was flooded or wetted by flows from the Low Flow Conveyance Channel (LFCC) outfall. This area supported some of the best native riparian habitat within the entire study area and currently supports the largest population of SWFLs within their range. These areas were colonized by native willows as the reservoir receded during the late-1990's to the early 2000's and were watered by the LFCC outfall. Vast expanses of multiple age classes of Goodding's and coyote willow habitat developed from the upper end of the reservoir pool (sites LF-17 and LF-17a) all the way through "The Narrows" and provided high quality breeding habitat for both Cuckoos and SWFLs. This reach has been surveyed every year since 2006.

Presence/Absence Surveys

All reaches were surveyed using methodology developed in cooperation with the Arizona Game and Fish Department, U. S. Geological Survey, and Halterman etal. (2000). Modifications to the survey protocol were also adapted based on past site specific survey information. In 2009, the YBCU Working Group established a survey protocol which was also incorporated into the Rio Grande survey methodology. All surveyors were required to attend protocol training prior to conducting formal surveys. The repeated call-playback method was used. With this method, surveyors moved through all suitable habitat in their designated survey site, playing the recorded "*kwolp*" call every 100 m. At each playback location, the call was played for 20 to 30 seconds followed by a pause of one minute for detection of a response by YBCUs. This procedure was repeated five times unless a response was detected before the fifth playback. If no response was detected, surveyors moved another 100m and repeated the call/pause sequence. If a response was heard the observer stopped playback, recorded their observations, and repeated the procedure again at 300m. In 2009, surveys were conducted four times with a minimum of 12 days between surveys, and generally between 0530 and 1100 hours (depending on weather conditions). Survey dates are summarized in Table 3.

All four surveys were conducted within the YBCU resident period as defined by the YBCU Working Group and supported by telemetry results from Sechrist et al. (2009). Multiple surveys were conducted to increase the likelihood of detection and to confirm the establishment of breeding territories. Multiple surveys also increased the probability of detecting late-arrivals and helped determine which sites remained occupied throughout the breeding season. Survey data were recorded on field forms which were subsequently transferred to electronic survey forms, as well as an Excel spreadsheet and GIS database.

For the purposes of this report a detection is defined as the documented presence of a YBCU during any and all surveys. For example, an individual YBCU documented on each of the four surveys would constitute four detections, while an individual documented on a single survey would be a single detection. A breeding territory is loosely defined as a breeding unit of YBCUs, generally comprised of a male and female, but sometimes including a "helper" male. A breeding territory can be comprised of two to multiple YBCU detections.

Table 3. YBCU survey schedule for the 2009 field season.

Survey number	Survey period
1	June 15 to late-June
2	Early-July to mid-July
3	Mid-July to late-July
4	Early-August to August 15th

Data recorded when a YBCU was detected included:

- Detection time
- Detection type (aural, visual, and/or both)
- Call type ('*kwolp*', '*one note*', '*knocker*', or '*coo*')
- Sex (male, female, juvenile, or unknown)
- Breeding status (paired, unpaired, or unknown)
- Playback number at time of detection
- UTM coordinates and estimated bearing and distance to YBCU if detected from a distance
- Relevant comments

Any assumptions regarding breeding status and/or sex were not made and were typically recorded as 'unknowns' on survey forms unless surveyors observed obvious pair interactions. In previous years, there has been debate about whether vocal responses to the playback tape varied by sex and/or breeding status (i.e. "*kwolp*" call indicating a paired male, "*coo*" call indicating an unpaired male, abbreviated "*kwolp*" call indicating a paired female, and a "*knocker*" call indicating an alarm call by paired males or females) (Wiggins 2005). Currently, there is considerable agreement that vocalizations are not a reliable determination of breeding status and/or sex (M. Halterman, pers. comm.).

Territory Estimation

For the purposes of estimating the distribution and abundance of breeding YBCU territories, all YBCU detections were considered to be those of resident birds. The seasonal timing of surveys was established to minimize the likelihood of detecting migrating Cuckoos.

Prior to 2009, territory estimation was based on a standardized technique of clumping YBCU detections within a 500 m radius using GIS analysis (Johanson et al. 2008). This technique allowed for a very consistent and repeatable estimation of YBCU territories. However, the results of this analysis tended to overestimate the abundance of YBCU territories when detections were widely scattered, and underestimate them when detections were relatively dense.

