Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Yellow-billed Cuckoo Surveys and Population Monitoring on the Lower Colorado River and Tributaries

2015 Annual Report

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

February 2016

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Lower Colorado River Multi-Species Conservation Program

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2015 Annual Report

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February 2016

Parametrix, Inc., and Southern Sierra Research Station. 2016. Yellow-billed Cuckoo Surveys and Population Monitoring on the Lower Colorado River and Tributaries, 2015 Annual Report. Prepared by D. Tracy and S.E. McNeil, Southern Sierra Research Station, Weldon, California, and Parametrix, Inc., Albuquerque, New Mexico. Submitted to the Bureau of Reclamation, Boulder City, Nevada. February 2016.

ACRONYMS AND ABBREVIATIONS

ac	acre(s)
Cibola NWR Unit #1	Cibola National Wildlife Refuge Unit #1 Conservation Area
COB	confirmed breeding territory
CRIT	Colorado River Indian Tribe
CVCA	Cibola Valley Conservation Area
DNA	deoxyribonucleic acid
ESA	Endangered Species Act
ft	foot/feet
g	gram(s)
GPS	Global Positioning System
ha	hectare(s)
km	kilometer(s)
LCR	lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
m	meter(s)
MEFF	mobile electronic field form
mi	mile(s)
n =	number equals (sample size)
Overton WMA	Overton Wildlife Management Area
oz	ounce(s)
Parametrix	Parametrix, Inc.
POS	possible breeding territory
PRB	probable breeding territory
PVER	Palo Verde Ecological Reserve
Reclamation	Bureau of Reclamation
SRA	State Recreation Area
SSRS	Southern Sierra Research Station
USFWS	U.S. Fish and Wildlife Service
YBCU	yellow-billed cuckoo (*Coccyzus americanus*)
YEW	Yuma East Wetlands

Symbols

°C	degrees Celsius
°F	degrees Fahrenheit
>	greater than
≥	greater than or equal to
>	less than
≤	less than or equal to
%	percent
±	plus or minus

CONTENTS

Page

Executive Summary ES-1

Introduction 1
Lower Colorado River Multi-Species Conservation Program 1
Yellow-billed Cuckoo History and Biology 1
Presence/Absence Surveys and Habitat Occupancy 4
Methods 4
Study Area and Survey Site Selection 4
Survey Schedule 7
Presence/Absence Surveys 7
Breeding Territory Estimates and Proportion of Habitat Occupied 10
Results 12
Site Descriptions 12
Presence/Absence Surveys 26
Breeding Territory Estimates and Proportion of Habitat Occupied 32
Discussion 32
Population Monitoring 34
Introduction 34
Methods 36
Nest Searching and Monitoring 36
Mist Netting, Color Banding, and Re-sights 39
Radio Telemetry 40
PinPoint GPS Units 41
Results 43
Nests 43
Color Banding, Recaptures, and Re-sights 46
PinPoint GPS Units 54
Discussion 56
Acknowledgements 59
Literature Cited 61

Tables

Table Page

1 Naming conventions for the YBCU project conducted under the LCR MSCP 6
2 Lower Colorado River yellow-billed cuckoo survey sites, 2015..... 8
3 Yellow-billed cuckoo survey period dates along the LCR, 2015 9
4 LCR MSCP – avian species recorded during all field work, 2015..... 9
5 Definitions for YBCU breeding territory estimation 11
6 Lower Colorado River YBCU survey detections and territory estimates for reach 1 through reach 3 sites (Muddy River, Beal Lake Conservation Area, and Topock), 2015..... 28
7 Lower Colorado River YBCU survey detections and territory estimates for reach 3 sites (Bill Williams River East and West), 2015..... 29
8 Lower Colorado River YBCU survey detections and territory estimates for reach 4 sites (‘Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1 Conservation Area), 2015 30
9 Lower Colorado River YBCU survey detections and territory estimates for reach 5 and reach 6 sites (Lago Tres to Mittry), 2015..... 31
10 Lower Colorado River YBCU survey detections and territories by river reach/area, 2015 (summary of tables 6–9) 31
11 Example of PinPoint-10 schedule, 2014 to 2015..... 41
12 Example of PinPoint-10 schedule, 2015 to 2016..... 42
13 Details of YBCU nests located within the LCR MSCP study area, 2015..... 44
14 Summary by site of clutch size, productivity, and fates of thirty-nine YBCU nests monitored on the LCR, 2015 47
15 Adult YBCU captured or recaptured in the LCR MSCP study area, 2015..... 48
16 Capture history of YBCUs recaptured or re-sighted in the LCR MSCP study area, 2015..... 51
17 YBCU young banded in the LCR MSCP study area, 2015 52
18 Summary of Lower Colorado River YBCU captures and attachments by site, 2015..... 56

Figures

Figure Page

1 Lower Colorado River YBCU study area. 5
2 Map of Lower Colorado River Multi-Species Conservation Program YBCU detections by area, 2015. 27
3 Lower Colorado River minimum (confirmed) YBCU breeding territories by survey area, 2015. 33
4 Lower Colorado River YBCU survey detections by geographic area and year, 2008 to 2015. 35
5 Number of active YBCU nests monitored weekly within the LCR MSCP study area, 2008–2015. 46
6 Map of migratory locations recorded from August 2014 to July 2015 by PinPoint-10 GPS units attached to three YBCUs captured at the PVER. 55

Attachments

Attachment

1 Crosswalk Table
2 Focal Birds Encountered During Yellow-billed Cuckoo Field Work, 2015

EXECUTIVE SUMMARY

In December 2013, the Bureau of Reclamation (Reclamation) contracted with Parametrix, Inc. (Parametrix), to monitor yellow-billed cuckoo (*Coccyzus americanus*) (YBCU) populations within suitable riparian habitat on the lower Colorado River (LCR) as part of an ongoing 50-year plan to conserve at least 26 species from Lake Mead to the Southerly International Boundary with Mexico (Reclamation 2004a). Parametrix subcontracted the Southern Sierra Research Station to implement a large portion of the work. The western population of YBCU was listed as a threatened species under the Endangered Species Act on November 3, 2014. The species has declined dramatically over the past century following an extensive loss of riparian forest. This report details field work conducted in 2015 to provide an annual reference for the status of the LCR YBCU population utilizing created habitat and to determine if the population along the LCR is increasing due to Reclamation's activities. This work may also help inform future habitat restoration for western YBCUs.

