RECLAMATION

Managing Water in the West

Lower Rio Grande Yellow-billed Cuckoo Survey Results - 2017

Selected Sites within the Lower Rio Grande Basin from Elephant Butte Dam, NM to El Paso, TX

U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Denver, Colorado

March 2018

Mission Statements

The U.S. Department of 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.

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prepared for

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U.S. Department of the Interior
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Contents

Figures

Tables

Executive Summary

During the summer of 2017, the Bureau of Reclamation (Reclamation) conducted presence/absence surveys for the federally threatened Western Yellow-billed Cuckoo (YBCU) within the Lower Rio Grande Basin, New Mexico. Surveys were completed within all potentially suitable habitat of the Rio Grande riparian corridor between Elephant Butte Dam, New Mexico and El Paso, Texas. Surveys were conducted in accordance with established protocols in order to determine the distribution and abundance of YBCU throughout this stretch of the Lower Rio Grande.

A total of 110 YBCU detections were recorded during the 2017 breeding season; 28 territories were delineated from these detections. Of these, 12 were considered possible breeders and 15 were considered probable breeders, as defined in Halterman et al. (2016). One breeding pair was confirmed by the discovery of an active nest in the Percha Reach. The Caballo Reach contained the largest breeding population with 64 detections comprising 16 territories. The Hatch Reach had 11 YBCU detections comprising 1 territory and the Radium Springs Reach had 10 detections and 4 territories. Sites within the Las Cruces Reach, first surveyed in 2017, had 9 detections and 3 territories. Both the Rincon Valley and Percha Reaches had 8 YBCU detections delineated into 2 territories each. The Mesilla Reach currently supports minimal suitable cuckoo habitat; only a few select patches of potential habitat were formally surveyed and no YBCUs were detected. The majority of territories and detections throughout the Lower Rio Grande were located in riparian habitat with a native overstory component.

Introduction

The Western Yellow-billed Cuckoo subspecies (*Coccyzus americanus occidentalis*), hereafter referred to as YBCU or cuckoo, is a Neotropical migratory bird whose population has been declining in abundance due, primarily, to habitat loss and degradation. In the 2014 listing by the US Fish and Wildlife Service (USFWS), the Western Distinct Population Segment (DPS) of the Yellow-billed Cuckoo was listed as threatened under the Endangered Species Act (ESA). The Bureau of Reclamation (Reclamation) began formal surveys for the YBCU within the Lower Rio Grande Basin in 2014.

In the southwestern United States, the YBCU nests 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 exotic saltcedar (*Tamarix* spp.), Russian olive (*Elaeagnus angustifolia*) or native vegetation (e.g. *Salix* spp.) also appears to be an important component for territory establishment (Sechrist et al. 2009). Although habitat models have shown a decrease in the probability of occupation when saltcedar coverage increases or native habitat is limited (Johnson et al. 2017), Eastern Yellow-billed Cuckoos extensively use saltcedar along the Pecos River in eastern New Mexico (Sechrist and Best 2014). Territories range in size from 4 to 40 hectares (ha), are usually in close proximity to water, and are not defended from conspecifics (Halterman 2001). A telemetry study on the Middle Rio Grande reported that YBCU home ranges varied from 5 to 282 ha, and averaged 82 ha based on the minimum convex polygon method (Sechrist et al. 2009). Nest heights can range from 1.3 to 14.5 meters (m) (McNeil et al. 2015, Halterman 2001). Both sexes incubate and the time from egg laying to fledging is approximately 17 days (Halterman 2001). Cuckoos typically arrive on breeding grounds in the Southwest by late May and initiate migration to wintering grounds in Central and South America by mid-August (Halterman et al. 2000). In 2010, a YBCU from the Middle Rio Grande was confirmed to have overwintered in parts of Paraguay and northern Argentina (Sechrist et al. 2012). Interestingly, the individual used the Pecos River corridor for both its spring and fall migration between the Rio Grande and South America.

Since the early 1900s, the YBCU population has declined dramatically due to habitat loss and modification, as well as a reduction of food resources due to pesticides (Gaines and Laymon 1984). Their diet primarily consists of larger insects including green caterpillars, katydids, cicadas and other small prey (Laymon 1998). Figure 1 illustrates the historic and last published breeding range of the YBCU. The Rio Grande is considered one of the important strongholds for the YBCU, and historically they were fairly common along sections of the river (Bailey 1928, Howe 1986).

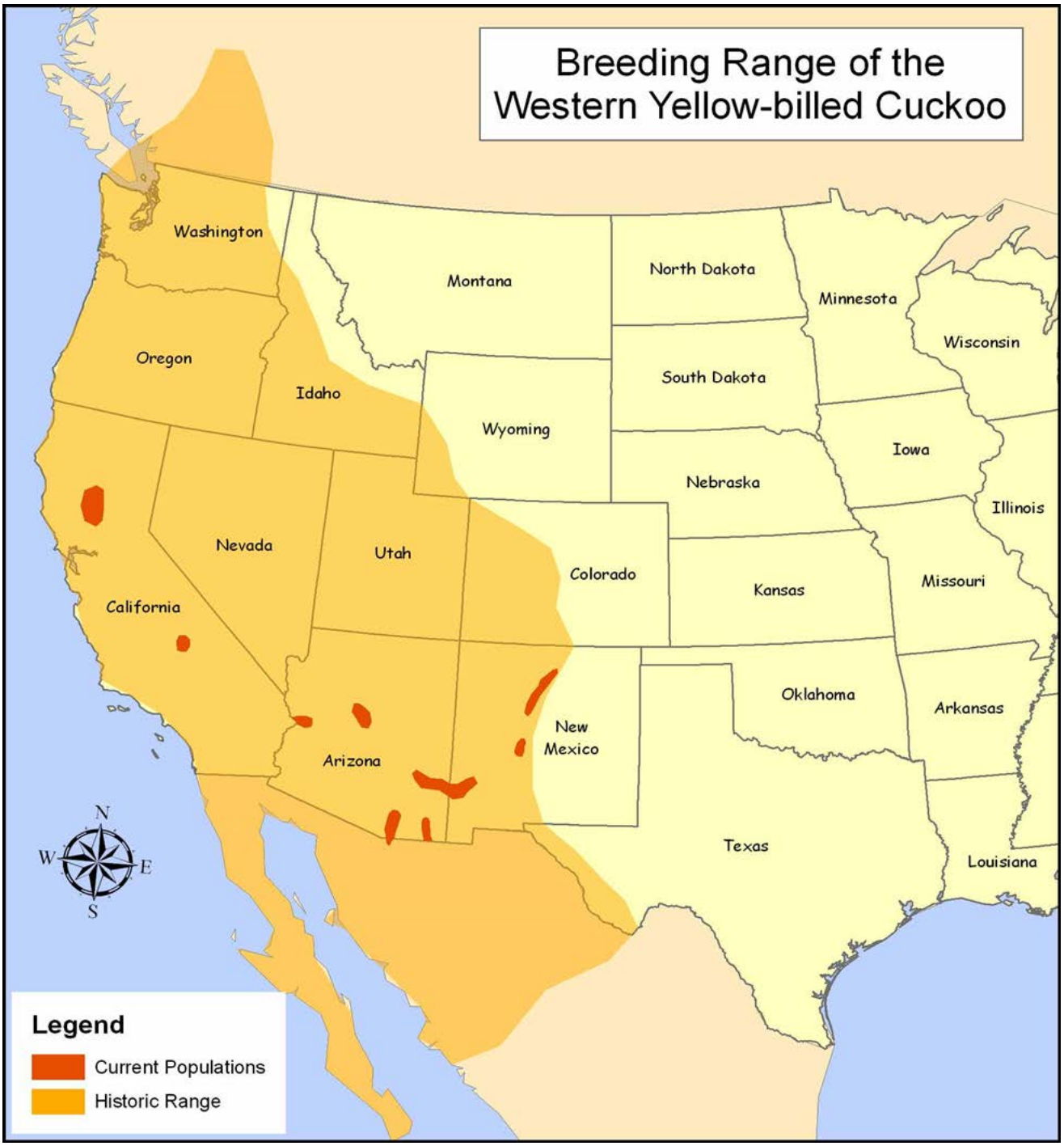

Figure 1. Historic and current breeding range of the Western YBCU (adapted from Laymon and Halterman 1987).
NOTE: Figure 1 depicts the most recently published map of the Western YBCU breeding range, but that map is based on 1987 data. Current data for New Mexico confirm a YBCU population on the Lower Rio Grande that is not depicted on this map.

It has been debated whether the YBCU (*C. a. occidentalis*) is a true subspecies. In 2001, the USFWS determined that the western population of yellow-billed cuckoo is a 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). The USFWS also concluded that the listing of the YBCU as endangered was "warranted, but precluded by higher priority listing actions" in 2001 (USFWS 2001), and reaffirmed this in 2012 (USFWS 2012). In 2005, the USFWS revised the listing priority of the Western DPS from 6 to a higher priority of 3 to better reflect the fact that threats are imminent to this population (USFWS 2005). In 2013, the USFWS published a proposed rule to list the Western DPS as threatened under the ESA, as amended (USFWS 2013). On November 3, 2014, the YBCU threatened listing became effective under the ESA (USFWS 2014) and critical habitat was proposed the following month. The proposed critical habitat is currently under review. The species is also listed as threatened, endangered, or sensitive by the states of California, Arizona, New Mexico, Colorado, and Utah.

During 2012 and 2013, Reclamation recorded incidental cuckoo detections within the Lower Rio Grande while conducting Southwestern Willow Flycatcher (*Empidonax traillii extimus*; SWFL) surveys. Reclamation initiated formal presence/absence surveys within the Lower Rio Grande in 2014 in order to determine the abundance and distribution of cuckoos. Surveys were conducted in suitable habitat within four reaches of the Lower Rio Grande until 2017, when portions of all seven reaches were surveyed.

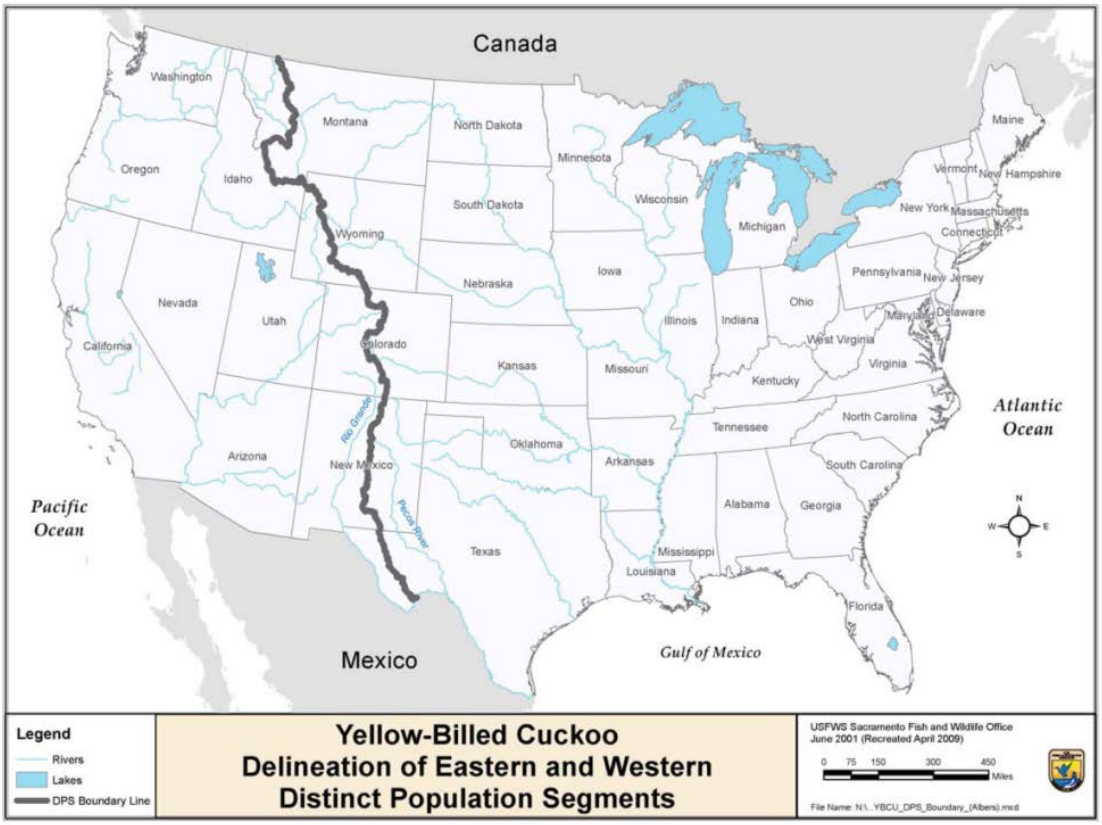

Figure 2. Delineation of distinct population segments of YBCUs (USFWS 2009).

Methods

Study Area

The study area extends for approximately 123 river miles from Elephant Butte Dam, New Mexico downstream to El Paso, Texas, and was divided into 7 distinct reaches encompassing 26 survey sites within the active floodplain of the Rio Grande. Between 2014 and 2016, 13 study sites in 4 reaches were surveyed. Based on pre-season reconnaissance during those years, it was determined that the Rincon Valley, Las Cruces, and Mesilla Reaches lacked substantial suitable habitat and that any patches of habitat were too small and isolated to warrant surveys. This was also confirmed by a habitat classification study conducted prior to the 2016 breeding season to evaluate the entire study area for the presence of potentially suitable YBCU breeding habitat based on vegetation species composition, density and patch size (Moore and Ahlers 2016). In 2017, surveys were conducted in all 7 reaches (21 survey sites) in order to encompass all potential breeding habitat and maintain project compliance for Reclamation and the U.S. Section of the International Boundary and Water Commission (USIBWC) projects. Riparian vegetation surveyed in the Lower Rio Grande consisted mostly of willow, saltcedar, and cottonwood varying in age and structure. The following is a reach-by-reach description of the entire study area from Elephant Butte Dam to El Paso.

The Caballo Reach is the northernmost reach in the study area and extends 26 river miles from Elephant Butte Dam to Caballo Dam. Based on vegetation mapping conducted in 2014 (Siegle and Ahlers 2015), only 9 percent of the riparian habitat within the reach supports a native canopy component (Table 1). Most of the reach, 90 percent, is classified as understory only (i.e. vegetation less than 5 m in height). The extensive amount of understory in this reach is primarily due to annual mowing activities that are targeted at controlling the growth of exotic saltcedar. The 2016 habitat classification study (Moore and Ahlers 2016) found that this reach contained the greatest extent of suitable YBCU breeding habitat within the Lower Rio Grande (151 ha) and was the only reach to contain highly suitable habitat (71 ha). Most of the potentially suitable habitat is found within an 11 river mile stretch of this reach within the Caballo delta and consists of sizeable patches of young to mid-aged Goodding's willow and coyote willow (*Salix exigua*), mixed with saltcedar that has not been mowed in several years. Suitable habitat is also found at the Las Palomas site, located at the mouth of Palomas Creek, which is fenced and managed as a natural area by the Bureau of Land Management. This site supports some suitable habitat and is a mixed community comprised of coyote willow, gallery cottonwoods, sparse saltcedar, and cattails (*Typha* sp.). The Saltcedar Patch is an island of saltcedar that has been inaccessible to mowing equipment and therefore contains some mature canopy. It was classified in 2016 as unsuitable YBCU habitat (Moore and Ahlers 2016). Riparian vegetation development in this reach is dependent on highly managed water levels in the Caballo Reservoir and site flooding is directly related to Reservoir storage. In 2017, the water elevation in Caballo Reservoir fluctuated approximately 16 feet (ft) during the year but held at a relatively high and steady level during the YBCU breeding season (+/- 2 ft). Reservoir storage fluctuated between roughly 20,000 and 78,000 acre feet (USBR 2017). Higher than normal reservoir levels lengthened the saturation period in portions of Caballo delta survey sites and flooded other habitat with up to 10 feet of water.