Realizing the inherent problems associated with the standardized 500 m radius technique, a new technique was developed to evaluate YBCU detections in an effort to provide an improved

estimation of breeding YBCU territories. The following list identifies some of the reasons why it is difficult to estimate breeding YBCU territories:

1) Breeding territories can be comprised of two to three adults (Halterman, pers. comm.).
2) Both males and females vocalize – coo, kwolp, and knocker calls.
3) YBCUs have large, undefended territories and can travel >500 m/day or >3000 m over breeding season based on telemetry data (Sechrist et al. 2009).
4) Since YBCU territories are undefended, they can overlap allowing for habitat use from multiple breeding YBCUs.
5) Actual YBCU locations are calculated based on surveyor UTMs, distance, and bearing, all of which have inherent errors.
6) Surveys later in the breeding season (i.e. Surveys 3 and 4) could detect hatch year fledglings which have dispersed from the nest site into surrounding areas.

In lieu of the 500 m radius technique, the following rules were applied to estimate the number of breeding YBCU territories based on 2009 detections:

1) Since a breeding territory is comprised of multiple (2-3) vocal adults and surveys are conducted a minimum of four times during the breeding season, a breeding territory should be comprised of more than a single detection.
2) A YBCU territory MUST have a minimum of two detections over the entire 4 survey period - <300 m apart during the same survey or <500 m apart during at least two surveys – otherwise the detections are not considered as part of a breeding territory, but rather as "random/floater" detections.
3) No more than three detections within 300 m, during the same survey period can be included in a single YBCU territory. More than three YBCU detections in an area <300 m suggests multiple breeding territories.
4) YBCU clumping patterns need to be evaluated based on the number and proximity of detections during individual survey periods. Ideally, multiple discreet detections within 300 m of each other over multiple surveys are needed to confirm a breeding territory
5) Although YBCU territories can overlap, "breaks" between detection clumps, regardless of distance, should be considered when delineating territories.
6) "Best biological opinion" should prevail when delineating and estimating YBCU territories. Habitat suitability and abundance, as well as the distribution of YBCU detections over the entire breeding season should be considered when delineating breeding territories.

Results

Presence/Absence Surveys

During the 2009 YBCU breeding season, a total of 356 detections of YBCUs were confirmed within the study area. These detections are believed to represent approximately 95 breeding territories (Table 4). Table 5 summarizes the 2006 through 2009 YBCU detections and territory estimation from the seven river reaches within the study area. Figures 4 through 7 illustrate the distribution and abundance of 2009 YBCU detections throughout the study area. Surveys forms and maps for all survey sites can be found in a separate Appendix.

Table 4. Number and percentage of YBCU detections and territories by river reach in 2009 within the Middle Rio Grande.

River Reach	YBCU Detections		YBCU Territories	
	Number of Detections	Percent of Detections	Number of Territories	Percent of Territories
Belen Reach	1	<1%	0	0%
Sevilleta NWR/La Joya Reach	4	1%	2	2%
San Acacia Reach	8	2%	1	1%
Escondida Reach	29	8%	9	9%
Bosque del Apache NWR Reach	47	13%	11	12%
Tiffany Reach	10	3%	3	3%
San Marcial Reach	257	72%	69	73%
Totals	**356**	**100%**	**95**	**100%**
Elephant Butte Reservoir Pool (Subset of San Marcial Reach)	211	59%	56	59%

Table 5. Number of YBCU detections and territories by river reach from 2006 to 2009 within the Middle Rio Grande.

River Reach	YBCU Detections/Territories Delineated			
	2006	2007	2008	2009[1]
	Detections/Territories	Detections/Territories	Detections/Territories	Detections/Territories
Belen	n/s	n/s	n/s	1/0
Sevilleta NWR/La Joya	n/s	n/s	n/s	4/2
San Acacia	n/s	n/s	n/s	8/1
Escondida	n/s	3/2	19/10	29/9
Bosque del Apache NWR	n/s	22/13	35/14	47/11
Tiffany	11/6	12/4	7/3	10/3
San Marcial	104/38	222/52	299/60	257/69
Total	**105/44**	**259/71**	**360/87**	**356/95**
Elephant Butte Reservoir (Subset of San Marcial)	74/28	182/36	252/45	211/56

NOTE: 2006 to 2008 trends are not directly comparable due to varying degrees of survey efforts and survey area. A minimum of three surveys were conducted in 2006, 2007, and 2008. A minimum of four were conducted in 2009.