Field work is expected to continue through 2018. Objectives of the 5-year study include:

1. Assist Reclamation in the documentation and standardization of data collected for the YBCU project. This will be accomplished by implementing standardized mobile electronic field forms and creating data dictionaries, metadata, and quality assurance/quality control processes following completion of field work (after the 2014 field season, all data will be collected electronically when feasible).

2. Document presence/absence of YBCUs in suitable habitat along the LCR.

3. Monitor and document population parameters that can be used to assess habitat quality, including nest success, breeding density, productivity, and survival rates. Surveys will be used to document annual presence/absence of YBCUs; nest searching and monitoring will be used to measure nest success, breeding density, and productivity; mark-recapture will be used to measure survival rates.

Between mid-June and mid-August 2015, call-broadcast surveys were conducted at 37 sites along the lower Colorado, Muddy, and Bill Williams Rivers, covering approximately 1,400 hectares (3,460 acres) of potential breeding habitat. Surveyors recorded 330 total detections, and 48 breeding territories were confirmed in 4 areas, including 39 nests found (33 of these at the Palo Verde Ecological Reserve). Clutch size averaged 2.88, and productivity averaged 1.08 young fledged per nest. Conditions may change from year to year, and the

analysis of multiple years of data will help gain a better understanding of the status and trends in productivity and breeding density of the LCR YBCU population.

Forty-five adult YBCUs were captured in 2015, including 32 newly banded and 13 that were banded in previous years. Among the recaptures was the oldest known YBCU, an eighth-year male banded as a chick in 2008 at Cibola Valley Conservation Area Phase 01, which was recaptured at the Cibola National Wildlife Refuge Unit 1 (Crane Roost), and successfully nested in 2015. This male had not been observed previously since 2008. Three of seven birds fitted with Global Positioning System (GPS) units in 2014 were also recaptured, and another seven birds were fitted with GPS units in 2015. Another three previously banded birds were re-sighted, including two at the Beal Lake Conservation Area: one male was captured in 2012 at the Cibola Valley Conservation Area, approximately 152 kilometers (94.5 miles) south of the Beal Lake Conservation Area, and one female was banded in 2014 at the Cibola National Wildlife Refuge, approximately 157.5 kilometers (97.5 miles) south of the Beal Lake Conservation Area. An additional 39 young were banded from 20 nests in 2015, bringing the total number of YBCUs banded in the study area since 2008 to 355, 166 adults and 189 young.

INTRODUCTION

Lower Colorado River Multi-Species Conservation Program

In 2005, the LCR Multi-Species Conservation Program (MSCP), a multi-agency plan, "was created to balance the use of Colorado River water resources with the conservation of native species and their habitats" (Bureau of Reclamation [Reclamation 2004b]). This coordinated, comprehensive, long-term effort focuses on conserving habitat, working toward the recovery of threatened and endangered species, and reducing the likelihood of additional species being listed (Reclamation 2004b). Reclamation is the implementing agency of the LCR MSCP.

The LCR MSCP covers areas within the historical flood plain of the Colorado River from Lake Mead to the United States-Mexico International Boundary, a distance of about 644 kilometers (km) (400 river miles) (Reclamation 2004b). A Habitat Conservation Plan was designed to provide Endangered Species Act (ESA) compliance over the 50-year period of the program.

Areas covered in the Habitat Conservation Plan include more than 3,278 hectares (ha) (8,100 acres [ac]) of riparian, marsh, and backwater habitat for 6 federally (or ESA) listed species, 20 other covered species, or "species that are included under the ESA incidental take authorization and are either currently listed or proposed for listing as threatened or endangered under the ESA or are protected under Arizona, California, or Nevada law; or may become listed during the 50-year LCR MSCP term affected by covered activities" (www.lcrmscp.gov).

Yellow-billed Cuckoo History and Biology

Yellow-billed cuckoos (*Coccyzus americanus*) (YBCUs) have been under the protection of various State and Federal laws for many years. In November 2014, the U.S. Fish and Wildlife Service (USFWS) listed the western distinct population segment (DPS) of the yellow-billed cuckoo as a threatened species under the ESA (USFWS 2014).

The YBCU is a riparian obligate bird that migrates between its breeding grounds in the United States and wintering areas in South America. The population has declined mainly due to loss of its preferred riparian habitat. YBCUs are among the last neotropical migrants to arrive in Arizona and California to breed, beginning to arrive in late May (Bent 1940). Their diet during the breeding season consists primarily of large insects, such as grasshoppers, katydids,

caterpillars, mantids, and cicadas, and can also include tree frogs and small lizards (Bent 1940; Hamilton and Hamilton 1965; Nolan and Thompson 1975; Hughes 1999).

Nesting usually occurs between late June and late July but can begin as early as late May and continue until late September (Hughes 1999). In the LCR region, the nesting period tends to be late June to late August, peaking in mid- to late July. Nesting at the Palo Verde Ecological Reserve (PVER), however, has recently been documented in September (McNeil et al. 2013; McNeil and Tracy 2013; Parametrix, Inc. [Parametrix] and Southern Sierra Research Station [SSRS] 2015), and adults tending to young may occur in this area until early October. The main nesting tree species in this region include Goodding's willow (*Salix gooddingii*), Fremont cottonwood (*Populus fremontii*), and tamarisk (*Tamarix* spp.). Other trees or large shrubs also used for nesting include honey mesquite (*Prosopis glandulosa* and *P. pubescens*), seep willow (*Baccharis salicifolia*), and coyote willow (*S. exigua*) (McNeil et al. 2013).