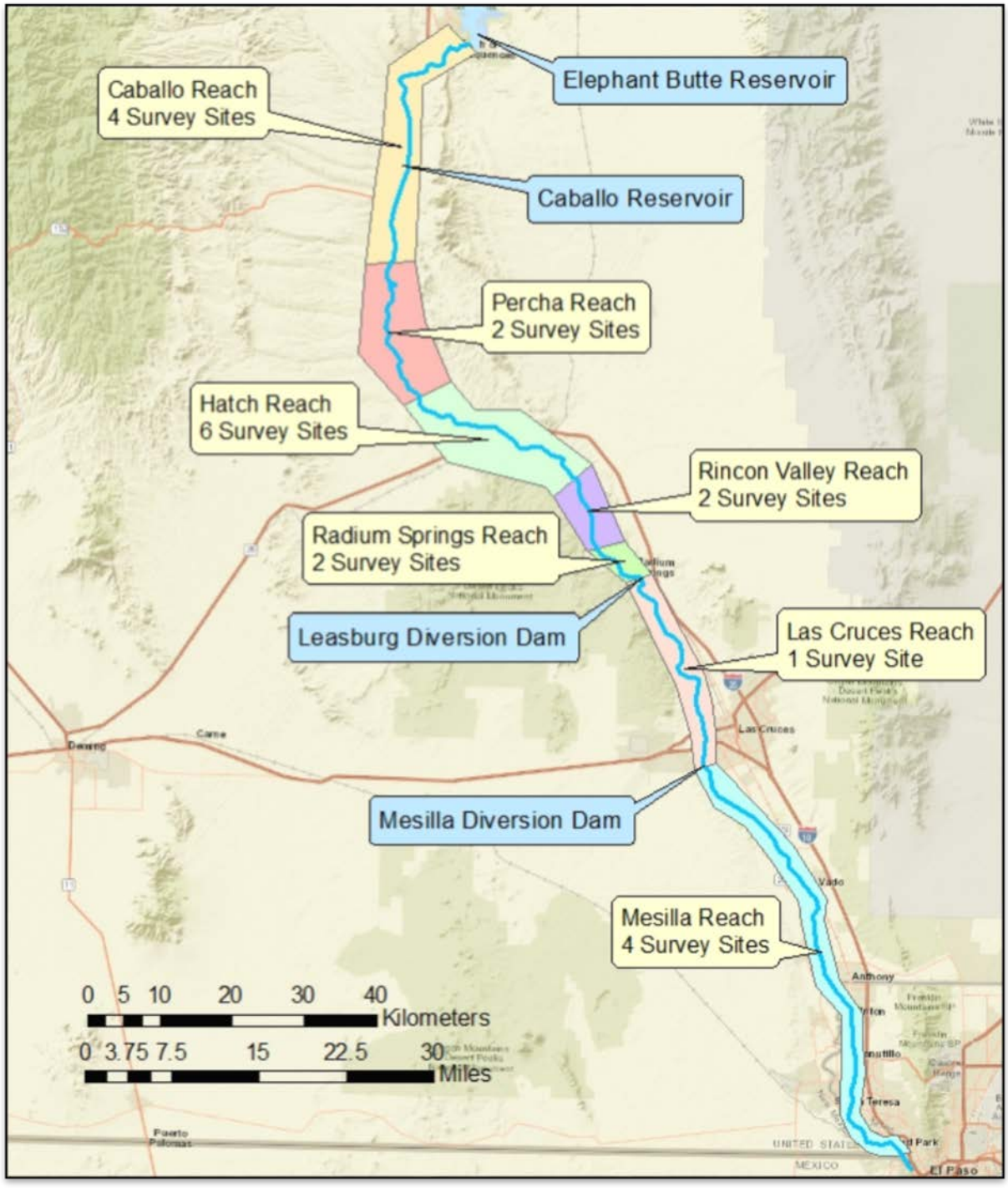

Figure 3. Overview of study area and sites surveyed in 2017 within each reach along the Lower Rio Grande, New Mexico.

Table 1. Major vegetation community types* within the Caballo Reach (Siegle and Ahlers 2015).

Riparian Community Types	Upper Section		Middle Section		Lower Section		Entire Reach	
	ha	%	ha	%	ha	%	ha	%
Native Canopy[1]/Native Understory[2]	84	4%	9	<1%	69	5%	162	3%
Native Canopy/Exotic Understory	155	7%	73	3%	17	1%	245	4%
Native Canopy/Mixed Understory	0	0%	37	2%	10	1%	47	1%
Exotic Canopy/Native Understory	7	<1%	6	<1%	0	0%	13	<1%
Exotic Canopy/ Exotic Understory	29	1%	0	0%	9	1%	38	1%
Exotic Canopy/ Mixed Understory	0	0%	0	0%	0	0%	0	0%
Mixed Canopy/Native Understory	0	0%	0	0%	0	0%	0	0%
Mixed Canopy/Exotic Understory	0	0%	0	0%	9	1%	9	<1%
Mixed Canopy/Mixed Understory	0	0%	7	<1%	1	<1%	8	<1%
Native Canopy – No Understory	1	<1%	54	2%	64	5%	119	2%
Exotic Canopy – No Understory	8	<1%	12	<1%	0	0%	20	<1%
Mixed Canopy – No Understory	0	0%	0	0%	0	0%	0	0%
No Canopy – Native Understory	857	40%	514	21%	232	17%	1603	27%
No Canopy – Exotic Understory	527	25%	636	26%	249	18%	1412	24%
No Canopy – Mixed Understory	472	22%	1134	46%	704	52%	2310	39%
Totals (ha)	**2138**		**2483**		**1365**		**5986**	

*Vegetation data based on 2011 aerial photography and 2014 ground truthing/classification using modified Hink and Ohmart (1984) method. Upper Section is upstream of Caballo Reservoir, Middle Section is within the typically dry delta of the reservoir and Lower Section is adjacent to lake water.
[1]Canopy = vegetation greater than 5m in height.
[2]Understory = vegetation less than 5m in height.

The Percha Reach extends approximately 15 river miles downstream from Caballo Dam. This reach contains the second largest extent of suitable YBCU habitat (34 ha). One portion of the reach, extending from just above Percha Diversion Dam to approximately one mile downstream of the dam, contains all of that suitable habitat. Habitat within this portion of the reach ranges from monotypic saltcedar to native cottonwood, coyote willow, and Arizona ash (*Fraxinus velutina*). A few larger patches of higher suitability habitat occur adjacent to Percha Dam within the Percha survey site and are composed of a mixture of cottonwood, Russian olive, saltcedar, Arizona ash, white mulberry (*Morus alba*) and Siberian elm (*Ulmus pumila*). Habitat along the remaining 14 river miles consists of small, narrow patches of young vegetation which lack the structure for suitable cuckoo habitat; most of these areas were not surveyed. The Trujillo site was first surveyed by Reclamation in 2017, and includes a 0.7 km corridor of predominately native riparian vegetation. The site was previously surveyed in by USIBWC contractors in 2010 and 2011. Most of this site was classified as either unsuitable habitat or entirely lacking riparian habitat in 2016 (Moore and Ahlers 2016).

The Hatch Reach is a long narrow reach that extends 18.5 river miles from approximately 10 miles upstream to 8.5 miles downstream of Hatch, New Mexico. The river in this reach is highly regulated by releases from Caballo Dam, and diversions from Percha Diversion Dam. In most areas, the riparian area is constrained by levees on both sides of the river. Routine mowing of woody

vegetation, both native and exotic, further limits the extent of riparian habitat in this reach. Recently, several "No-mow" zones have allowed woody vegetation growth. However, hydrology typically favors upland species. Nevertheless, the 2016 habitat classification study (Moore and Ahlers 2016) documented 15 ha of suitable YBCU habitat in the Hatch Reach. All suitable habitat was located within a short stretch of site HA-06 and occurs on lower terraces and islands. This habitat consists of a mixture of mature coyote willow with interspersed saltcedar. Other patches of coyote willow and mixed coyote willow/saltcedar occur sporadically within this reach, but lack the height or width of suitable YBCU habitat. Much of the native habitat historically present in this reach was negatively impacted during the winter of 2012 and 2013 by drought and the lack of prolonged Rio Grande flows. The reduced flows and receding ground water levels caused many of the native willows to die, but some of this habitat has begun to recover during the past three years. The USIBWC is conducting restoration or has planned restoration activities at several sites within this reach. The entire reach is surveyed in 6 segments (HA-01 to HA-06).

The Rincon Valley Reach extends approximately 11 miles between the Hatch Reach and Radium Springs Reach, and includes areas that are being considered by USIBWC for restoration. Woody vegetation consists of narrow strips of saltcedar or occasional mixed stands of young coyote willow. The development of native vegetation in this reach is restricted by nearby agriculture, roads, canyon walls and highly regulated river flows. Saltcedar is also routinely mowed in this reach, limiting the age and height of woody vegetation. Annual assessments by Reclamation biologists since 2014 determined that the area did not support potential cuckoo habitat due the narrowness, age, and lack of density/structure of the vegetation, and no surveys were conducted until 2017. The reach was surveyed for the first time in 2017, in two segments (HA-07 and HA-08).

The Radium Springs Reach extends five river miles from Broad Canyon Ranch to Leasburg Diversion Dam. Native riparian habitat in this reach is limited by the highly regulated river and the active floodplain is narrowed by a railroad grade, roads, or steep canyon walls. Overbank flooding rarely occurs in this reach and much of the riparian habitat is perched above the river channel. Saltcedar, in various age classes, dominates the riparian community and ranges from narrow bands along the river bank to larger patches where the active floodplain is not as constricted. Much of this habitat is not suitable for breeding YBCUs. The 2016 habitat classification study documented 8.5 ha of suitable YBCU habitat in this reach, composed of willows and saltcedar (Moore and Ahlers 2016). Reclamation, USIBWC, and other cooperators have initiated, or plan to implement, riparian restoration activities at several sites in this reach. The entire reach is surveyed in two segments (Selden Canyon and Radium Springs).

The Las Cruces Reach extends 20 miles from Leasburg Diversion Dam downstream to Mesilla Diversion Dam. The active floodplain is tightly restricted in most areas by levees. Periodic mowing of the riparian area has reduced the establishment of vegetation along most of this reach. There are several active USIBWC restoration sites within this reach, but more than half of this reach is devoid of any significant riparian vegetation. Most of the riparian vegetation present consists of very narrow (less than 10 m wide) bands of saltcedar, coyote willow or mixed native and non-native species. Wider patches of saltcedar of mixed age classes are also present, but cover less than seven ha of the reach and were considered unsuitable in the 2016 habitat classification study (Moore and Ahlers 2016). The lack of habitat, noted since 2014, precluded any surveys being conducted until 2017, when a 10.5 km stretch of river downstream of Radium Springs was surveyed (LD-01).

The Mesilla Reach is the longest in the study area and encompasses approximately 40 river miles of the Rio Grande between Las Cruces, New Mexico and El Paso, Texas. Riparian habitat within much of this reach is either absent or limited due to a highly regulated river, extensive mowing, and an incised river channel. When woody vegetation does occur it is generally limited to narrow strips of saltcedar or coyote willow within the channel prism of the Rio Grande. Evaluation by Reclamation biologists found no potentially suitable habitat in this reach and cuckoo surveys were not conducted prior to 2017. In order to ensure project compliance and thorough survey coverage, several vegetated patches were surveyed in 2017 in select sites (ELLA-02 to ELLA-05). Several sites within this reach are either slated for or undergoing riparian restoration by USIBWC.

Presence/Absence Surveys

All reaches were surveyed using methodology outlined in the Final Draft of the 2016 Cuckoo Natural History Summary and Survey Protocol (Halterman et al. 2016). This methodology has been in use since surveys were initiated in the Lower Rio Grande in 2014. It specifies 4 surveys conducted at least 12 days apart within 3 survey periods, as shown in Figure 4. The start and end dates of survey period two may be moved up to three days earlier or later to accommodate survey logistics. All surveyors are required to attend protocol training prior to conducting formal surveys.

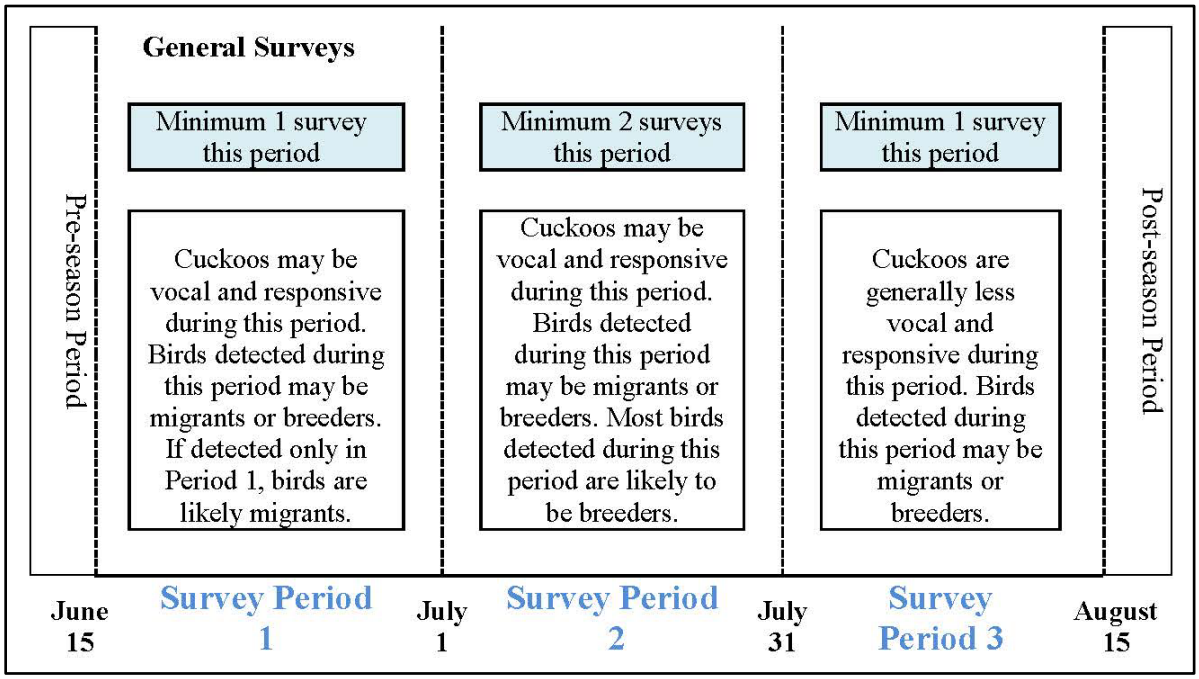

Figure 4. YBCU survey periods based on Halterman et al. (2016).

Using the repeated call-playback method, surveyors move through all suitable habitat within their designated survey site, playing the recorded "*kowlp*" call every 100 m. At each playback location, the call is played for 20 to 30 seconds followed by a 1 minute pause for detection of responses by YBCUs. This procedure is repeated five times, or until a YBCU response is detected. If no response is detected, surveyors move another 100 m and repeat the call/pause sequence. If a response is heard,

the observer stops playback, records their observations, and repeats the procedure again at 300 m to reduce the potential for duplicate counting of individuals.