[1] 2009 Territories were estimated using a different technique than 2006-2008.

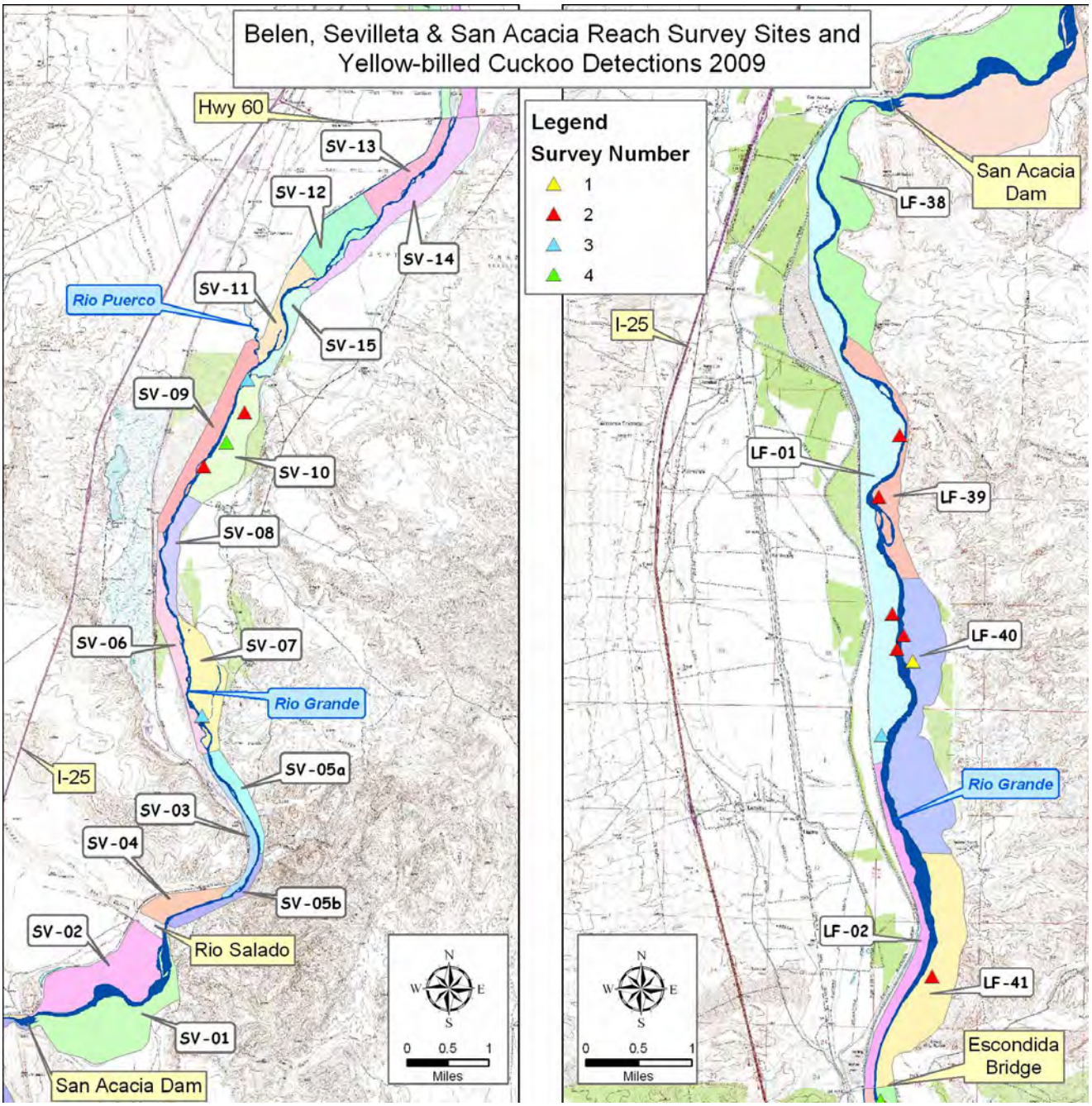

Figure 4. Overview of the survey sites and YBCU detections within the Belen, Sevilleta NWR/La Joya and San Acacia reaches of the Rio Grande, New Mexico.