Nests are built by both sexes and consist of a loose platform of sticks. Clutch size ranges from one to five (Payne 2005), averaging two to three (Laymon 1998). From 2008 through 2012, clutch size in the study area averaged 2.8 (n = 72; McNeil et al. 2013). Eggs are generally laid daily until clutch completion (Jay 1911). Incubation begins once the first egg is laid and lasts 9 to 11 days (Potter 1980, 1981; Hughes 1999). Both sexes incubate, with males generally tending the nest overnight (Halterman 2009). Young hatch asynchronously and are fed mostly large insects (Laymon and Halterman 1985; Laymon et al. 1997; Halterman 2009). After fledging at 5 to 9 days, young may be dependent on adults for at least 3 weeks (Laymon and Halterman 1985; McNeil et al. 2013). Fall migration begins in August, and most birds have left by mid-September (Hughes 1999; McNeil et al. 2013).

The "Presence/Absence Surveys and Habitat Occupancy" section describes YBCU surveys that were conducted in 2014 to estimate presence/absence, habitat occupancy, and breeding territories. The "Population Monitoring" section describes other population monitoring tasks, including nest searching and monitoring, mist netting, color banding, recapturing, and re-sighting.

Each year, datasets with relatively small sample sizes are generated. From one year of data alone, parameter estimation is prone to increased error due to stochastic or unknown events. Year to year differences may not be indicative of trends, and conclusions made annually may change once multiple years of data are analyzed. It is also difficult to identify yearly causes of variation in productivity or survival. Multi-year analyses, including biologically relevant covariates, can measure differences existing within and among populations and may identify important sources of variation that could potentially be managed. Similarly, long-term mark-capture-recapture data are required, at least 10 years

for most wild bird populations (Amstrup et al. 2005), to assess survival and population growth rates. Therefore, annual reports will include minimal analyses, showing basic population estimates, such as nest success, average productivity, and lists of birds banded, recaptured and re-sighted by area and site. A more thorough analysis of the data from multiple years will be presented in the final summary (2014–18) report.

Changes to Data Collection in 2015

Difference in methods used to collect data in 2015, may make it difficult to compare data collected with certain aspects of data collected in previous years. From 2008 to 2014, data collected during YBCU field work conducted under the LCR MSCP were recorded while in the field into paper data sheets and Garmin Global Positioning System (GPS) units, then entered/imported at field houses into Microsoft Access database forms. Additionally in 2014, a subset of data was entered while in the field into mobile electronic field forms (MEFFs) created in TerraSync™ version 5.41 and loaded onto Trimble® Juno 3B GPS units (Trimble Navigation, Ltd.) to evaluate the use of MEFFs for future data collection. GPS Pathfinder Office version 5.6 (Trimble Navigation, Ltd.) was used to transfer, differentially correct, review, and correct all MEFF data files, which were then exported to separate .mdb files. Beginning in 2015, all data were collected on MEFFs/Trimble Juno GPS units and processed in GPS Pathfinder Office. Whenever possible, data were directly entered into MEFFs in the field. If field conditions interfered with electronic collection, data were entered into field notebooks and spatial locations were recorded with Garmin GPS units if necessary, then transferred into MEFFs later. Such field conditions encountered in 2015 included multiple YBCU observations, causing difficulties in recording all data into MEFFs in a timely manner; dense canopy; steep canyons; or other factors affecting satellite communications with TerraSync. Potential factors affecting the comparability of data between 2015 and previous years include:

1. The possibility of observers spending more time looking down at MEFFs to enter data instead of writing codes into field notebooks. This step requires additional training for field crews unfamiliar with MEFFs and can affect the quantity of time spent looking up toward the canopy to monitor YBCU activity. In these instances, potentially fewer YBCU detections, observations, estimated territories, and confirmed territories can occur.

2. Using TerraSync/Juno units to store GPS locations sometimes takes longer in areas with dense canopy cover. Field researchers for this project noted that TerraSync rejects satellites positioned less than 5 degrees above the horizon, sometimes causing delays in obtaining location data.

3. In 2015, all data were exported into separate .mdb files instead of a single database as had been done in previous years. A single database enabled easier review of all data together. In 2015, the lack of using a single database caused difficulties in monitoring overall YBCU activity during the season and impacted planning of daily field activities.

PRESENCE/ABSENCE SURVEYS AND HABITAT OCCUPANCY

Long-term monitoring programs focus on the status and trends of species' distribution and can effectively document a species' annual state and changes in their condition through time (MacKenzie et al. 2006). Through repeated surveys, the annual status of populations can be assessed by examining within-season distribution, occupancy, and abundance patterns (both spatial and temporal) across the landscape. The analysis of multi-year datasets can reveal emergent trends in a number of population parameters, including fluctuations and responses to environmental changes such as habitat restoration or creation.

YBCUs are difficult birds to study. They can have large overlapping home ranges, are furtive, call infrequently, and often engage in behaviors to avoid detection (Hamilton and Hamilton 1965; Laymon et al. 1997). In addition, YBCUs have a short nesting cycle, females may demonstrate polyandrous behavior (Halterman 2009), an individual or pair may have multiple broods, and the detection of transient birds during surveys may complicate survey results (McNeil et al. 2013). Due to these challenges, call-broadcast surveys alone are inadequate to accurately estimate breeding abundance or density, prompting the development of alternative methods (McNeil et al. 2013) described below.