All four surveys are conducted within the YBCU resident period, June 15 through August 15, and therefore all detections are assumed to be those of resident paired or unpaired cuckoos. A detection is defined as the presence of a YBCU during any survey period. A single individual may have multiple detections over the season. Multiple surveys were conducted to increase the likelihood of detections, the probability of positively identifying occupied locations during the breeding season, and aid in the determination of breeding status. A test of the survey protocol, detailed in Carstensen et al. (2015), found that 98 percent of occupied locations and 90 percent of individuals would be positively identified with the four-survey protocol. Survey data were recorded on field forms that were subsequently transferred to electronic survey forms developed by Reclamation, as well as to a digital spreadsheet and GIS database. The actual location of the detected cuckoo was derived based on the surveyor's location, compass bearing, and an estimated distance to the detected YBCU.

Data recorded when a YBCU was detected included the following:

- Detection time
- Detection type (aural, visual, or both)
- Call type ('*kowlp*', '*coo'*, or *Other* - including '*knocker*')
- Playback number at time of detection
- UTM (NAD83) coordinates of the surveyor, and estimated bearing and distance to YBCU
- GPS accuracy when detected YBCU waypoint was taken
- Relevant comments (e.g. observed breeding activity, vegetation types, hydrology, etc.)

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 individual surveys was established to minimize the likelihood of detecting migrating cuckoos. A YBCU "detection" is a confirmation of an individual within a site. However, the determination of breeding pairs is considered an estimation. A breeding territory is loosely defined as a breeding unit of YBCUs, generally comprised of a male and female, but may also include a "helper" male. A breeding territory is composed of two or more distinct YBCU detections and can be considered a possible, probable or confirmed breeding territory as defined in Halterman et al. (2016).

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. 2008).
2) Both males and females vocalize – making coo, kowlp, and knocker calls - and therefore cannot be differentiated by call.
3) YBCUs have large, undefended territories and can travel >500 m/day or >3 km during the breeding season based on telemetry data (Sechrist et al. 2009).
4) Since YBCU territories are undefended they can overlap, allowing for habitat use by multiple breeding pairs of YBCUs.

5) Actual YBCU locations are calculated based on surveyor UTM coordinates, distance, and compass bearing, all of which have inherent estimation errors.
6) Surveys conducted later in the breeding season (i.e., Surveys 3 and 4) could detect hatch year fledglings that have dispersed from the nest site into surrounding areas; resulting in an overestimation of breeding pairs based on detections.

Prior to 2009, territory estimation methodology was developed by Reclamation based on a standardized technique of grouping YBCU detections within a fixed 500 m radius using GIS analysis (Johanson et al. 2008). This technique allowed for a very consistent and repeatable estimation of YBCU territories, but 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 this technique, new rules were established in 2009 to improve the estimation of breeding YBCU territories and these rules align with the methods delineated in the YBCU Survey Protocol Final Draft (Halterman et al. 2016).

The following rules are used to estimate breeding YBCU territories based on survey detections:

1) A YBCU territory MUST have a minimum of 2 detections less than 500 m apart during at least 2 surveys (Example 1, Figure 5). If these conditions are not met, the detections are not considered to be part of a breeding territory, but rather to be floater detections.
2) No more than 3 detections within 300 m during the same survey period can be included within a single YBCU territory. More than 3 YBCU detections during the same survey period in an area less than 300 m apart suggests multiple breeding territories (Example 2, Figure 5).
3) YBCU clumping patterns should 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 (Example 3, Figure 5).
4) Although YBCU territories can overlap, “natural breaks” between detection clumps, regardless of distance, should be considered when delineating territories (Example 4, Figure 5).
5) “Best biological judgment” 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.

A center point for each grouping of detections believed to be a territory was created to establish the territory center. These center points are used to generate a GIS layer to estimate habitat utilization.

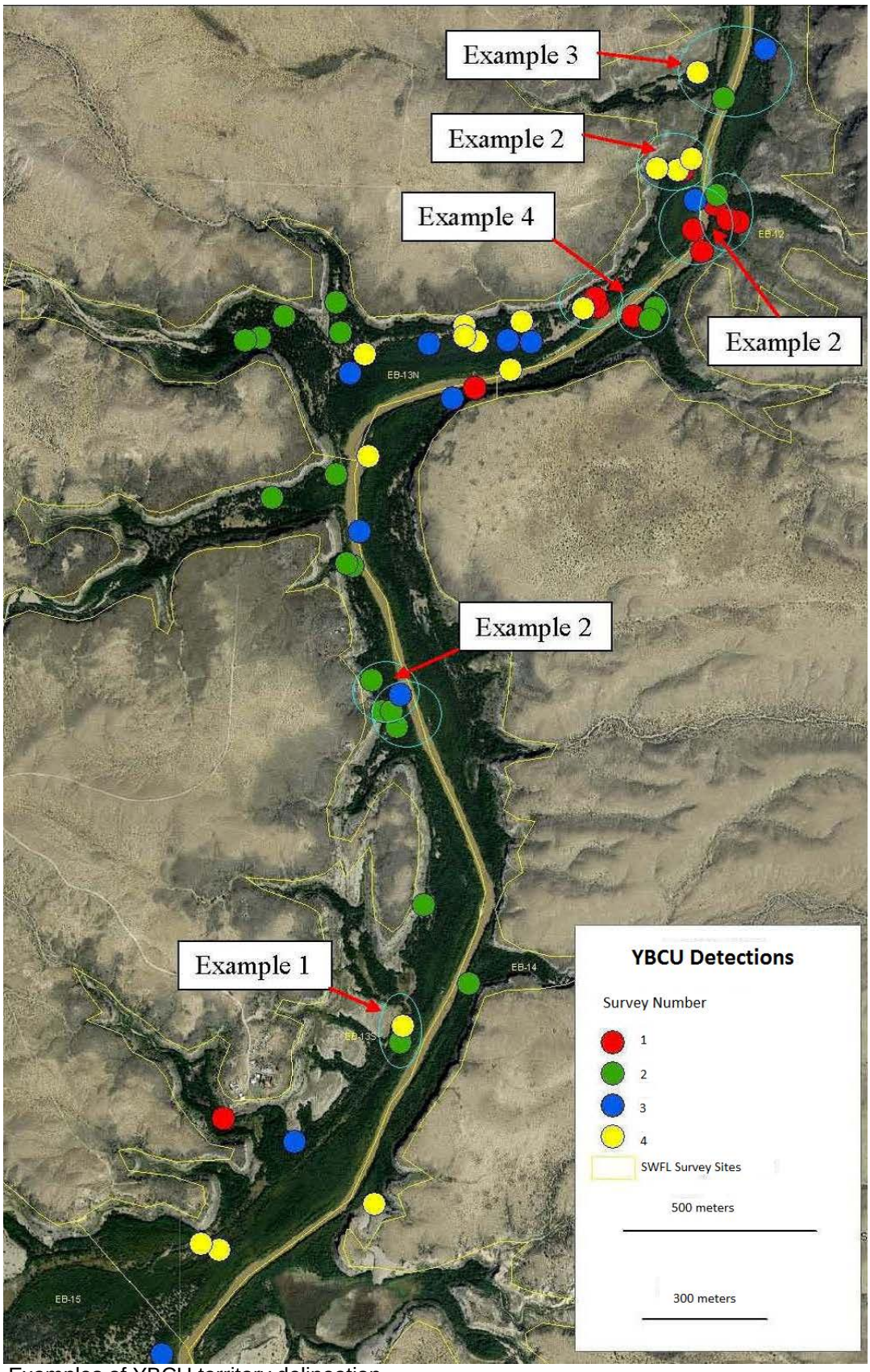

Figure 5. Examples of YBCU territory delineation.

Habitat Utilization

The Caballo Reservoir Delta was mapped and delineated into Hink and Ohmart (1984) habitat types in the summer of 2014 (Siegle and Ahlers 2015). Two methods of analysis were used to quantify habitat utilization and identify potential habitat preferences for cuckoos breeding in the Caballo Reach. The first was based on the major habitat community type where each individual was detected, while the second was based on the habitat encompassing their estimated core use area (i.e. home range or territory center). All detections and territories within the Caballo Reach between 2014 and 2017 were used for both analyses. Delineated Hink and Ohmart (1984) habitat types were grouped into major vegetation community classes (Table 1). The only habitat categories included in the analysis were those that included woody vegetation species (defined as native or exotic). Categories such as marsh, open water, road, railroad and upland were considered non-essential or non-use areas and were excluded. Major vegetation community types were delineated based on their canopy and understory vegetation; canopy consists of woody vegetation taller than 5 m and understory consists of woody vegetation shorter than 5 m. Availability was quantified by the hectares of each vegetation community type mapped within the survey sites themselves. The two methods used to determine habitat utilization include:

1) Detection distribution
   The location of all cuckoo detections and their associated habitat types were used to assess habitat use in general. Using GIS, the detection points were overlaid onto the major plant community layer to determine which types of habitat were occupied. The distribution of detection points within the major community types was then analyzed. These points and associated habitat types were evaluated to determine habitat use at the time of the detection (Figure 6A).

2) Territory composition
   Core use areas were determined by establishing a 150 m radius circle (7.1 ha) around the territory center point, which is equal to the 50 percent kernel home range determined by a 2 year radio telemetry study conducted in the Middle Rio Grande Study Area (Sechrist et al. 2009). The major vegetation community types utilized by cuckoos in core use areas were determined by calculating the percent area covered by each community type within a 150 m radius circle of a territory center (Figure 6B).

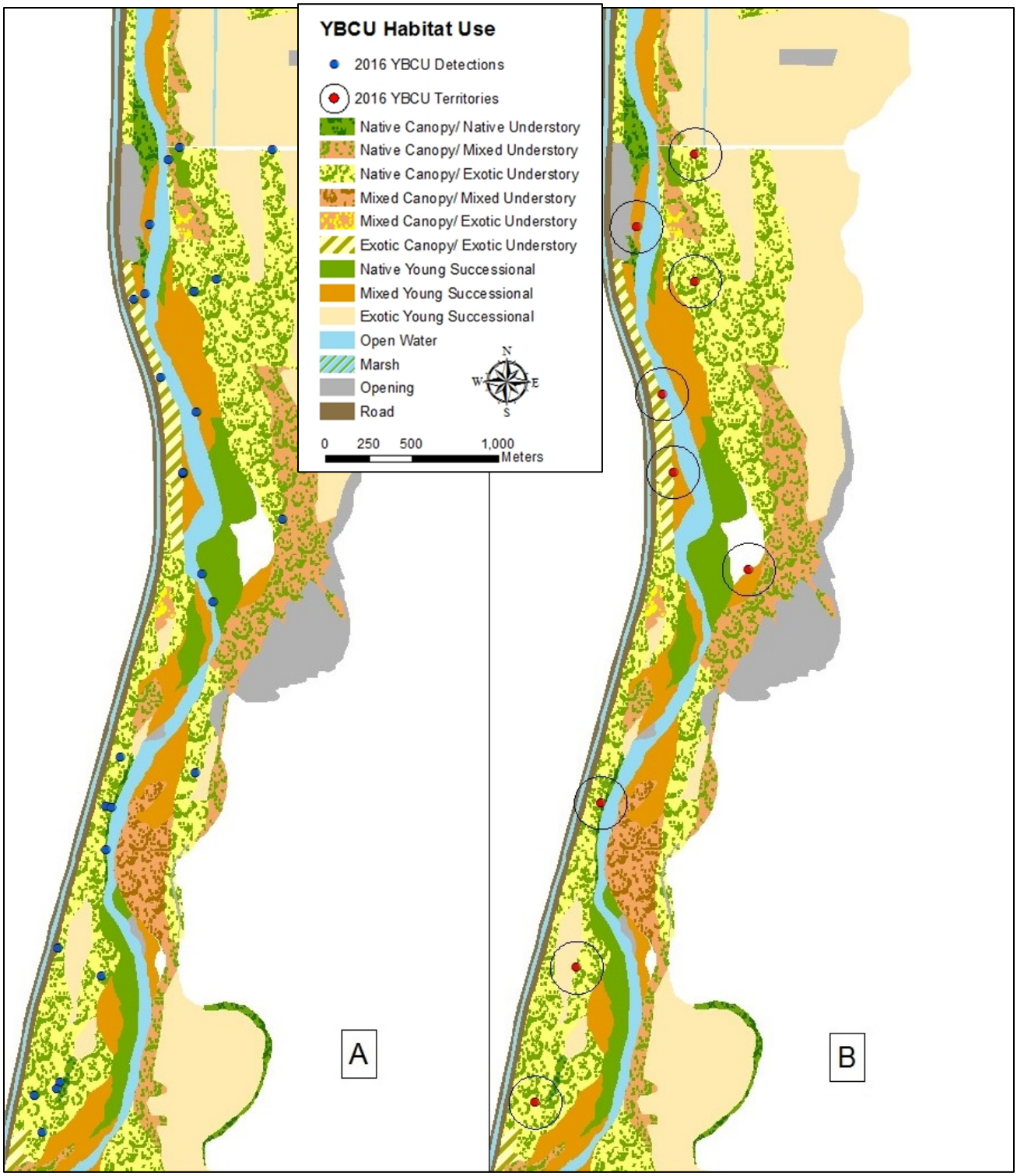

Figure 6. Illustration of methods used to quantify habitat use based on YBCU detections (A) and territories (B).

Nesting Habitat Evaluation

Without radio telemetry, nest discovery is difficult due to the large home range of individual YBCUs, the height at which nests are constructed and the secretive nature of the birds. Therefore, nest searching and monitoring efforts were limited, and focused upon small habitat patches with multiple YBCU detections. If an active YBCU nest was located, it was monitored to determine nest fate. After the territory was vacated by the breeding cuckoos, a vegetation survey was conducted. A 50 m tape was stretched in each of the 4 cardinal directions from the nest tree. Canopy cover was measured using the line-intersect method and included any woody vegetation over a meter tall. Cover was measured by noting the start and end points of each woody species, but since species can overlap along a transect, the sum of cover for all species does not necessarily reflect total overstory cover across the tape. Total overstory cover was also calculated using the amount of uncovered tape. For each section of tape where a species was measured, height for that portion was determined by measuring the tallest shrub or tree in that clump. Canopy cover was also estimated using a denisometer by taking 4 readings at 0, 25 and 50 m from the central point along the tape. The four readings at each point were averaged to get one value per point, or three values per transect, which were then averaged to estimate mean percent canopy cover.

Results

Presence/Absence Surveys

During the 2017 breeding season, 110 YBCU detections were documented within the Lower Rio Grande study area (Table 2; Figures 7 through 14). The detections represented 28 delineated territories, of which, by definition, 15 are probable breeding pairs, 12 are possible breeding pairs, and 1 is a confirmed breeding pair. As in previous years, the majority of detections and territories were located in the Caballo Reach.

Table 2. Number and percentage of YBCU detections and territories by river reach in 2017 within the Lower Rio Grande Study Area.