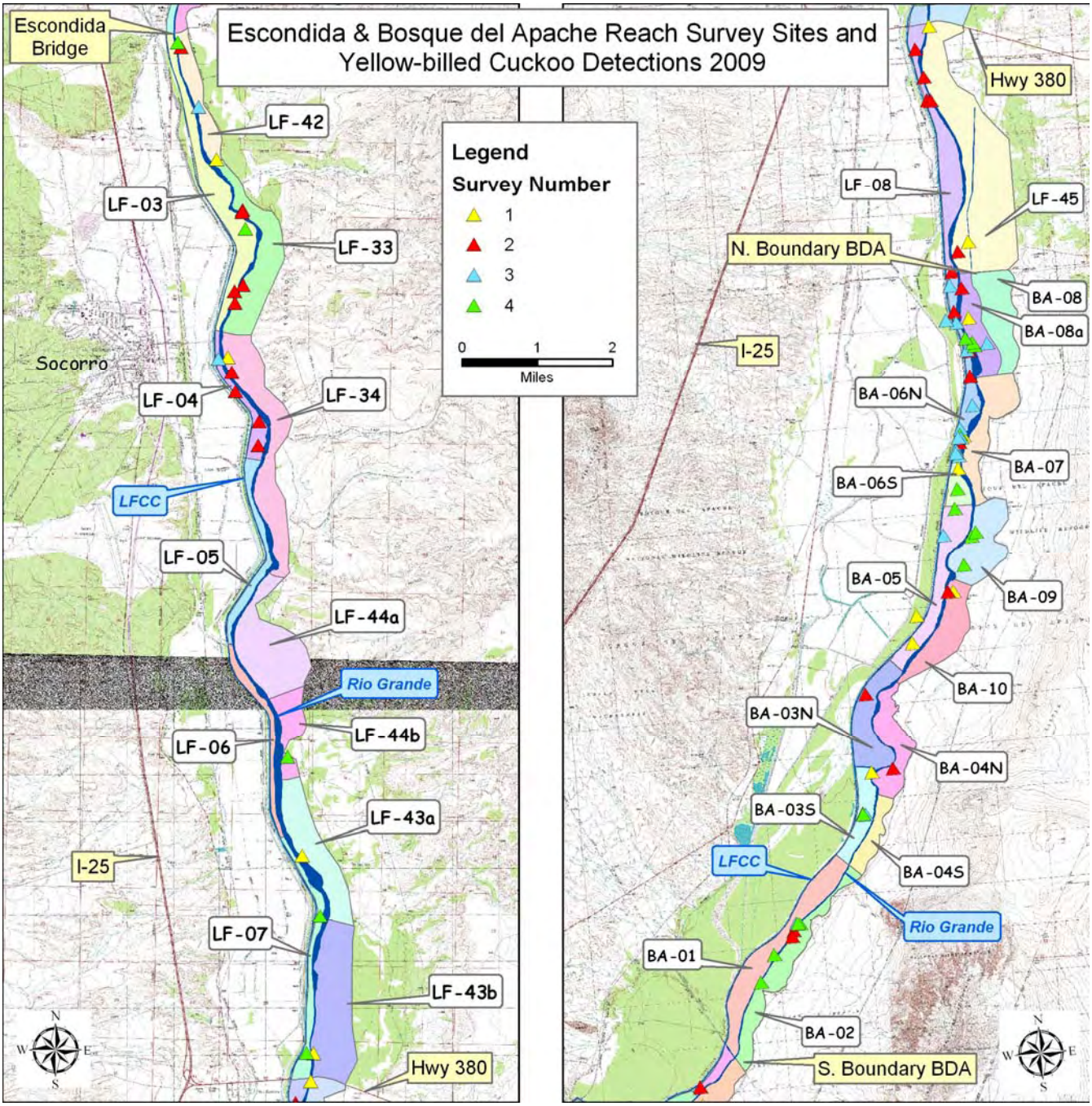

Figure 5. Overview of survey sites and YBCU detections within the Escondida and Bosque del Apache NWR reaches of the Rio Grande, New Mexico.