Methods

Study Area and Survey Site Selection

Surveys of suitable YBCU habitat were conducted along approximately 322 km (200 river miles) of the LCR and tributaries, from the Overton Wildlife Management Area (Overton WMA) in southern Nevada to near Yuma, Arizona (the study area) (figure 1). Suitable habitat that a YBCU would potentially use was defined as at least 20 ha (49 ac) of contiguous riparian vegetation containing cottonwood and willow of structural types I–III (an overstory averaging > 4.6 meters (m) (15 feet [ft]) tall (Anderson and Ohmart 1984). Occasionally, smaller patches were also surveyed depending on the location and habitat quality.

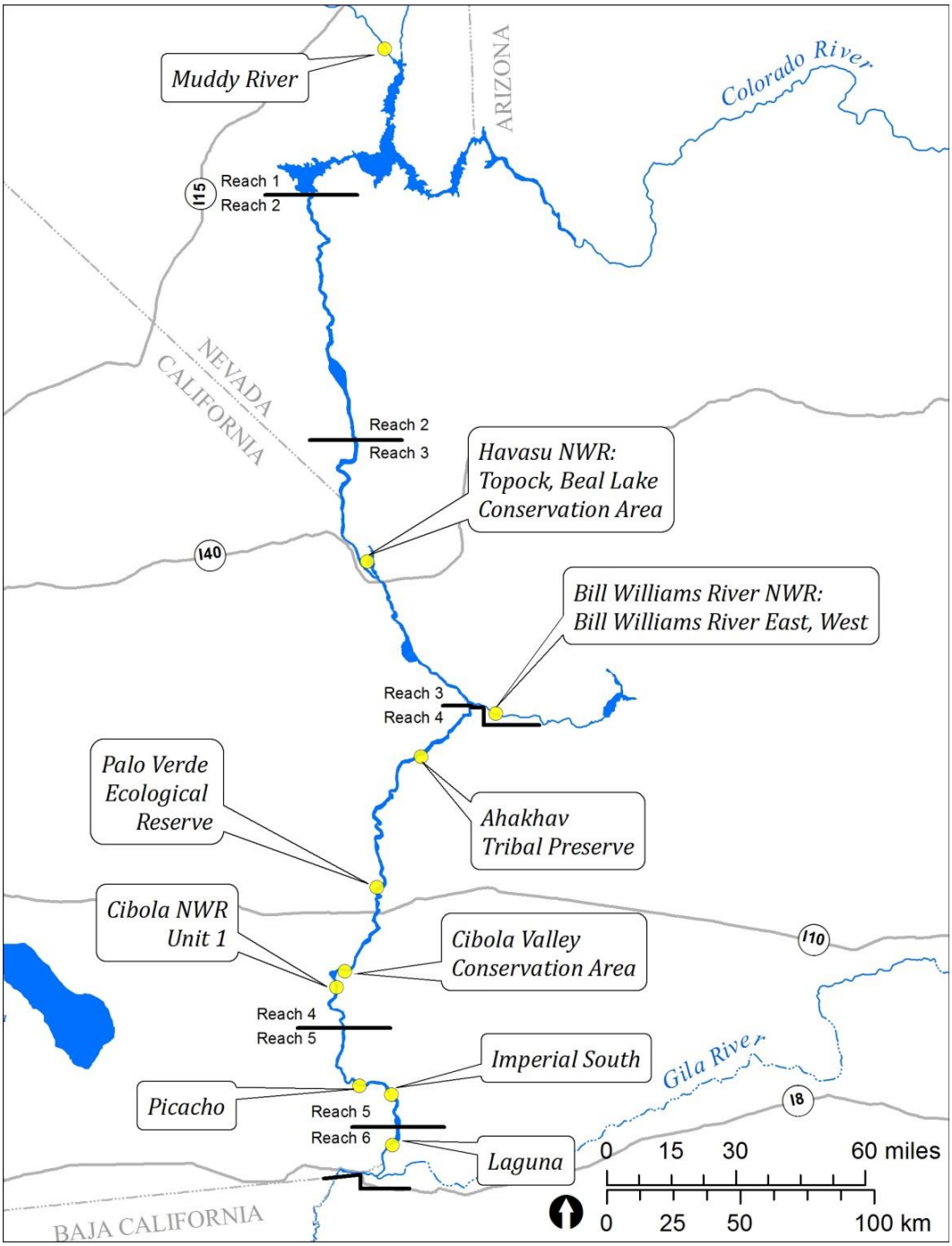

Figure 1.—Lower Colorado River YBCU study area.
Horizontal black lines show river reach boundaries, and yellow circles represent areas surveyed in 2015. Sites are clustered within areas.

In 2014, Reclamation instituted a three-tiered naming convention to be used for all projects conducted under the LCR MSCP (table 1). The area encompassed by the LCR MSCP boundary has been divided into standardized areas, sites, and sections, with areas covering the largest geographic extent and sections the smallest. Several projects may be ongoing within these categories. Section boundaries were delineated by Reclamation based on the needs of various projects occurring there, and they may not entirely comprise suitable YBCU habitat. For the YBCU project, a GPS unit was used to determine the boundaries of potential breeding habitat within each section. Where boundaries were inaccessible, georeferenced 2004–2013 aerial imagery was used to estimate the boundaries. Once potential breeding habitat was identified within a section, survey transects were established (as described below).

Table 1.—Naming conventions for the YBCU project conducted under the LCR MSCP

Term	Definition
Study area	Potential YBCU breeding habitat along a 322-km (200-mile) stretch of the Lower Colorado River and tributaries, from Overton Wildlife Management Area, Nevada to Yuma, Arizona.
River reach (reach)	A LCR MSCP discrete watershed segment used for the analysis of impacts and conservation measures (Reclamation 2004a). Survey results are grouped by each river reach later in this report.
Survey area (area)	A collection of clustered monitored sites (see figure 1).
Survey site (site)	At least 20 ha (49 ac) of potential breeding habitat that contains cottonwood and willow of structural types I-III (sites with an overstory averaging > 4.6 m [15 ft] tall) (Anderson and Ohmart 1984), that can be monitored in one morning. For full coverage of the area, one or more linear transects were traversed.
Section	A spatially explicit location that may include transects, survey points, plots, net lanes, trap lines, etc., used for different projects under the Lower Colorado River Multi-Species Conservation Program.
Transect	Spatially explicit trails spaced 200 to 250 m (656 to 820 ft) throughout potential breeding habitat from which yellow-billed cuckoo surveys were conducted.
Survey point (point)	Spatially explicit location where YBCU call-broadcasts were played to elicit responses. Points are spaced 100 m (328 ft) apart along transects (Halterman et al. 2015).