River Reach	YBCU Detections		YBCU Territories	
	Number of Detections	Percentage of Total Detections	Number of Territories	Percentage of Total Territories
Caballo	64	58%	16	57%
Percha	8	7%	2	7%
Hatch	11	10%	1	4%
Rincon Valley	8	7%	2	7%
Radium Springs	10	9%	4	14%
Las Cruces	9	9%	3	11%
Mesilla	0	0%	0	0%
Totals	**110**	**100%**	**28**	**100%**

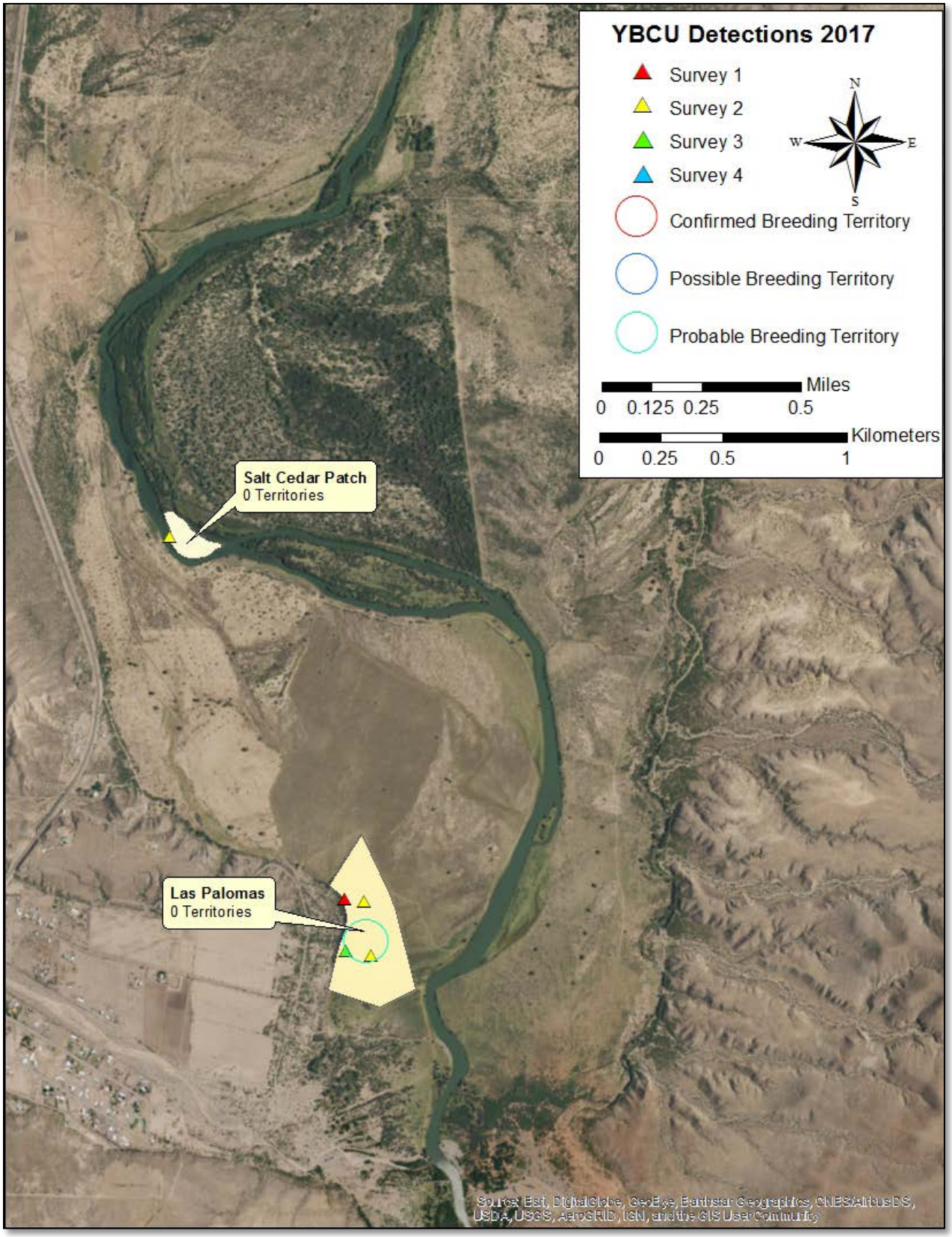

Figure 7. Overview of survey sites and YBCU detections in the north half of the Caballo Reach 2017.

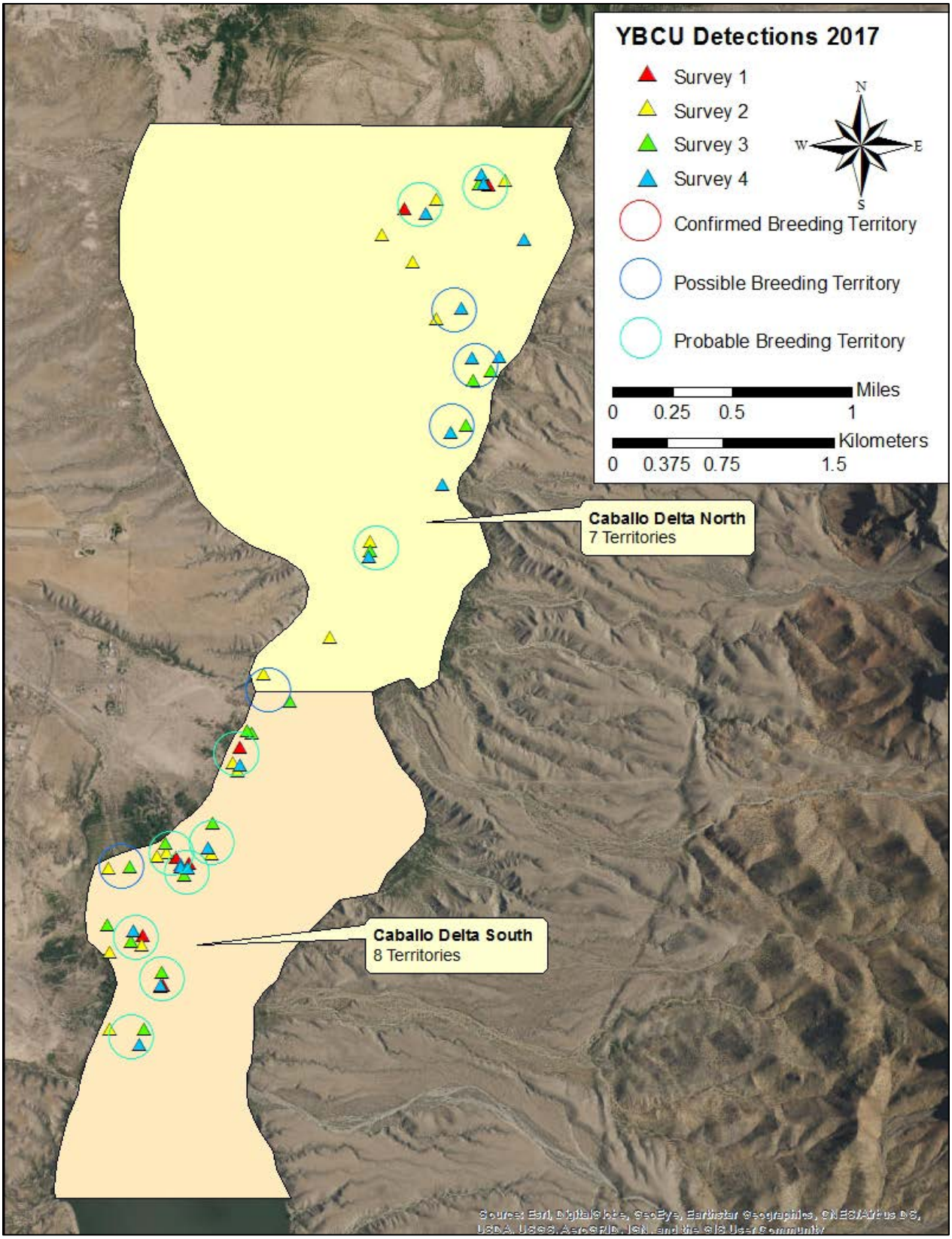

Figure 8. Overview of survey sites and YBCU detections within the southern half of the Caballo Reach 2017.

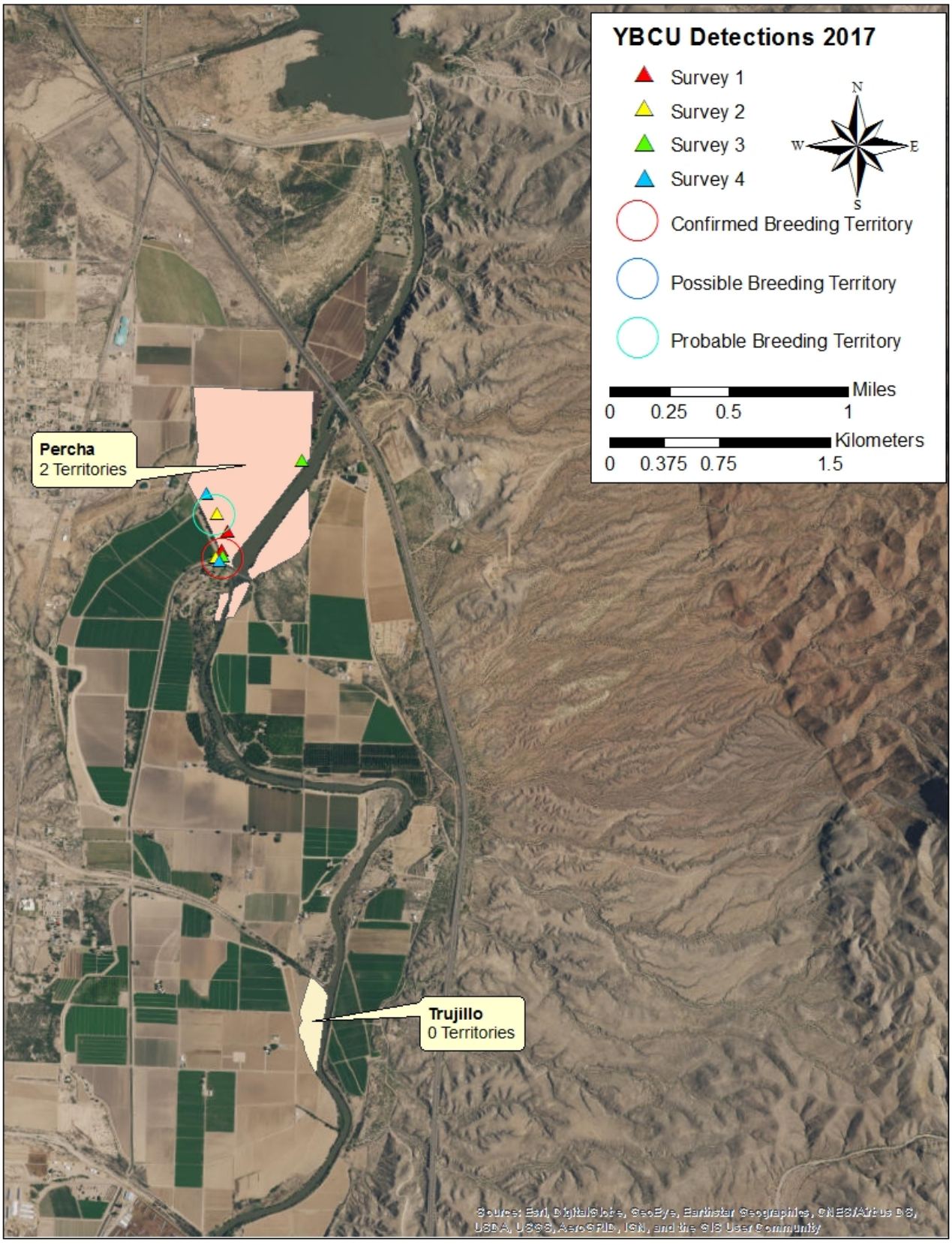

Figure 9. Overview of survey sites and YBCU detections within the Percha Reach in 2017.

Figure 10. Overview of survey sites and YBCU detections within the Hatch Reach in 2017.

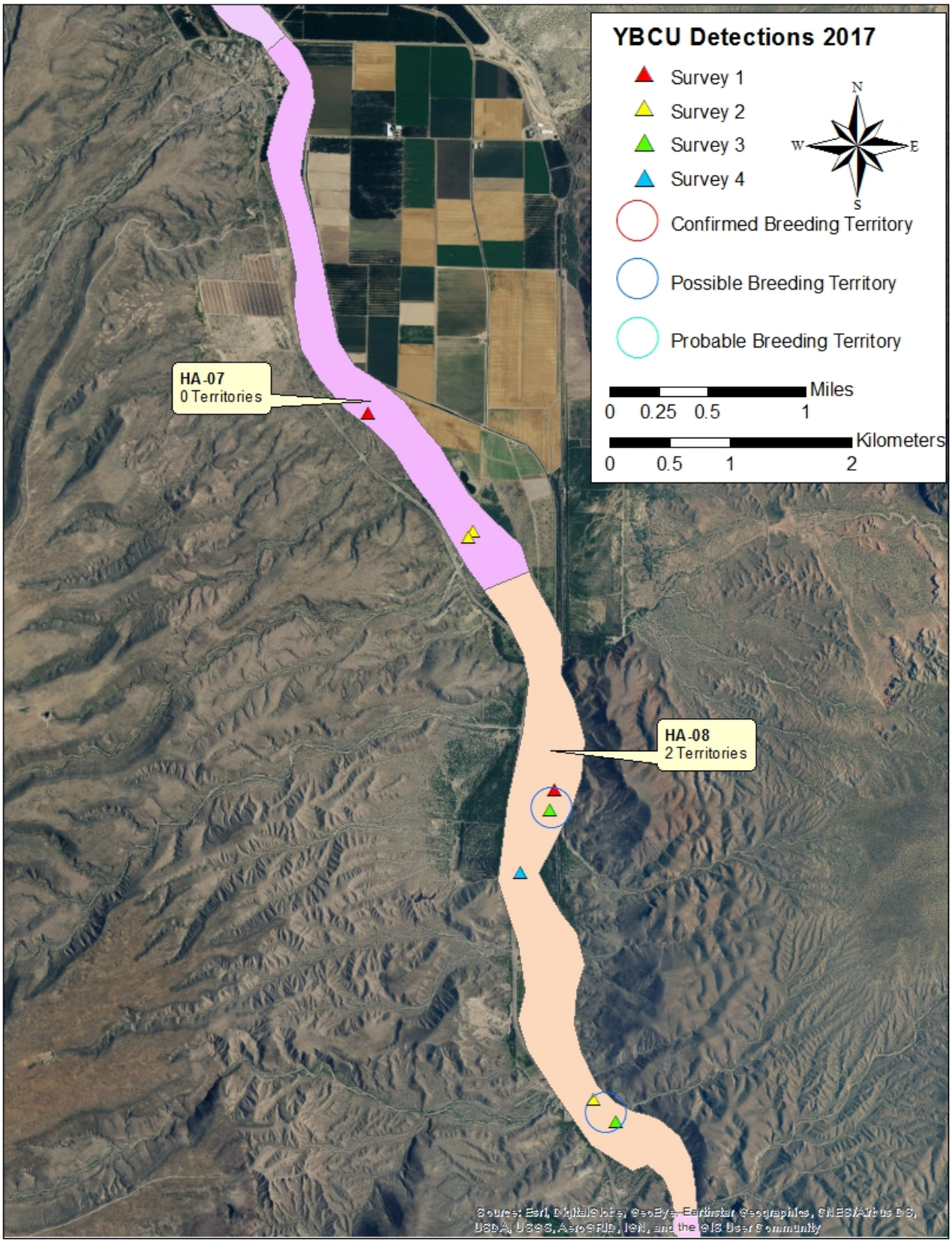

Figure 11. Overview of survey sites and YBCU detections within the Rincon Valley Reach in 2017.