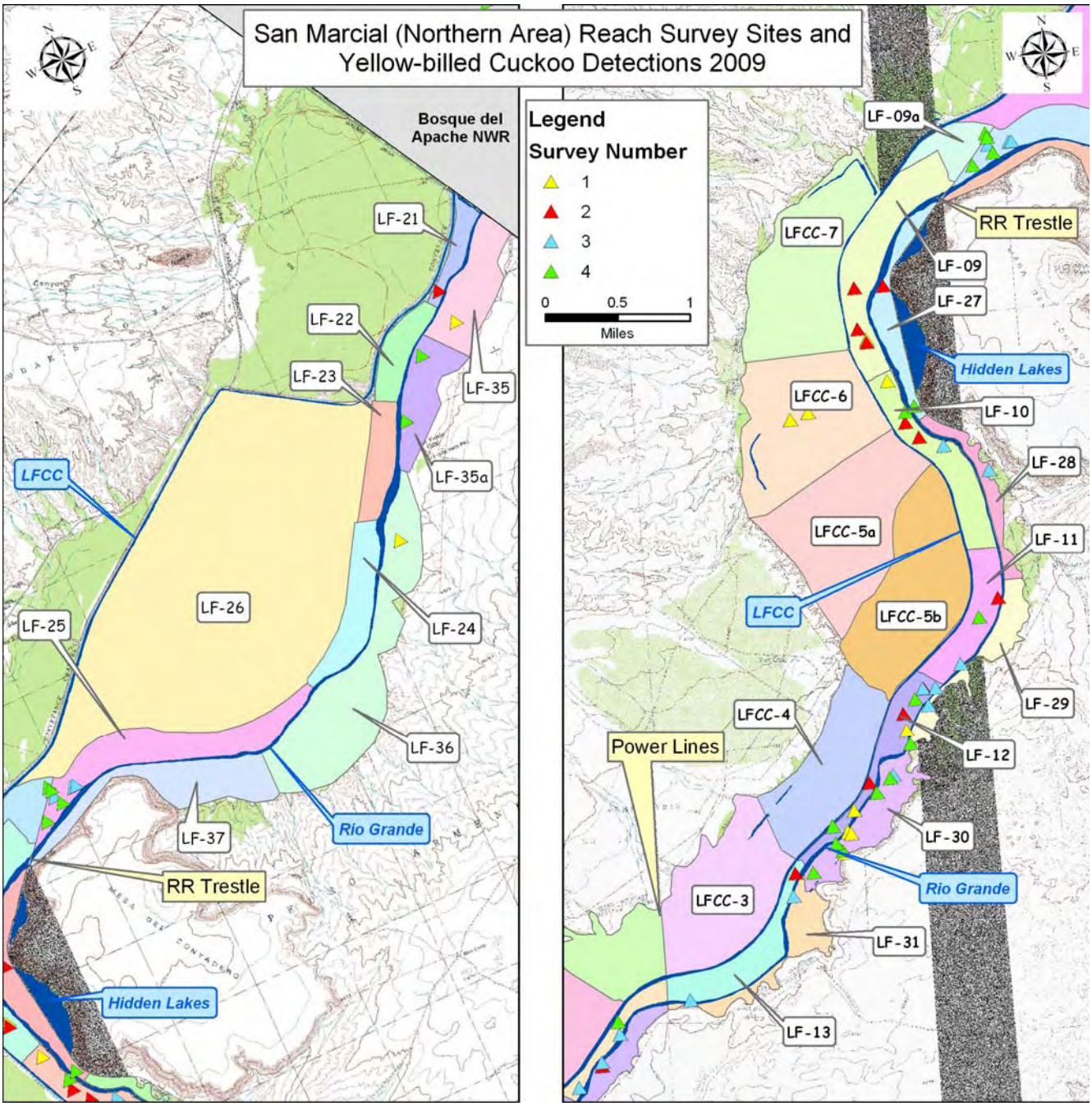

Figure 6. Overview of survey sites and YBCU detections within the Tiffany and northern San Marcial reaches of the Rio Grande, New Mexico.