Survey Schedule

Surveys are conducted annually if one or more potential breeding territories were reported during either of the previous two breeding seasons and at all LCR MSCP created habitat at least 2 years old that contain suitable structure and vegetation types. Surveys are conducted in alternate years where YBCUs were detected but did not indicate at least a possible breeding territory in either of the previous 2 years. Surveys are conducted every 2 years at sites where YBCUs were not present for 2 previous and consecutive years. After 2 years, conditions will be re-evaluated to determine when and if surveys should resume. Thirty-seven sites were surveyed in 2015 (figure 1, table 2).

Presence/Absence Surveys

Four to five standard YBCU broadcast call surveys (Halterman et al. 2015) were conducted at each site every 12 to 16 days. One survey was conducted during each survey period at most sites (table 3). A fifth survey was not conducted in cases where the first four consecutive surveys resulted in no YBCU detections. Surveys were conducted on foot or from kayaks, between sunrise and 10:30 a.m., or until temperatures reached 40 degrees Celsius (°C) (104 degrees Fahrenheit [°F]). Whenever possible, adjacent sites were surveyed on the same day to minimize the possibility of double counting the same individual. Radios were used to communicate among surveyors when adjacent patches were surveyed at the same time.

Surveys were conducted along one or more parallel transects spaced approximately 200 to 250 m (650 to 820 ft) apart, with survey points spaced every 100 m (328 ft) along transects. Surveys were assumed to cover 100 to 125 m (328 to 410 ft) of habitat on either side of each transect. Most transects traversed through the habitat; however, some ran along edges, such as adjacent roads, to exploit greater visual detectability or because the interior was inaccessible. Trimble Juno 3B GPS units (±15 m horizontal accuracy) were used to locate survey points. At each point, surveyors recorded the location, time, and any LCR MSCP avian focal species detected (table 4).

At each survey point, surveyors listened and watched for YBCUs for 1 minute. If none were detected, an MP3 player and hand-held speaker were used to broadcast a 5-second YBCU contact call (the “kowlp” call) (Hughes 1999), at approximately 70 decibels (calibrated with a decibel-meter before each survey), once per minute for 5 minutes. A 5-second call was followed by 55 seconds of active listening. If a YBCU was detected, call-playbacks were immediately discontinued, and surveyors recorded the true bearing and estimated the distance from the surveyor to the bird, time of detection, number of calls broadcasted, response type, behavior, vocalizations, and presence and/or color combination of

Table 2.—Lower Colorado River yellow-billed cuckoo survey sites, 2015

Geographic area	Area	Site	Size (ha)	Reach #
Overton Wildlife Management Areas (WMA), Nevada	Muddy River	Overton Wildlife	40[a]	1
Havasu National Wildlife Refuge, Arizona	Beal Lake Conservation Area[b]	CPhase 05	19.7	3
		CPhase 06	15.8	3
	Topock	Pintail Slough	22.3	3
		Topock Platform	9.3	3
Bill Williams River National Wildlife Refuge, Arizona	Bill Williams River East	Cave Wash	44.9	3
		Cougar Point	49.7	3
		Esquerra Ranch	73.9	3
		Honeycomb Bend	24.8	3
		Kohen Ranch	43.4	3
		Mineral Wash	41.0	3
	Bill Williams River West	Borrow Pit	37.8	3
		BW Marsh	18.4	3
		Cross River	50.5	3
		Mosquito Flats	58.9	3
		North Burn	42.1	3
		Sandy Wash	80.8	3
Parker, Arizona	‘Ahakhav Tribal Preserve	CRIT[c] 09	62.5	4
Blythe, California	Palo Verde Ecological Reserve (PVER)[b]	Phase 01	13.0	4
		Phase 02	31.6	4
		Phase 03	34.0	4
		Phase 04	41.2	4
		Phase 05	87.4	4
		Phase 06	89.0	4
		Phase 07	91.6	4
Cibola Valley, Arizona	Cibola Valley Conservation Area (CVCA)[b]	Phase 01	37.2	4
		Phase 02	27.5	4
		Phase 03	43.9	4
Cibola National Wildlife Refuge, Arizona	Cibola National Wildlife Refuge Unit 1 Conservation Area[b]	Cottonwood Genetics	16.5	4
		Crane Roost	57.3	4
		CW-North	7.3	4
		Hippy Burn	29.1	4
		Mass Transplanting	8.1	4
		Nature Trail	14.5	4
Yuma, Arizona	Picacho	Lago Tres	14.8	5
	Imperial South	Fisher’s Landing	24.4	5
	Laguna	Mittry	12.2	6

[a] Overton WMA is > 40 ha (99 ac) but comprises mostly unsuitable breeding habitat. Around 40 ha (99 ac) were surveyed.
[b] Palo Verde Ecological Preserve (PVER) and Cibola Valley Conservation Area (CVCA) are managed under the LCR MSCP.
[c] CRIT = Colorado River Indian Tribe.