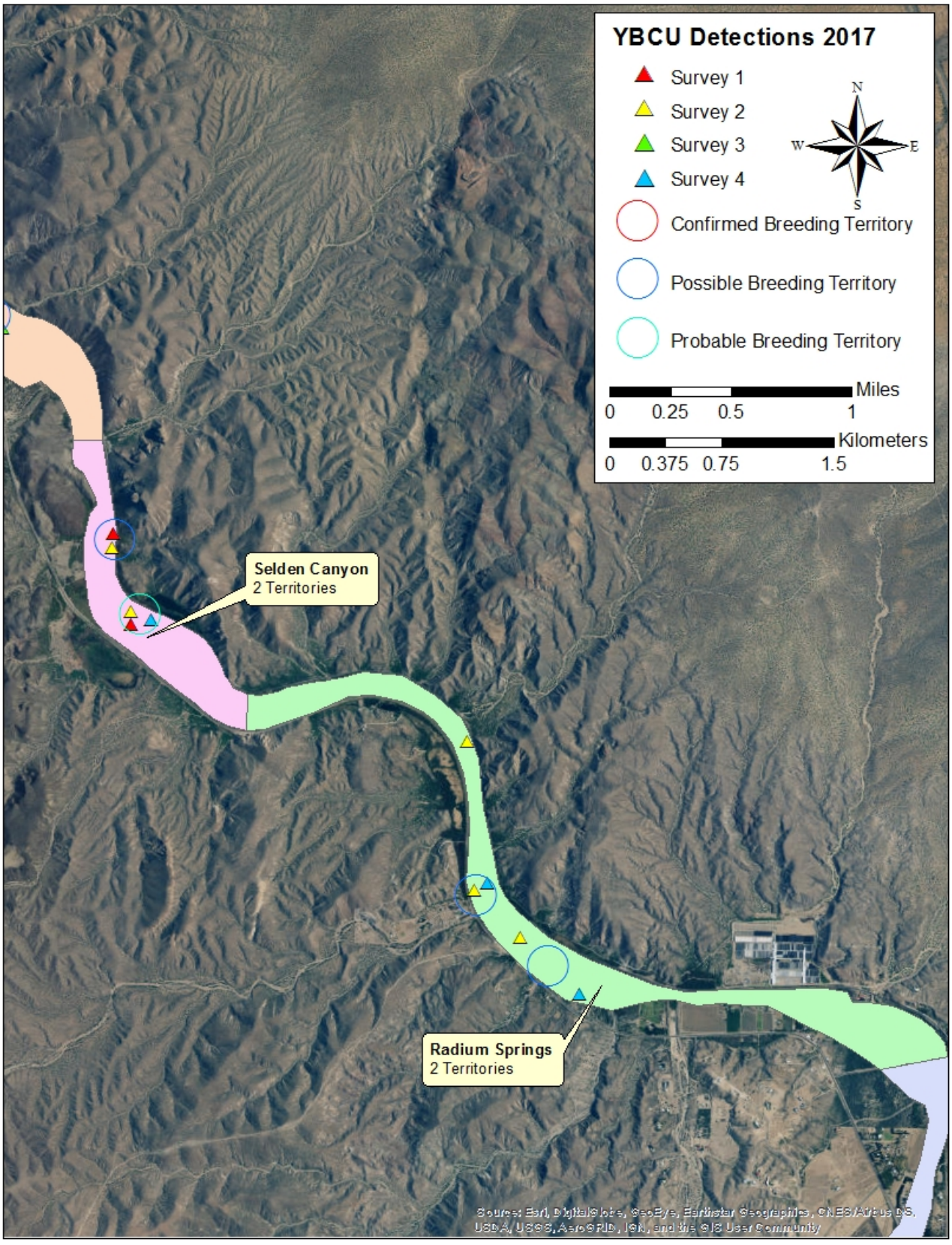

Figure 12. Overview of survey sites and YBCU detections within the Radium Springs Reach in 2017.

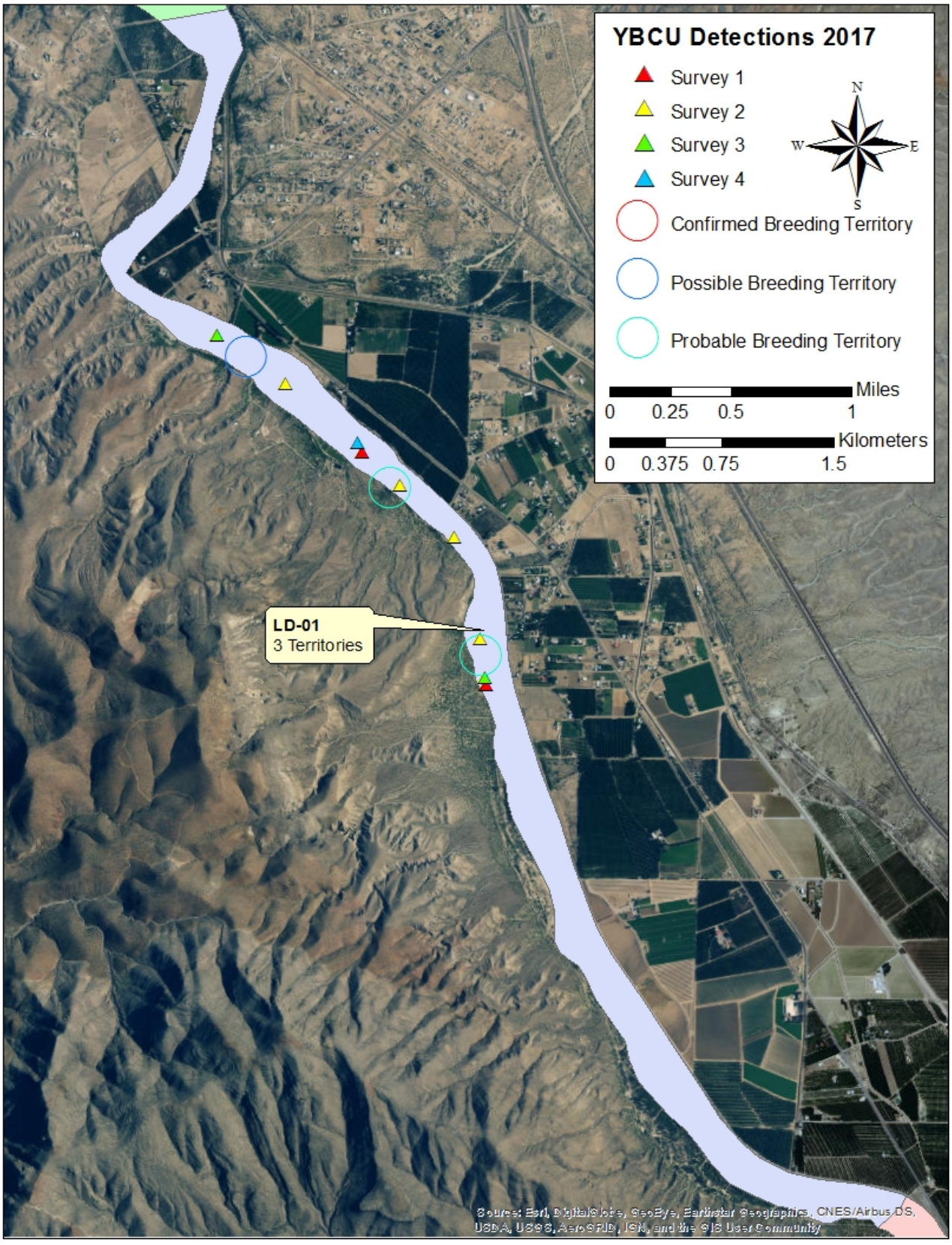

Figure 13. Overview of survey sites and YBCU detections within the Las Cruces Reach in 2017.

Figure 14. Overview of survey sites and YBCU detections within the Mesilla Reach in 2017

Habitat Utilization

In order to maximize sample sizes, habitat utilization analyses were performed on all detections and territories from 2014 to 2017 rather than 2017 alone. Results of these analyses are presented in the discussion section.

Nesting Habitat Evaluation

Formal nest searches were limited within the Lower Rio Grande and were primarily directed at following up on groups of detections located in more isolated patches of habitat. One active nest was discovered within the Percha survey site in August. The nest was 5.4 m off the ground in a saltcedar, less than 50 m from both open water and a paved road. A group of fledglings were also detected in close proximity to the active nest but it is unclear if they were offspring of the same or an adjacent pair. After the territory had been vacated, Reclamation biologists conducted a brief vegetation survey. Woody vegetation (trees and shrubs) measured within a 50 m radius of the nest tree was dominated by mesquite (*Prosopsis* sp.), wolfberry (*Lycium torreyi*), saltcedar and cottonwood (Table 3). The estimated canopy cover within a 50 m radius of the nest was between 67 and 73 percent, depending on the method being used (Table 4).

Table 3. Vegetation Species Composition Surrounding YBCU Nest (n=1)

Species	Percent of Transects Covered	Average Height
Honey Mesquite	5.4%	4.2 m
Screwbean Mesquite	15.5%	6.4 m
Wolfberry	18.1%	1.7 m
Saltcedar	14.7%	5.7 m
Cottonwood	14.2%	11.9 m
Elm	11.1%	10.0 m
Rabbitbrush	0.5%	1.2 m

Table 4. Estimated Percent Canopy Cover Surrounding YBCU Nest (n=1)

Direction	Estimated Percent Cover by Densiometer	Percent Canopy Cover by Line Intercept
North	64.6%	79.6%
East	97.6%	76.2%
South	63.3%	57.2%
West	67.9%	58.0%
Total	**73.3%**	**67.8%**

Discussion

Presence/Absence Surveys

The YBCU has declined in abundance throughout the Western U.S. largely due to habitat loss and degradation. In November 2014, the YBCU was listed as threatened under the ESA (USFWS 2014). Historical data show that the species was once relatively common along the Rio Grande (Bailey 1928, Howe 1986). Prior to 2014, formal cuckoo surveys had not been conducted along the Lower Rio Grande. All detections documented during 2012 and 2013 along the Lower Rio Grande were incidental, and USIBWC occasionally detected cuckoos during isolated surveys conducted near restoration areas in 2010-2011 (Table 5). These detections confirmed the presence of cuckoos within the Lower Rio Grande and supported the need for formal surveys.

Table 5. Number of YBCU detections and territories by river reach from 2012 to 2017 within the Lower Rio Grande Study Area.

	YBCU Detections/ Territories					
River Reach	**2012***	**2013***	**2014**	**2015**	**2016**	**2017**
Caballo	5/ NA	12/ NA	28/ 8	48/ 15	62/ 15	64/ 16
Percha	0/ NA	0/ NA	0/ 0	1/ 0	3/ 1	8/ 2
Hatch	0/ NA	1/ NA	0/ 0	4/ 1	6/ 2	11/ 1
Rincon Valley	NS	NS	NS	NS	NS	8/ 2
Radium Springs	0/ NA	2/ NA	8/ 2	10/ 4	16/ 6	10/ 4
Las Cruces	NS	NS	NS	NS	NS	9/ 3
Mesilla	NS	NS	NS	NS	NS	0/0
Total	**5/ NA**	**15/ NA**	**36/ 10**	**63/ 20**	**87/ 24**	**110/ 28**

* 2012 and 2013 results are considered incidental detections and are not comparable to 2014 through 2017 data. NA = not available (not delineated) NS = not surveyed.

Since the initiation of formal surveys in the Lower Rio Grande study area, detections and territories have generally increased annually (Figures 15 and 16). The greatest increase was observed in the Caballo Reach where detections increased from 28 in 2014 to 64 in 2017, while territories doubled from 8 to 16. In Radium Springs, 8 detections comprising 2 territories in 2014 grew to 16 detections comprising 6 territories in 2016. However, in 2017, detections and territories decreased to 10 and 4, respectively. Detections in Percha and Hatch have almost doubled each year, but these reaches still contain less than three territories annually (Table 5; Figures 15 and 16). Nevertheless, breeding at one of these territories was confirmed through discovery of an active nest.

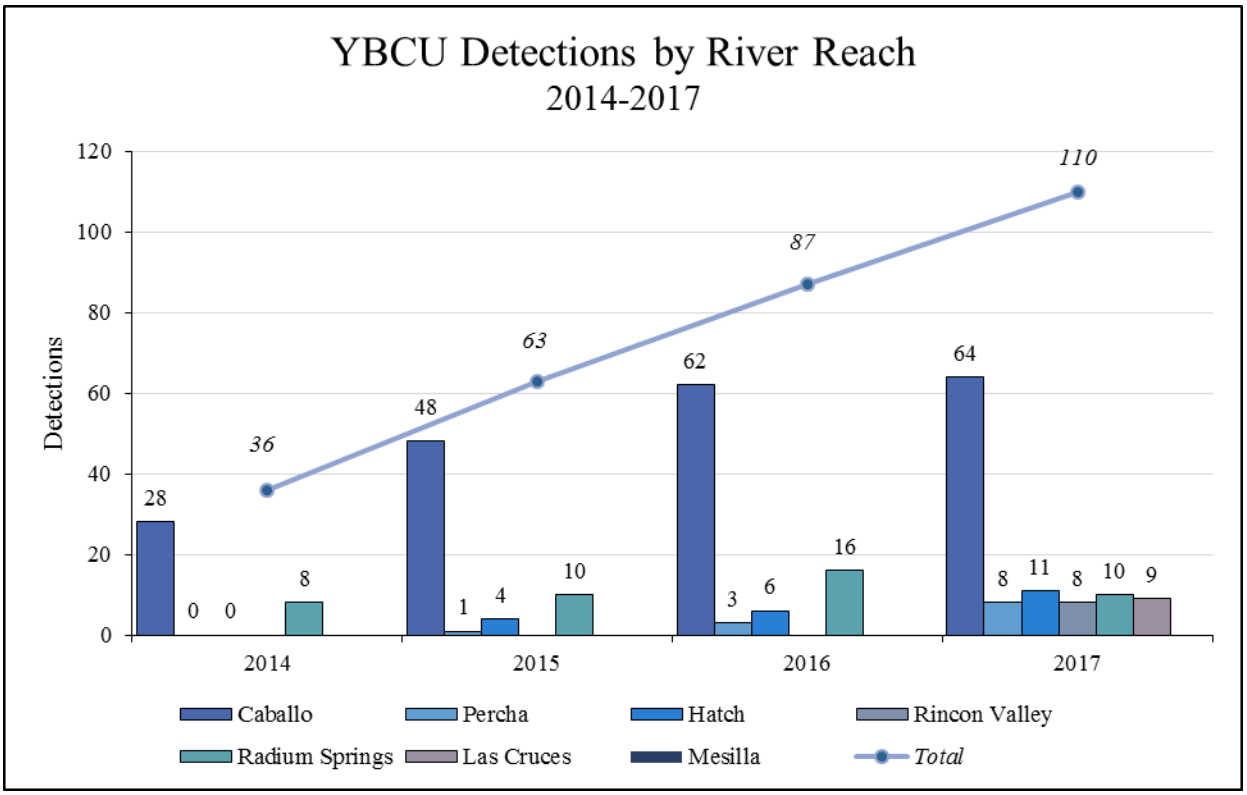

Figure 15. YBCU detections in reaches surveyed 2014-2017.