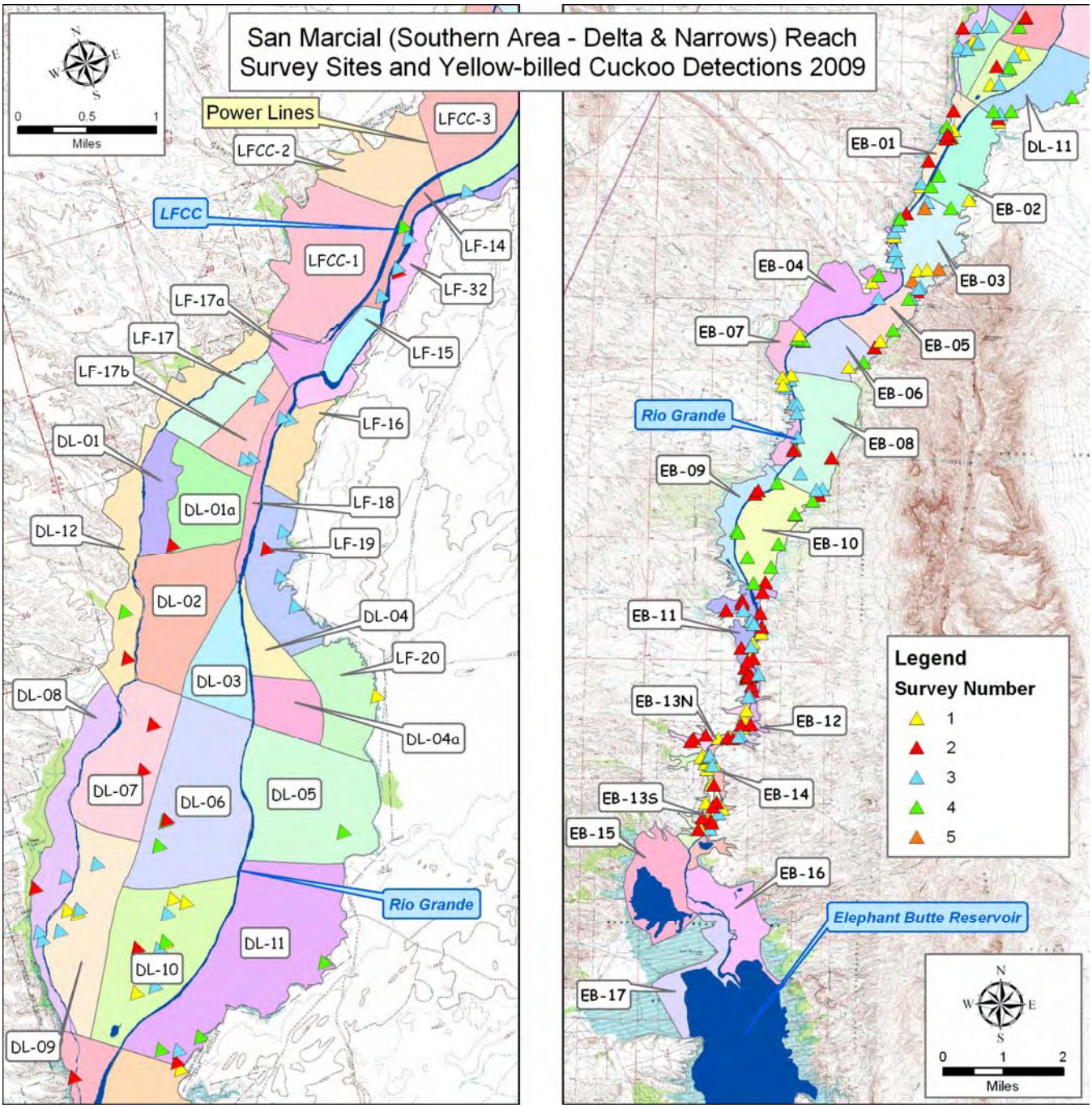

Figure 7. Overview of survey sites and YBCU detections within the southern San Marcial reach of the Rio Grande in New Mexico.