Table 3.—Yellow-billed cuckoo survey period dates along the LCR, 2015

Survey period	Dates
1	June 15 to June 28
2	June 29 to July 12
3	July 13 to July 26
4	July 27 to August 9
5	August 10 to August 25

Table 4.—LCR MSCP – avian species recorded during all field work, 2015

Scientific name	Common name	American Ornithologists' Union code recorded
Empidonax traillii	Willow flycatcher	WIFL
Coccyzus americanus	Yellow-billed cuckoo	YBCU
Colaptes chrysoides	Gilded flicker	GIFL
Melanerpes uropygialis	Gila woodpecker	GIWO
Pyrocephalus rubinus	Vermilion flycatcher	VEFL
Vireo bellii arizonae	Arizona Bell's vireo	BEVI
Setophaga petechia sonorana	Sonoran yellow warbler	YEWA
Piranga rubra	Summer tanager	SUTA
Rallus obsoletus yumanensis	Yuma Ridgway's rail[1]	CLRA
Laterallus jamaicensis coturniculus	California black rail	BLRA
Ixobrychus exilis	Least bittern	LEBI
Micrathene whitneyi	Elf owl	ELOW

[1] Clapper rail (*Rallus longirostris*) is now Ridgway's rail (*Rallus obsoletus*) (Chesser et al. 2014).

leg bands observed. Any breeding evidence was recorded, including individuals carrying food or nesting material, copulation, the presence of a juvenile, or a nest. Surveyors then progressed along the transect 300 m (984 ft) from the estimated location of the detected YBCU to avoid additional disturbance and detections of the same bird.

An individual YBCU visually observed or heard during a survey, including any detected while traveling between survey points, was recorded as a survey detection. If the same individual was presumed to have been detected more than once during a single survey (such as when an individual appeared to follow a surveyor), only the initial detection was used in calculating the detection total. It

is not typically possible to tell individuals apart by call or appearance; however, occasionally, individuals considered to have unique calls or behaviors may be recognized. Detections > 300 m (984 ft) apart during a single survey were generally counted as separate individuals, and were considered separate survey detections, although surveyors used their judgment to determine whether multiple detections within 300 m (984 ft) were of the same individual. The distance between separate individuals of 300 m (984 ft) is somewhat arbitrary, but is reasonable for most areas, because it corresponds to the typical minimum distance found between active nests (SSRS field data records). Because the number of survey detections are positively correlated to the number of breeding territories (McNeil et al. 2013), survey detection counts throughout the season can be used as a rough index of nesting territories. However, in higher-density nesting areas (e.g., PVER Phases 06 and 07), using a distance of 300 m (984 ft) results in undercounting individuals and nests. Therefore, at known high-density sites (confirmed by active nests ≤ 200 m [656 ft] apart), the distance used to separate individuals was reduced to 200 m (656 ft). Repeated detections of one individual and detections occurring before or after surveys were classified as non-survey or repeat detections. Data collected for repeat detections were the same as that collected for survey detections. In addition, all avian focal species encountered during surveys and other field activities were recorded (attachment 2). To standardize the survey data, the number of detections per ha (2.5 ac), the detections per 20 ha (49 ac), and the average size of a YBCU territory (McNeil et al. 2013) were also calculated (see table 1 for a summary and definition of terms related to surveys).

Breeding Territory Estimates and Proportion of Habitat Occupied

To estimate breeding territory abundance, patches were called potential breeding territories if detections occurred in the area during two or more survey periods. A single YBCU detection in an area was considered an unreliable indicator of breeding status due to the transient nature of non-breeding YBCUs (Johnson et al. 2007; McNeil et al. 2013). All detections were assessed by spatial location, observed behaviors, and dates, and used to categorize breeding status for each occupied patch as a possible (POS), probable (PRB), or confirmed (COB) breeding territory (table 5). All detections were used to estimate breeding territories, including those made during surveys, and all other activities such as nest searches, mist netting, telemetry, and re-sight attempts described in the "Population Monitoring" section. POS and PRB territories were re-visited whenever possible, to increase the likelihood of confirming breeding. Any fledglings or juveniles found that could have come from territories already counted were not counted as new territories.

Table 5.—Definitions for YBCU breeding territory estimation

Estimation type	Term	Definition
Breeding territory estimation	Possible breeding territory (POS)	Two or more total detections in an area during two survey periods and at least 10 days apart. For example, within a certain area, one detection made during survey period 2 coupled with another detection made 10 days later during survey period 3 warrant a POS territory designation.
	Probable breeding territory (PRB)	Three or more total detections in an area during at least three survey periods and at least 10 days between each detection; plus yellow-billed cuckoos observed carrying food (single observation), carrying a stick [single observation], traveling as a pair, or exchanging vocalizations.
	Confirmed breeding territory (COB)	Observation of copulation, stick carry (multiple observations), food carry (multiple observations), distraction display (only given during breeding), an active nest, or confirmed fledgling(s).
Population estimation	Minimum territory estimate	The observed number of confirmed breeding territories (COB).
Habitat occupancy	Occupancy	Occupancy is based on two or more total detections in an area during two or more survey periods. Multiple detections of YBCUs in an area suggest that these areas were inhabited for an extended period and may have been used for breeding.
	Sample unit	To control for variation in site/section size, the proportion of habitat occupied was calculated using similarly sized areas or sample units. Sections with contiguous habitat (more than 30 ha [74 ac]) were divided into equal area sample units or into smaller physical/practical sample units. This resulted in sample units of 15 ha (37 ac) to approximately 25 ha (62 ac), wholly contained within sections. For sections smaller than 30 ha (74 ac), the section was the sample unit boundary.

The POS, PRB, and COB counts were used to estimate the number of breeding territories and not the number of breeding pairs. Territory estimates represent two adults associated with a single nest. Factors that complicate territory estimates may include nesting females leaving nests before young are independent (McNeil et al. 2013) and polyandrous females that re-nest with another male after leaving an active nest (Halterman 2009). Also, following a successful or failed nest, one or both adults may re-nest. Referring to each nesting attempt as additional pairs may then be inappropriate.

To estimate the proportion of habitat occupied (≥ 2 total detections at least 10 days apart), similarly sized sample units were used to control for variation in

site size (see table 5). The proportion of habitat occupied within each area was the number of occupied sample units divided by the total number of sample units surveyed.