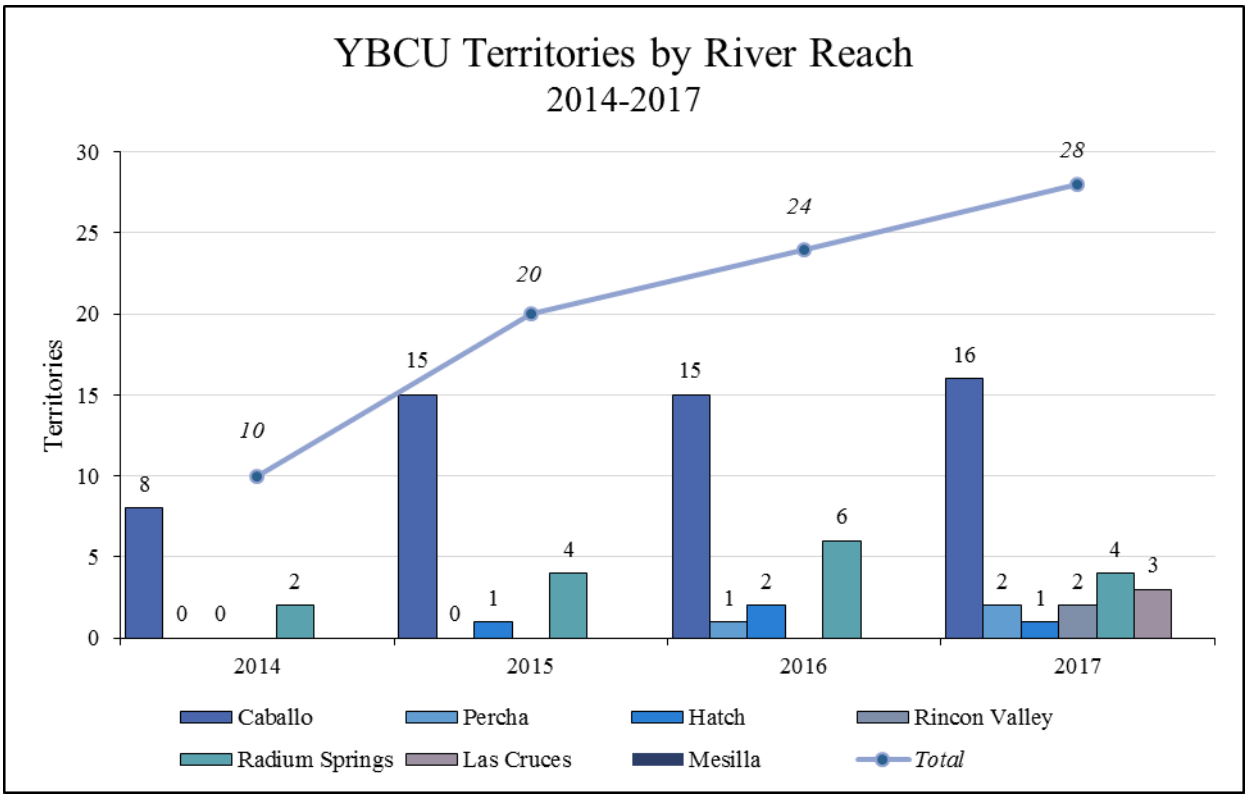

Figure 16. YBCU territories in reaches surveyed 2014-2017.

Formal surveys were conducted within the Rincon Valley, Las Cruces, and Mesilla Reaches for the first time in 2017. These reaches were previously excluded due to limited habitat availability. Eight detections comprising two territories were recorded in the Rincon Valley Reach, despite a predominance of exotic saltcedar. The Las Cruces Reach, just south of the Radium Springs Reach, had nine detections delineated into three territories. These detections justify the continuation of surveys in these reaches. No cuckoos were detected in the Mesilla Reach (Table 5). The following is a reach-by-reach breakdown of YBCU surveys activity and current trends.

The **Caballo Reach** continues to contain the majority of cuckoo detections and territories within the Lower Rio Grande study area. For the last 3 years there have been at least 15 territories within this reach (Figure 16). Most of these are found within the large swaths of highly suitable habitat that have developed in the delta of Caballo Reservoir. This habitat is different from occupied patches downstream due to the wide, unconstrained floodplain, predominately native vegetation, and mesic conditions resulting from a higher water table and fluctuating reservoir level. The quantity of suitable habitat in the reservoir delta will likely continue to increase if these conditions persist into the future. Periodic mowing of riparian vegetation in the Caballo Reservoir delta is the primary limit to habitat expansion in this area. Conversely, riparian habitat upstream of the Caballo Reservoir delta is linear and limited by human activities including levees, roads and agriculture. Vegetation upstream of the Caballo delta is dominated by saltcedar due to the perched nature of the floodplain. In the absence of significant restoration activities, it is unlikely that suitable habitat will develop upstream of the Caballo Reservoir delta in the near future.

The **Percha Reach** contains limited YBCU habitat, but it is the second largest extent of suitable habitat in the Lower Rio Grande after the Caballo Reach. While detections and territories increased this year, they remain low overall (Figures 15 and 16). The majority of riparian habitat is constrained by roads or levees and is perched above the river channel. Native willows and cottonwoods are limited to small strips or patches immediately adjacent to the river where hydrology is more suitable. Most detections occur northwest of the Percha Dam, where there are a few larger patches of habitat. The first territory in this reach was recorded in 2016 and a nesting pair was confirmed in 2017. The Trujillo site further south contains dense growth of coyote willow, but is unlikely to have the structure or vegetation types to attract breeding cuckoos in the near future.

Cuckoos were detected in the **Hatch Reach** for the first time in 2015. Suitable habitat within this reach is limited by a levee-restricted and perched floodplain, and periodic mowing of riparian vegetation. Native vegetation was also negatively impacted by drought conditions between 2011 and 2013. Although some vegetation has begun to recover, only a handful of habitat patches provide the size and structure of riparian habitat necessary for YBCUs. Overbank flooding does occur on lower river bars and islands, which provides the potential for additional habitat development. Detections in 2017 increased compared to previous years, but were widely dispersed throughout the reach and only one territory was delineated.

The **Rincon Valley Reach** was surveyed for the first time in 2017 and is composed primarily of small patches of coyote willow and decadent saltcedar. Despite the apparent lack of suitable habitat, there were several detections scattered in narrow strips of saltcedar and two territories were

delineated. Future surveys are needed to determine the occupation and habitat use of this reach, and to determine whether suitable breeding habitat develops.

The **Radium Springs Reach** has been minimally impacted by human activity, particularly in comparison to the surrounding area, and therefore contains a small amount of suitable YBCU habitat. Relatively large patches of mixed saltcedar and willows have developed in several areas within this reach. There were 10 detections and 4 territories in 2017 and 2015, which is slightly lower than the 6 detected in 2016 (Figure 16). If more suitable habitat develops in this reach as a result of restoration or natural processes, it is possible the population may increase in the future.

The **Las Cruces Reach** was first surveyed in 2017. The potential for suitable habitat is restricted by a perched floodplain that reduces the potential for overbanking. This reach lacks significant woody vegetation and it is unlikely to develop due to mowing and hydrologic conditions. While there were several detections clustered within narrow saltcedar patches, future surveys are needed to determine if sufficient habitat will develop to support breeding pairs.

Also surveyed for the first time in 2017, the **Mesilla Reach** lacks significant riparian habitat aside from small islands within the channel prism. Extensive mowing reduces the amount of woody vegetation on the floodplain and a regulated river limits the potential for overbank flooding and regeneration of native species. These conditions make it unlikely for YBCU habitat to develop in this reach.

During 2017 cuckoo surveys, 24 of 110 YBCU detections (22 percent) were made prior to broadcasting the “kowlp” recording (Table 6). Thirty percent of all detections in the last four years were made prior to playing the broadcast recording. These results emphasize the need for a pre-broadcast listening period when conducting surveys. Between 2014 and 2017, 75 percent of all detections (n=297) 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. Thirty-six percent of all solicited responses (n=208) occurred following the first “kowlp” playback and 79 percent of all solicited responses occurred after the first three “kowlp” playbacks (Table 6). These data suggest that of the YBCUs that do respond to the call-playback, most will do so within the first three “kowlp” playbacks.

Table 6. Summary of YBCU detections per broadcast period, 2014 through 2017.

			Detections per Broadcast Period				
	Detections prior to playback	**Detections using playback**	**Broadcast Period**				
			1	**2**	**3**	**4**	**5**
2014 (n=37)	18	19	6 (32%)	7 (37%)	5 (26%)	1 (5%)	0
2015 (n=63)	19	44	16 (36%)	13 (30%)	9 (20%)	4 (9%)	2 (5%)
2016 (n=87)	28	59	18 (31%)	16 (27%)	6 (10%)	11 (19%)	8 (14%)

2017 (n=110)	24	86	35 (41%)	22 (25%)	12 (14%)	10 (12%)	7 (8%)
Totals (n=297)	**89 (30% of Total)**	**208 (70% of Total)**	**75 (36%)**	**58 (28%)**	**32 (15%)**	**26 (13%)**	**17 (8%)**

Fifty-nine percent of all detections between 2014 and 2017 were made during the second and third survey periods (Table 7) suggesting that the peak of the breeding season, or at least a more vocal period, occurred during the month of July. In most years, the fewest detections occurred during the first survey period. These data indicate that cuckoos are less apt to respond to playback vocalizations during the early portion of their breeding cycle.

Table 7. Summary of YBCU detections per survey period, 2014 through 2017.

	YBCU Detections per Survey Period			
	Survey 1	**Survey 2**	**Survey 3**	**Survey 4**
2014 (n=37)	2 (5%)	16 (43%)	11 (30%)	8 (22%)
2015 (n=63)	9 (14%)	16 (25%)	18 (29%)	20 (32%)
2016 (n=87)	24 (28%)	27 (31%)	21 (24%)	15 (17%)
2017 (n=110)	16 (15%)	40 (36%)	25 (23%)	29 (26%)
Totals (n=297)	**51 (17%)**	**99 (34%)**	**75 (25%)**	**72 (24%)**

Habitat Utilization

Detection Distribution Method

Of the 202 total cuckoo detections documented in the Caballo Reach between 2014 and 2017, 189 were recorded in various habitat types consisting of woody riparian vegetation (Table 8). Thirteen detections were recorded in areas classified as “non-habitat” (e.g. open areas, cattail marsh, etc.) and were excluded from analysis. However, some of the areas designated as marsh have been colonized by young willows since the area was mapped in 2014. Seventy percent of the detections in the Caballo Reach between 2014 and 2017 were located in areas with a native species-dominated canopy (Figure 17). One percent of detections were located in habitat dominated by exotic canopy and there was only one detection in mixed canopy (Table 8). These low percentages likely reflect the scarcity of those habitat types in the Caballo Reach (Table 1). Fifty-six percent of detections were recorded in habitat with only one layer: canopy or understory, with 28 percent of detections in each (Table 8). Seventy-seven percent of detections in habitat with only an understory component, which is defined as woody vegetation less than 5m (15 ft) in the Hink and Ohmart (1984) classification system, were found in mixed understory.

Table 8. Distribution of YBCU detections within the major habitat types of the Caballo Reach, 2014 - 2017.

Major Plant Community Type	Number of YBCU Detections*	Percent Distribution
Native Canopy/Native Understory	32	16.9%
Native Canopy/Exotic Understory	48	25.4%
Native Canopy/Mixed Understory	0	0.0%
Exotic Canopy/Native Understory	1	0.5%
Exotic Canopy/Exotic Understory	1	0.5%
Exotic Canopy/Mixed Understory	0	0%
Mixed Canopy/Native Understory	0	0%
Mixed Canopy/Exotic Understory	0	0%
Mixed Canopy/Mixed Understory	1	0.5%
Native Canopy – No Understory	53	28.1%
Exotic Canopy – No Understory	0	0%
Mixed Canopy – No Understory	0	0%
Native Understory – No Canopy	7	3.7%
Exotic Understory – No Canopy	5	2.7%
Mixed Understory – No Canopy	41	21.7%
TOTAL	**189**	**100%**

* YBCU detections within non-habitat areas were excluded (n=13). Two were open road and 11 were in marsh/open water. Detections less than 20m from habitat were assigned the closest habitat type.

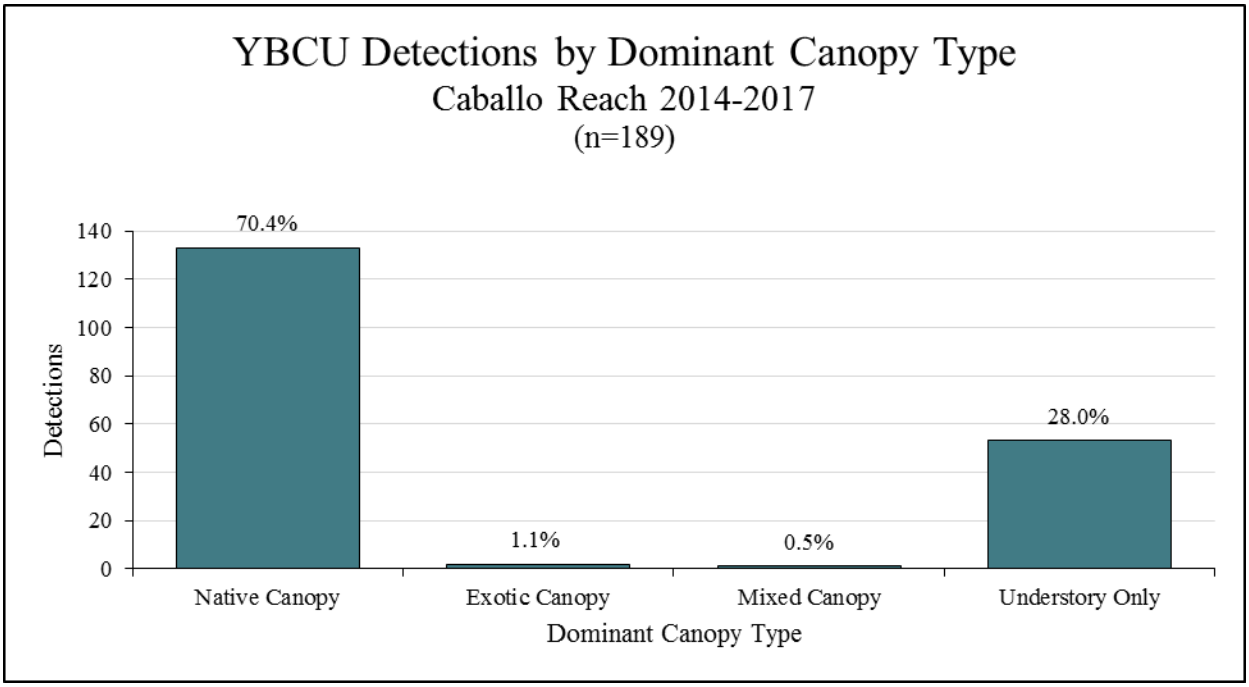

Figure 17. 2014-2017 YBCU detection distribution by dominant canopy type in the Caballo Reach.

Territory Composition Method

Habitat composition of the 54 cuckoo territories delineated in the Caballo Reach between 2014 and 2017 was similar to the distribution of detections, although a much larger proportion of the habitat in territories was composed of vegetation lacking overstory structure than was evident in the distribution of detections. Approximately 131 ha of non-habitat was excluded from analysis with 88 ha consisting of open water or marsh habitat. Vegetation communities with a native species-dominated canopy comprised 54 percent of the area encompassed by cuckoo territories (Table 9, Figure 18, Figure 19a). Forty-five percent of the area encompassed by cuckoo territories contained no overstory vegetation (Figure 19b). Vegetation communities with a mixed native and exotic canopy comprised less than one percent of cuckoo territories, again perhaps reflecting the scarcity of these habitat types in the Caballo Reach (Table 1).

Table 9. Composition of YBCU breeding territories in Caballo Reach by major plant community type, 2014-2017 (n=54).