Discussion

The western YBCU has declined in abundance throughout the western U.S. due to habitat loss and degradation and is considered a candidate for listing under the Federal Endangered Species Act. Historical data show that the species was once relatively common along the Rio Grande (Bailey 1928). Surveys conducted by Reclamation over the past four years have documented a significant and potentially increasing population of Cuckoos within the Middle Rio Grande Basin. Territory numbers have increased within the San Marcial reach with the greatest increase specifically within the exposed conservation pool of Elephant Butte Reservoir (Table 5). The population increase is likely a result of the recently established and expanding native habitat within the pool.

Survey effort has increased annually within the study area. The geographic extent of the surveys increased from 57 km (35.5 river miles) in 2006 to 144 km (89.5 river miles) in 2009. Also, the number of surveys conducted each breeding season increased. From 2006 through 2008 a minimum of three surveys were conducted and in 2009 the number of surveys was increased to a minimum of four.

The Belen, Sevilleta NWR/La Joya, and San Acacia reaches were all surveyed for the first time in 2009. A total of 13 Cuckoo detections, believed to represent only three breeding territories were found collectively within these three reaches (Table 4). As stated in the Methods section, Cuckoo habitat was generally limited to patches immediately adjacent to the Rio Grande. These reaches were not subject to frequent overbank flooding, limiting the potential for establishment and development of native vegetation. Several river bars and lower terraces support vegetation that is either currently, or could potentially become, Cuckoo breeding habitat. Future surveys will determine if these reaches can develop and/or maintain viable Cuckoo populations.

The Escondida reach has been surveyed wholly or in part since 2007. Surveys conducted in 2007 provided only limited data since only two sites within the reach were surveyed. In 2008 and 2009, surveys documented 19 and 29 Cuckoo detections, representing 10 and 9 breeding territories, respectively (Table 5). During the past several years, several river bars and lower terraces in this reach have developed, providing suitable YBCU habitat composed of willows, cottonwood, and Russian olive (which, although an exotic species, does provide good vegetative structure and density). River dynamics in this reach are somewhat limited by San Acacia Diversion Dam and overbank and scouring flows are very infrequent. Future surveys will determine whether this population of Cuckoos can persist or possibly expand.

The Bosque del Apache NWR reach has been surveyed since 2007 and Cuckoo detections have increased considerably (Table 5). In 2007, (based on the results of three surveys) a total of 22 Cuckoos were detected and in 2009 (based on the results of four surveys) 47 Cuckoos were detected. Although different methods were employed to estimate the number of breeding territories from 2007 through 2009, between 11 and 14 breeding territories were believed to be established within the active Rio Grande floodplain of this reach during this period. Similar to the Escondida reach, this reach has experienced significant habitat development during the past several years which, unlike the Escondida reach, has occurred in several areas due to regular overbank flooding. This developing habitat has prompted an increase in both Cuckoo detections

and SWFL territories over the past three years (Moore and Ahlers 2010), a trend that is likely to continue into the foreseeable future barring any catastrophic event.

Habitat within the Tiffany reach appeared suitable for Cuckoos, with some areas receiving regular overbank flooding. Large stands of overstory cottonwood and Goodding's willow with understory saltcedar provided suitable habitat for both breeding Cuckoos and SWFLs. Cuckoo detections, regardless of survey effort, have ranged from seven to 12 over the past four years. These detections were believed to represent from three to six breeding territories (Table 5). Future surveys will determine if this small Cuckoo population is able to persist.

The San Marcial reach was the largest and most densely occupied reach in the study area. Although it is difficult to accurately assess the population trend of this reach due to changes in survey effort and the methods used to estimate breeding territories, all indications were that this reach has experienced a significant population increase since 2006. In 2006, 104 Cuckoo detections –comprising an estimated 38 breeding territories– were made; in 2009 Cuckoo detections increased to 257, representing approximately 69 breeding territories (Table 5). This reach supports one of the largest contiguous expanses of native riparian habitat in the Southwestern U.S. The number of Cuckoo territories in this reach is expected to increase over the next several years due primarily to habitat availability.