Results

Site Descriptions

Sites are described by geographic area, with the most northerly sites presented first. Each area may contain several sites, and sites may contain one or more sections. An overview of the project area locations is provided in figure 1. Site codes used beginning in 2014 are in parentheses after the site names (attachment 1). Due to the recent Federal listing of this species, and for protection of nesting birds, site maps showing specific nesting areas are not included in this annual report.

Overton WMA, Nevada

Area: Muddy River

Clark County

The Muddy River area lies within the Muddy River drainage in Moapa Valley about 3.2 km (2 miles [mi]) south of Overton on State Route 169. The Nevada Department of Wildlife manages the Overton WMA as wildlife habitat. The Overton WMA consists of 7,145 ha (17,657 ac) of Mojave Desert upland and riparian flood plain where the Muddy River flows into the Overton arm of Lake Mead. Within the flood plain, 66 ha (165 ac) of agricultural crops, including barley (*Hordeum vulgare*) and alfalfa (*Medicago sativa*) are grown for migrating and wintering waterfowl. Most riparian habitat not managed for waterfowl has been invaded by tamarisk. There are small patches of remnant Goodding's willow overstory with tamarisk understory along the main channel of the Muddy River. A narrow stringer of Fremont cottonwoods lines the perimeter of the agricultural fields. There is little suitable habitat within the Overton WMA, and part of one site was surveyed in 2015.

Site: Overton Wildlife (MROW) ***40 ha (99.0 ac)***

Section: Overton Wildlife

The survey follows a line of cottonwoods among an access road, a seasonally flooded pond, and fallow fields, continuing along the flood plain of the Muddy River. Dominant trees are Goodding's willow, which line the main channel, and scrubby tamarisk, which forms a dense understory. Several fields to the west are dry during the breeding season and flooded in winter for waterfowl. Upstream to the north, east, and south, patches of tamarisk line the main fork of

the Muddy River. Adjacent to the riparian vegetation are creosote bush (*Larrea tridentata*) dominated Mojave Desert uplands. There was one survey detection at this site in 2015.

Havasu National Wildlife Refuge, Arizona

The Havasu National Wildlife Refuge was established in 1941 and encompasses over 48 km (30 river miles) of the LCR and adjacent land from Needles, California, to Lake Havasu City, Arizona. YBCU habitat within the refuge is almost entirely within the Topock Marsh area, a historical river meander east of the main river channel currently managed as wildlife habitat. Water levels are seasonally manipulated to benefit wildlife and recreation. Two areas within the refuge were surveyed in 2015: the Beal Lake Conservation Area and Topock.

Area: Beal Lake Conservation Area

Mohave County (Colorado River Drainage)

Sites: CPhase05 (BLCP5) and CPhase06 (BLCP6) ***35.5 ha (87.7 ac)***
Sections: C1505 and C1506

The Beal Lake Conservation Area lies approximately 3 km (1.9 mi) south of Topock Platform between Beal Lake and Topock Marsh and contains two sites surveyed together. The sites consist of a mosaic of native trees planted in the historical Colorado River flood plain. Approximately 21 of 43 ha (52 of 106 ac) planted from 2003 to 2005 (Reclamation 2008, 2010) were surveyed for YBCUs. Hectares not surveyed do not contain habitat for YBCUs. Multiple access roads cross the sites and define the perimeter. There is year-round water in an irrigation ditch bordering the southeastern edge, which connects Beal Lake to the southwest, with Topock Marsh to the northeast. There were seven survey detections at this site in 2015, including one PRB and one COB territory (nest).

Area: Topock

Mohave County, Arizona (Colorado River drainage)

Two sites in this area were surveyed in 2015: Pintail Slough and Topock Platform.

Site: Pintail Slough (TKPS) ***22.3 ha (55.3 ac)***
Sections: North Dike (HAVND) and Pintail Slough (HAVPS)

The North Dike section is a mature restoration plot along the north dike of Topock Marsh, with an overstory of Fremont cottonwood and Goodding's willow and an understory of seep willow and honey mesquite. An agricultural field to the north separates habitat in this section from Pintail Slough. The section is

surrounded by access roads, with a cement-lined irrigation canal along the western edge. The historical flood plain lies south and west and is dominated by mesquite and tamarisk. The Pintail Slough section consists of single, large cottonwoods lining the slough, a restored field 250 m (820 ft) to the south, and another stand 300 m (984 ft) southeast. The slough supports cattails (*Typha* spp.), and the surrounding understory is a mix of tamarisk, arrowweed (*Pluchea sericea*), and quail bush (*Atriplex lentiformis*). The southeast habitat is dominated by cottonwoods that established naturally following flooding of nearby wintering waterfowl habitat. The southern planted field has a sparse overstory of cottonwoods and a dense ground cover of non-native Johnson grass (*Sorghum halapense*). A system of access roads intersects the section. There were three survey detections at this site in 2015, including one POS territory.

Site: Topock Platform (HAVTPR) ***9.3 ha (23 ac)***
Section: Topock Platform

Topock Platform was first planted with Fremont cottonwood and Goodding's willow in the late 1990s as nursery stock for restoration efforts. The trees were rarely cut, and additional trees have been planted or have grown voluntarily. It now includes 9.3 ha (23 ac) of restored habitat located next to fields formerly flooded in winter for waterfowl habitat. The understory, which came in voluntarily, has increased the diversity of the vegetation over the years. However, the USFWS no longer irrigates the site, and it is in severe decline, with many dead and dying cottonwoods and willows. During summer, this habitat is dry and supports a healthy cicada population. There were three survey detections at this site in 2105, including one POS territory.