Major Plant Community Type	Area of Habitat Type* (ha)	Percentage of Territory
Native Canopy/Native Understory	45.5	18.0%
Native Canopy/Exotic Understory	41.3	16.4%
Native Canopy/Mixed Understory	4.2	1.7%
Exotic Canopy/Native Understory	0.2	0.1%
Exotic Canopy/Exotic Understory	0	0%
Exotic Canopy/Mixed Understory	0	0%
Mixed Canopy/Native Understory	0	0%
Mixed Canopy/Exotic Understory	0	0%
Mixed Canopy/Mixed Understory	2.7	1.1%
Native Canopy – No Understory	45.8	18.1%
Exotic Canopy – No Understory	0	0%
Mixed Canopy – No Understory	0	0%
Native Understory – No Canopy	10.5	4.2%
Exotic Understory – No Canopy	9.1	3.6%
Mixed Understory – No Canopy	93.1	36.8%
TOTAL	**252.4**	**100%**

*Area based on 150 m radius circle (7.1 ha) surrounding estimated territory center. 130.9 ha of non-habitat were excluded from analysis (87.8 ha of marsh/open water, 35.1 ha of open/road, and 8 ha of uplands/unmapped).

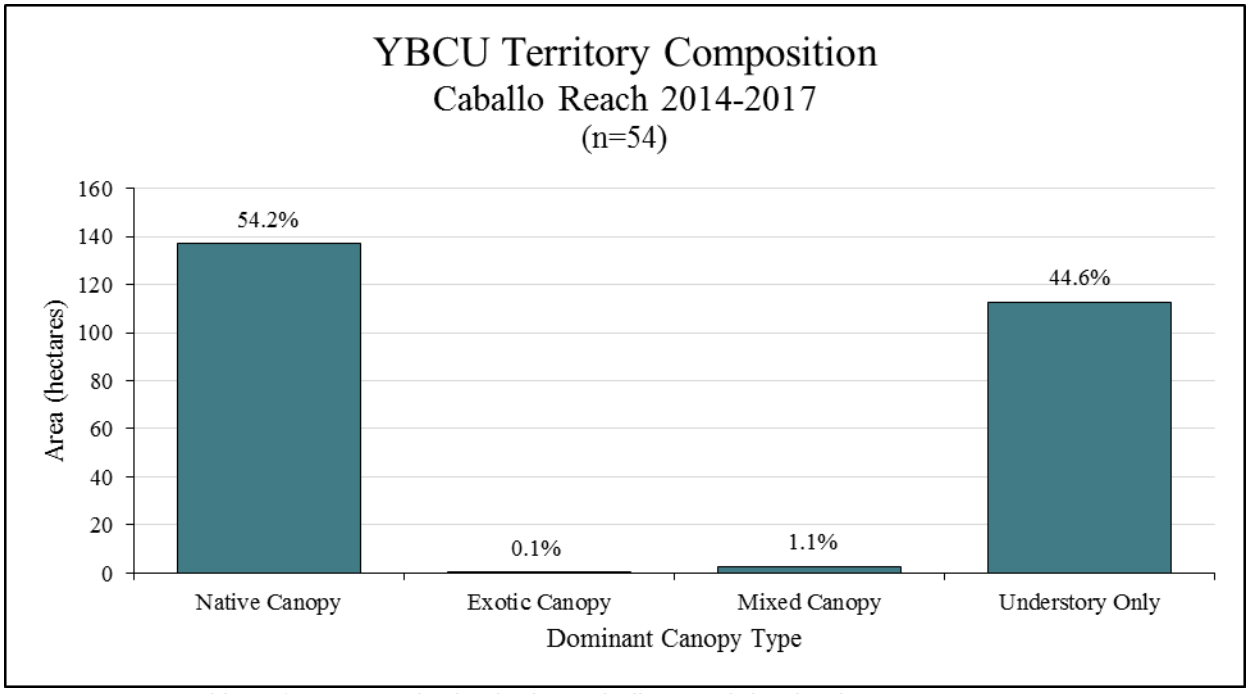

Figure 18. Composition of YBCU territories in the Caballo Reach by dominant canopy type. Non-habitat areas excluded.

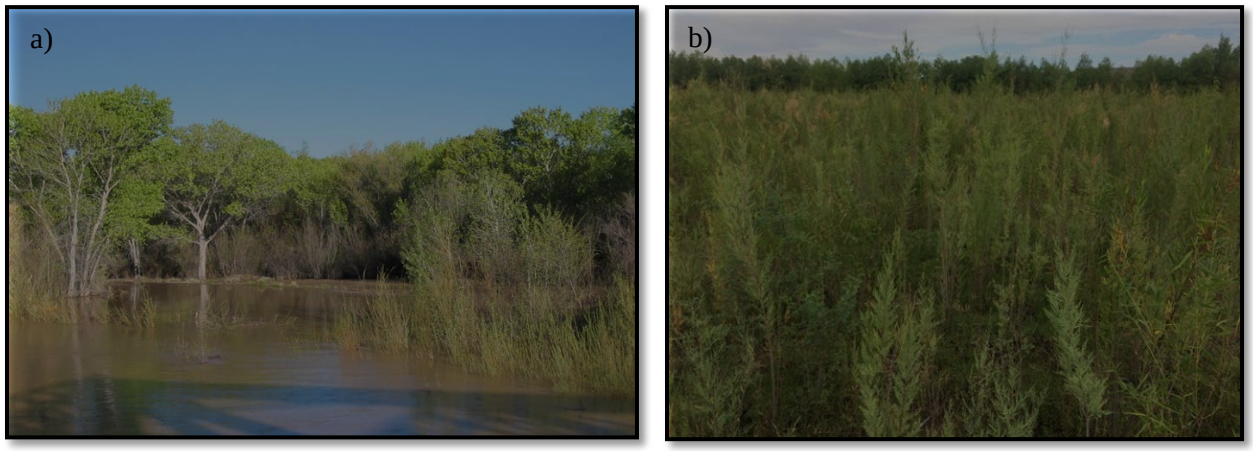

Figure 19. Examples of YBCU native overstory habitat with understory structure (a) and understory-only habitat, likely used primarily for foraging (b).

Territory Composition vs. Availability

The majority of cuckoo detections between 2014 and 2017 were recorded in the Caballo Reach. To compare habitat use with availability, the composition of vegetation communities in delineated territories was compared to those present within the boundaries of the Caballo Reach sites during the 2014 mapping effort (Figures 7 and 8).

Eighty-eight percent of the woody vegetation community types within the Caballo Reach survey sites were understory only communities, primarily mixed native and nonnative stands. Eleven percent were communities with a native canopy component (Table 10).

The three most prevalent overstory community types in both the Caballo survey sites and YBCU territories were native canopy with no understory, native canopy with a native understory and native canopy with an exotic understory. However, while the availability of native canopy with mixed understory was similar to that of native canopy and exotic understory, YBCU territories contained significantly less area of native canopy with a mixed understory (Figure 19).

Table 10. Major vegetation community types* of sites (n=4) surveyed within the Caballo Reach (Adapted from Siegle et al. 2015).

Major Plant Community Type	Area of Habitat Type (ha)	Percentage of Surveyed Area
Native Canopy/Native Understory	20.8	2.7%
Native Canopy/Exotic Understory	16.4	2.1%
Native Canopy/Mixed Understory	15.2	2.0%
Exotic Canopy/Native Understory	0.9	0.1%
Exotic Canopy/Exotic Understory	2.1	0.3%
Exotic Canopy/Mixed Understory	0.0	0.0%
Mixed Canopy/Native Understory	0.0	0.0%
Mixed Canopy/Exotic Understory	0.0	0.0%
Mixed Canopy/Mixed Understory	2.5	0.3%
Native Canopy – No Understory	34.3	4.5%
Exotic Canopy – No Understory	0.3	0.0%
Mixed Canopy – No Understory	0.0	0.0%
Native Understory – No Canopy	131.7	17.2%
Exotic Understory – No Canopy	114.6	15.0%
Mixed Understory – No Canopy	427.0	55.8%
TOTAL	765.8	100.0%

*Vegetation data based on 2011 aerial photography and 2014 ground truthing/classification using modified Hink and Ohmart (1984) method. 526.1 ha of non-habitat was excluded from analysis and included open water (448.1 ha), marsh (22.1 ha) and open/road (55.7 ha).

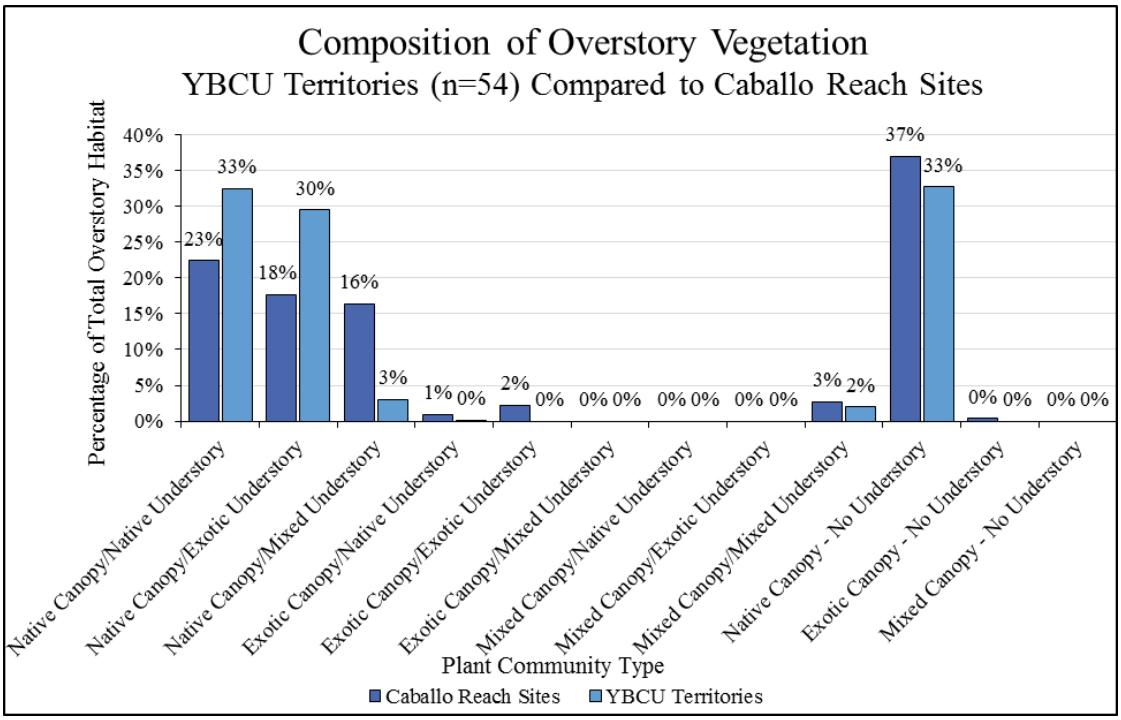

Figure 20. Comparison of overstory vegetation composition in territories from 2014 to 2017 (139.9 ha) vs. total availability within the survey sites of the Caballo Reach as of 2014 (92.5 ha).
NOTE: Only community types with an overstory component were included in the analysis.

Understory communities showed similar trends in use and availability. While mixed understory was the most common understory type within YBCU territories (approximately 48 percent), it also comprised over 60 percent of the Caballo survey sites (Figure 20).

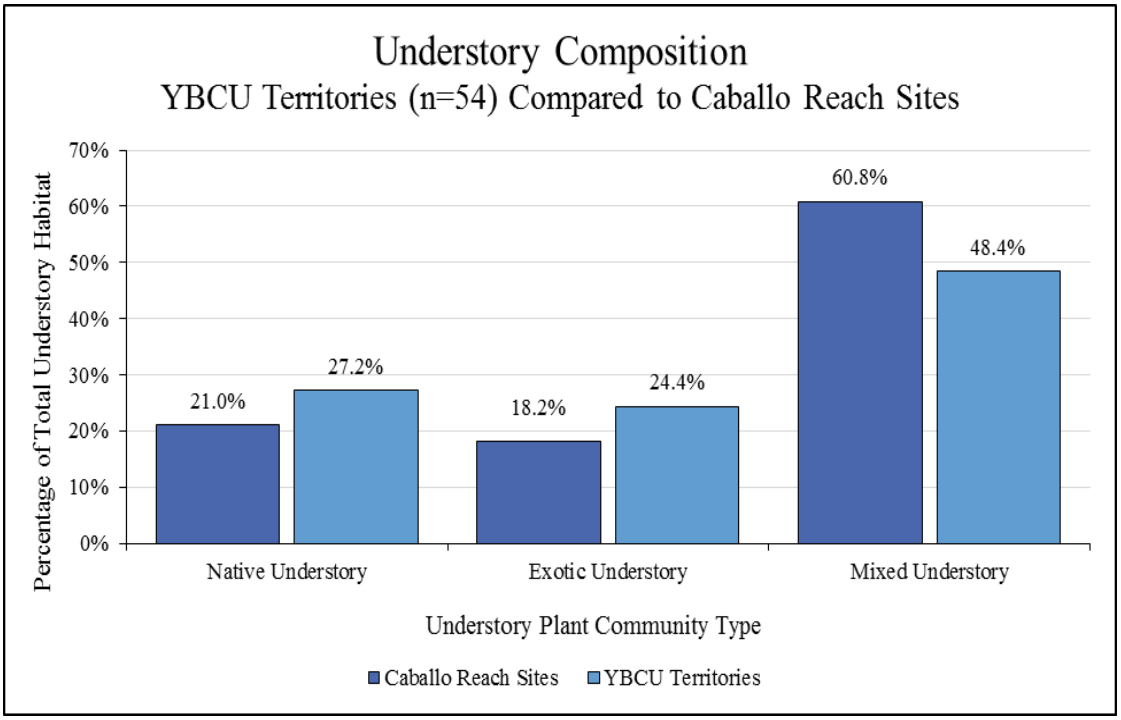

Figure 21. Comparison of understory vegetation in territories from 2014 to 2017 (206.7 ha) vs. total availability within the survey sites of the Caballo Reach as of 2014 (731.3 ha).
NOTE: Only community types with an understory component were included in the analysis.

As expected, YBCU territories showed a preference for native canopy communities. While native canopy communities comprised approximately 11 percent of the available habitat, it comprised approximately 54 percent of YBCU territories. Understory-only communities also comprised a large percentage of YBCU territories, but this may be a result of the prevalence of this vegetation type within the Caballo Reach (Figure 21).