The vast majority of YBCU territories within the San Marcial reach were specifically within the Elephant Butte Reservoir conservation pool. Approximately 80 percent of all Cuckoo detections and territories found within the San Marcial reach were within Elephant Butte Reservoir (Table 5). Nearly 60 percent of all Cuckoo detections and territories found within the entire study area were within Elephant Butte Reservoir (Tables 4 and 5). Following the recession in Elephant Butte Reservoir water levels from 1995 to 2003, several vast stands of native, Goodding's willow-dominated habitat became established. In the northern, upstream portion of Elephant Butte Reservoir this habitat is maintained by flows from the LFCC and rarely dries out. Habitat, particularly within the southern portion of the exposed Reservoir, continues to improve and is likely to support an increasing number of Cuckoos in the near future. Conversely, habitat in the upper portion of the exposed Reservoir, associated with both the Rio Grande and the western LFCC-fed portion, has begun to decline in quality due to either a reduced groundwater table or extended flooding. These areas become less attractive to both Cuckoos and SWFLs as they are converted to either cattail marsh or saltcedar.

From 2007 to 2009, 336 out of 975 YBCU detections (35 percent) were made prior to broadcasting the "kwolp" recording (Table 6). This result emphasizes the need for a pre-broadcast listening period when conducting surveys. Over 80 percent of all detections (n=975) were made during the pre-broadcast period and the first two playback broadcasts combined, suggesting that during the breeding season Cuckoos are relatively vocal and responsive to the broadcast recording (Table 6). However, this does not take into consideration those Cuckoos that may not respond to any broadcasts.

In 2007, 41 percent of all detections were made during the third [and final] survey period (Table 7). Based on these results the survey protocol was modified in 2008 to include a fourth survey period in the hopes of detecting additional Cuckoos. However, due to time constraints 4 surveys

Table 6. Summary of 2007 through 2009 YBCU responses after playback number.

Percentage of Responses After Playback # [1]							
	Detections prior to playback	**Detections using playback**	**Playback number**				
			1	**2**	**3**	**4**	**5**
2007 (n=259)	89	170	45% (n=76)	26% (n=45)	17% (n=28)	5% (n=9)	7% (n=12)
2008 (n= 360)	120	240	46% (n=110)	26% (n=63)	12% (n=29)	9% (n=21)	7% (n=17)
2009 (n=356)	127	229	47% (n=108)	24% (n=55)	20% (n=46)	5% (n=11)	4% (n=9)
TOTALS (n= 975)	**336**	**639**	**46% (n=294)**	**26% (n=163)**	**16% (n=103)**	**6% (n=41)**	**6% (n=38)**

[1] Comparison between 'Playback' detection types only – does not include detections prior to playback.

Table 7. Summary of 2007 through 2009 YBCU detections per survey period.

	Percentage of Detections Observed per Survey Period			
	Survey 1	Survey 2	Survey 3	Survey 4
2007 (n=259)	30% (n=78)	29% (n=74)	41% (n=107)	Not Conducted
2008 (n=360)	18% (n=66)	27% (n=98)	36% (n=129)	19%[1] (n=67)
2009 (n=356)	24% (n=86)	30% (n=107)	26% (n=92)	20% (n=71)
TOTALS (n= 975)	**24% (n=230)**	**29% (n=279)**	**34% (n=333)**	**14%[1] (n=138)**

[1] Only a portion of the study area was surveyed four times, or four surveys were not completed in all years.

were not uniformly conducted throughout the study area. The survey results from 2008 and 2009 indicated a fairly significant decrease in the number of detections during the fourth survey, suggesting that the Cuckoos either left the area or were less vocal. Based on these results, a fifth survey does not appear to be warranted. In 2008 and 2009, approximately 60 percent of all Cuckoo detections were made during the second and third survey periods – perhaps suggesting the peak of the breeding season, or at least a more vocal period (Table 7).

Recommendations

1. Continue annual surveying within currently occupied sites and suitable habitat to the extent that funding allows.
2. Survey unoccupied reaches periodically (every 2 or 3 years) in order to detect any establishing populations of Cuckoos and developing habitat.
3. Monitor any incidentally documented Cuckoo nests in order to gain insight into success and productivity rates.
4. Update the GIS database with annual YBCU territory locations in order to monitor population trends based on detection and territory abundance.
5. Coordinate with other entities to initiate the development of a rangewide database similar to that for the SWFL.
6. Incorporate the use of the YBCU Working Group survey protocol.
7. Utilize the YBCU survey forms developed through the YBCU working group to the extent that is practical in an effort to standardize the collection of relevant data.
8. Evaluate the potential for habitat restoration throughout the Middle Rio Grande.

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