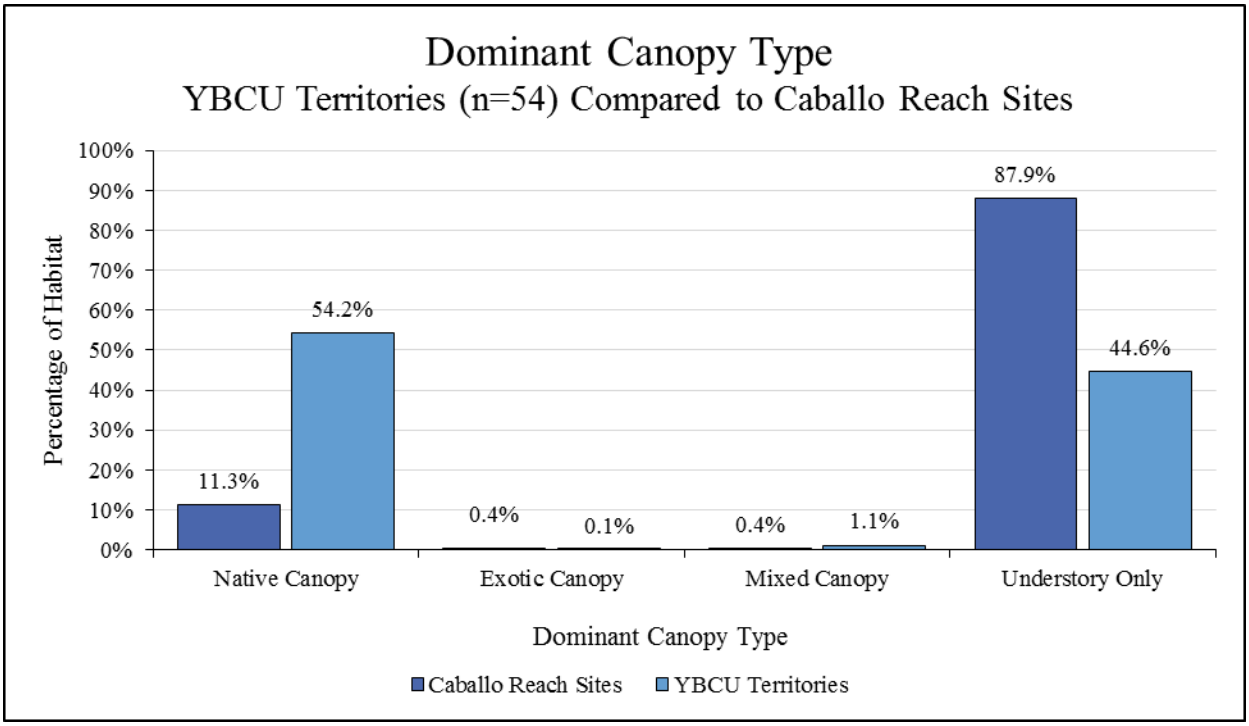

Figure 22. Comparison of dominant canopy vegetation composition between YBCU territories (2014-2017, 206.7 ha) and total availability within survey sites of the Caballo Reach as of 2014 (731.3 ha).

Between 2014 and 2017, nearly 70 percent of YBCU detections in the Caballo Reach were in vegetation communities with a native-dominated canopy, and this community comprised 54 percent of the total estimated area of YBCU territories. Twenty-eight percent of detections were found in understory-only vegetation communities that comprised 45 percent of the total area of estimated YBCU territories (Figures 17 and 18). Although understory vegetation without any overstory structure can provide foraging habitat for cuckoos, it does not provide suitable nesting habitat. Moreover, vegetation communities with only understory vegetation and no overstory component comprise 90 percent of all vegetation communities in the middle and lower Caballo Reservoir Delta (Table 1) and 88 percent of the Caballo Reach sites (Table 10). Given this, it is likely that breeding cuckoos are not truly utilizing the large amount of understory-only vegetation suggested in Figures 17 and 18, and that their actual breeding territory size in the Caballo Delta may be smaller than the 7.1 ha (50 percent kernel home range) territory used for these analyses. Indeed, cuckoo territories are reported to range from 4 to 40 ha in size (Halterman 2001). Further studies, especially radio telemetry or geolocation studies, are required in order to determine true habitat utilization and any preference hierarchy of habitat features.

A comparison of the vegetation composition within Caballo Reach survey sites and within estimated cuckoo breeding territories suggests similar trends—the most common overstory and understory vegetation communities within the Caballo sites are also those most abundant in cuckoo territories. The most striking difference is that although vegetation communities with a native canopy component comprise only 11 percent of the Caballo Reach sites, those communities comprise 54 percent of the area encompassed by cuckoo territories (Figure 21). This observation reaffirms the fact that overstory structure is a requirement for suitable YBCU breeding habitat. When looking at the Caballo Delta sites, it is also apparent that cuckoos return to the same general area year after year, and may be moving into developing habitat (Figure 22). The prevalence of mixed understory vegetation seen in cuckoo territories in the Caballo Delta is absent in the Las Palomas site, where native canopy with native understory comprises most territory centers (Figure 23). Habitat mapping was conducted in 2014 and it is possible that areas of understory-only may be developing into areas with an overstory component and areas lacking substantive woody vegetation may be developing into understory. This may explain the increase of detections within the southern section of Caballo Delta South classified as mixed understory in 2014 (Figure 22).

Defining suitable YBCU breeding habitat within the Lower Rio Grande is also an ongoing process. The vegetation community surrounding the successful nest located in the Percha site was considered atypical breeding habitat - a mixed native and exotic canopy and understory composed primarily of mesquite and saltcedar. However, additional nesting habitat and nest success data are necessary to draw any population-level conclusions of breeding habitat preference or productivity within the Lower Rio Grande.

Caution should be used when interpreting the comparisons between the habitat within territories and that of the Caballo Reach sites or the Caballo Reach as a whole. As previously mentioned, each territory is delineated with a constant shape and area, and may include areas that the cuckoos do not utilize. It is unlikely that territories will be comprised of all suitable habitat, and a YBCU may also be detected in vegetation that is not classified as suitable breeding habitat. Additionally, territories are delineated based on groupings of detection points projected by surveyors, not by the tracking of an individual or the location of a nest. Analysis of availability and utilization based on total area of the reach does not reflect the distribution or continuity of the habitat types within the site or other factors that may influence territory selection. Nevertheless, the overall trends in habitat use and general comparisons between use and availability are still valuable tools in understanding the breeding habitat requirements of this species. Radio telemetry data coupled with more recent and extended vegetation mapping would be invaluable additions to the understanding of nesting and foraging habitat requirements of the YBCU.

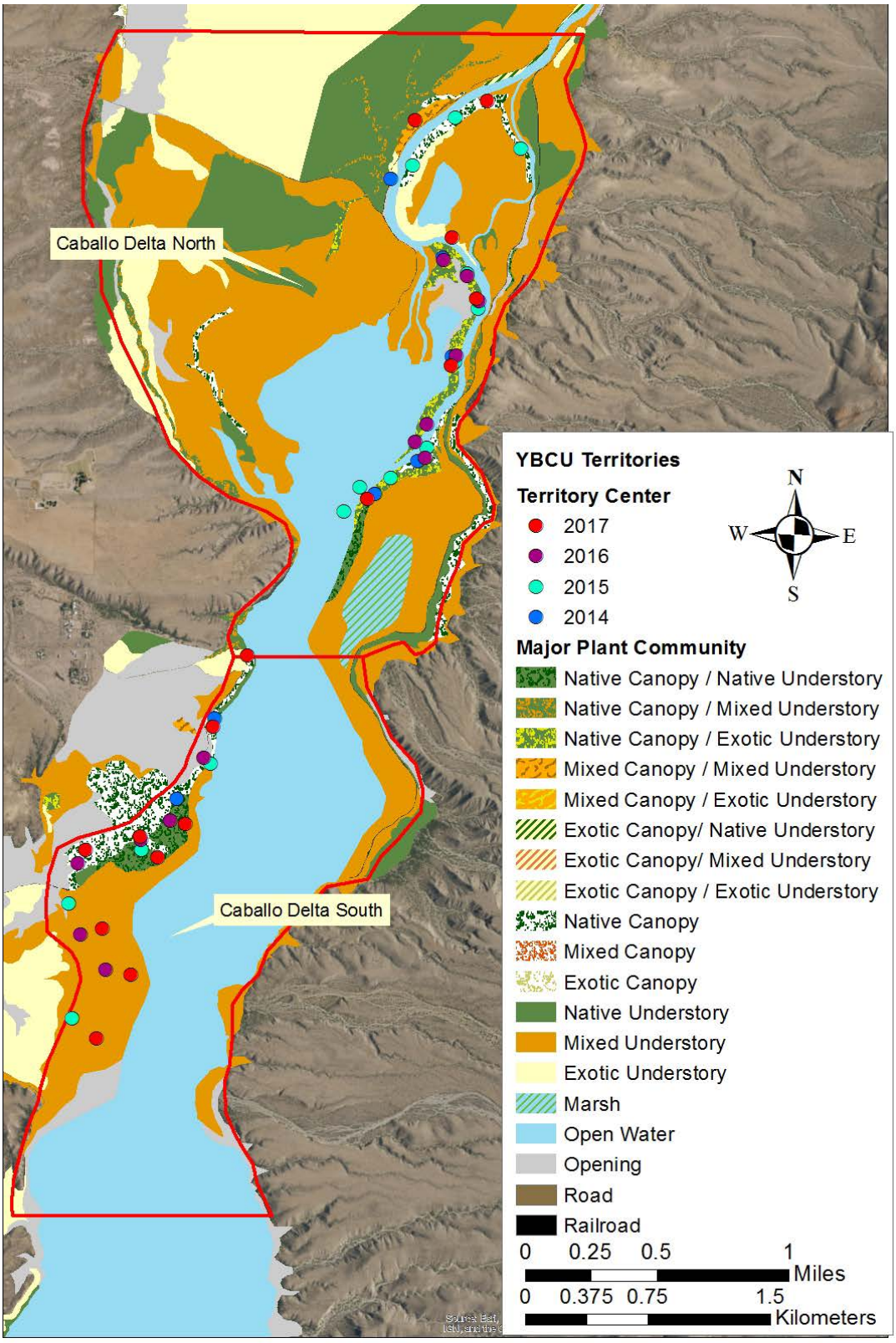

Figure 23. Delineated YBCU territory centers (2014 to 2017) and plant communities in the Caballo Delta sites as mapped in 2014, adapted from Siegle and Ahlers (2015). Habitat utilization analysis only included habitat within site boundaries.

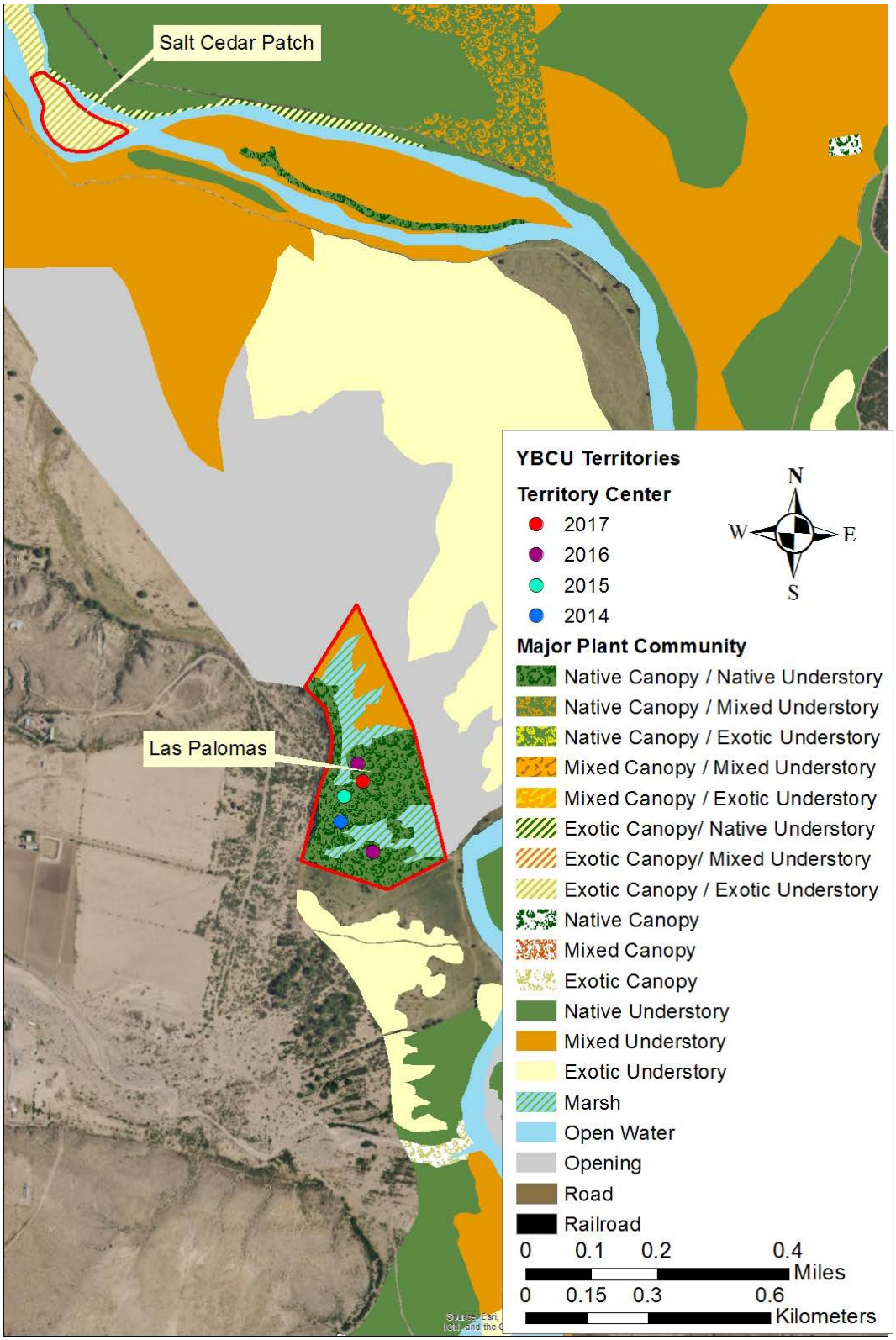

Figure 24. Delineated YBCU territory centers (2014 to 2017) and plant communities in the northern part of the Caballo Reach as mapped in 2014, adapted from Siegle and Ahlers (2015). Habitat utilization analysis only included habitat within site boundaries.

Conclusions

Surveys in the last four years have documented a small and apparently expanding population of cuckoos within the Lower Rio Grande. The most abundant suitable habitat and the largest breeding population of cuckoos are within the Caballo Reservoir delta. The remainder of the study area contains limited suitable habitat. Based on annual detections, the confirmation of a nest, and the presence of fledglings, it appears that there is some sufficient habitat within the Lower Rio to support breeding pairs. However, additional years of survey data and further nest monitoring will be necessary to determine any long term population trends and information on nest site selection and success. Future surveys will be valuable to resource managers monitoring the Lower Rio Grande as a whole and will help determine whether this population of cuckoos continues to expand.

Recommendations

1. Continue annual surveying within currently occupied sites and suitable habitat to the extent that funding allows.
2. Conduct pre-season reconnaissance in un-surveyed study sites to ensure that all potentially suitable habitat is being surveyed.
3. Conduct detailed habitat mapping within the Lower Rio Grande to aid in targeting survey efforts and predicting impacts from river maintenance/management activities.
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 range-wide database similar to that for the SWFL.
6. Initiate radio-telemetry study to determine home range and habitat utilization as well as to locate nests within the Lower Rio Grande.
7. Monitor any documented YBCU nests in order to gain insight into variables influencing nest site selection and nest success.
8. Monitor for presence of and defoliation by saltcedar leaf beetles (*Diorhabda* species) to determine any potential effects to cuckoo populations or habitat selection.

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PEER REVIEW DOCUMENTATION

PROJECT AND DOCUMENT INFORMATION

Project Name Yellow-billed Cuckoo Surveys WOID FA418

Document Lower Rio Grande Yellow-billed Cuckoo Survey Results – 2017: Selected sites within the Lower Rio Grande Basin from Elephant Butte Dam, NM to El Paso, TX

Document Date March 2018

Team Leader Darrell Ahlers, 86-68290, Wildlife Biologist

Document Author(s)/Preparer(s) M. White, K. Dillon, and S. Moore

Peer Reviewer Mike Horn, 86-68290, Fisheries and Wildlife Resources Group Manager

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	Mike Horn

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: Mike Horn Review Date: 2/27/18 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: Darrell Ahlers Date: 2/27/18 Signature: _____