Bill Williams River NWR, Arizona

Area: Bill Williams River East and Bill Williams River West
Mohave and La Paz Counties (Bill Williams River drainage)

The Bill Williams River East and West areas are within the Bill Williams River National Wildlife Refuge. The refuge was established in 1993 (formerly part of the Havasu National Wildlife Refuge established in 1941) to protect the largest remaining natural riparian forest in the LCR Valley. It is located 14.3 km (8.9 mi) south of Lake Havasu City, Arizona, and consists of 2,430 ha (6,000 ac) of the Bill Williams River drainage managed by the USFWS. This refuge extends from Lake Havasu upstream on the Bill Williams River for about 16 km (10 mi), and historically has supported the most extensive and productive YBCU breeding habitat in the LCR watershed. Portions of the Bill Williams River contain perennial surface water. The managed hydrologic regime enables overbank

flooding necessary for natural regeneration of native vegetation and persistence of cottonwood-willow forest. Occasional winter releases from Alamo Dam have resulted in some natural forest regeneration.

The vegetation composition and structure in the eastern half of the refuge is significantly different from that found downstream from Gibraltar Rock in the western half. East of Gibraltar Rock, shallow underground bedrock and cliffs bordering the riparian area increase perennial flows and surface water; west of Gibraltar Rock, the river channel widens into a sandy, broad flood plain that persists to the western edge of the refuge at its interface with Lake Havasu. There were 12 sites within Bill Williams River East and Bill Williams River West surveyed in 2015. These sites are described from east to west.

Area: Bill Williams River East

Site: Cave Wash (BECW) ***44.9 ha (111 ac)***

Section: Cave Wash

This site is in the flood plain of the Bill Williams River at the eastern end of the refuge. This part of the refuge consists of a broad riparian area with both historical and recently formed river channels. There are extensive areas of dense tamarisk, although the vegetation is predominately native. Water is seasonally present in some side channels and perennial in the main channel. The main channel is lined with young cottonwood, willow, and tamarisk, averaging 10 m (32 ft) high, surrounding dense marsh. There were no survey detections at this site in 2015.

Site: Honeycomb Bend (BEHB) ***24.8 ha (61.3 ac)***

Section: Honeycomb Bend

This transect follows the Bill Williams River, connecting with Cave Wash to the east and Mineral Wash to the west. It follows the river through some of the best riparian habitat on the refuge. Tall cottonwoods and willows with a dense understory of willow, arrowweed, and tamarisk dominate the multi-structured habitat. The river is perennial, and beaver dams have created ponds lined with dense willows, cattails, and tamarisk. The riparian area is restricted by surrounding cliffs, with intermittent overbank flooding. There were two survey detections at this site in 2015, with two POS and one PRB territory.

Site: Mineral Wash (BEMW) ***41 ha (101 ac)***

Section: Mineral Wash

This linear site is located between Honeycomb Bend and Esquerra Ranch, following the river channel from a restricted canyon bordered by cliffs and then an open flood plain. The river is lined with bands of tall dense willows, large

cottonwoods, and an understory of willows, tamarisk, arrowweed, mesquite, and marsh vegetation. The surrounding Sonoran Desert vegetation includes saguaros (*Carnegiea gigantea*) and creosote bush. Perennial water flows through the site, and seasonal flooding occurs during winter and summer rains. A public access road follows Mineral Wash, and there is some recreational activity where the road terminates at the river. There were six survey detections at this site in 2015, with three POS and two COB territories.

Site: Esquerra Ranch (BWER) ***73.9 ha (183 ac)***
Section: Esquerra Ranch

This site lies between Mineral Wash and Cougar Point and begins at the intersection of Mineral Wash Road and the Bill Williams River. The transect runs downstream along the river channel to a river bend (known as Cougar Point). This site is bounded by a steep cliff on the southwest and a broad dry upland area (the site of the historical Esquerra Ranch house) to the northeast. There were two survey detections at this site in 2015, and one POS territory.

Site: Cougar Point (BECP) ***49.7 ha (122.8 ac)***
Section: Cougar Point

This site is in the western section of the pre-2009 Big Bend route and lies between the Esquerra Ranch and Gibraltar Rock routes. The route follows the river bend around Cougar Point. The northernmost part runs through an area of extensive forest, which regenerated following 2005 flooding. The southern part skirts older forest along the old main river channel and is composed of cottonwoods, willows, and a dense understory of tamarisk and arrowweed. Several meanders contain perennial water. There were no survey detections at this site in 2015.

Site: Kohen Ranch (BEKR) ***43.4 ha (107.2 ac)***
Section: Kohen Ranch

The site covers areas of natural regeneration that occurred following prolonged flooding during 2005–06. The route begins at the historical Kohen Ranch and heads northeast following the northern edge of the river channel and parallel to the Gibraltar Rock route. The route passes through mature cottonwood-willow forest as well as a mix of park-like vegetation, with a high cottonwood overstory and Bermuda grass ground cover. There is a 2009 USFWS mesquite restoration site on the edge of this route. There were no survey detections at this site in 2015.

Area: Bill Williams River West

Site: North Burn (BWNB) ***42.1 ha (104 ac)***

Section: North Burn

Much of this site burned in 2005 and has regenerated with tamarisk and quail bush and a few native trees. The survey route is within the habitat rather than the edge. This site can be reached by kayak or by hiking the Cross River trail. There were two survey detections at this site in 2015.

Site: BW Marsh (BWBWM) ***18.4 ha (45.5 ac)***

Section: BW Marsh

Surveyed by kayak, this route provides access to habitat within the broad western flood plain by following the main channel of the Bill Williams River upstream from Lake Havasu. The channel floods seasonally from upstream waters and is periodically inundated by fluctuating lake levels. Riparian vegetation consists of cottonwoods and willows with a dense understory of tamarisk. The shore is lined with cattails. Regular boating and fishing activities occur here. There were two survey detections at this site in 2015, including one POS territory.

Site: Mosquito Flats (BWMF) ***58.9 ha (145.5 ac)***

Sections: Site 12, Site 13

The western end of the refuge spreads out into a wide flood plain dominated by mature Fremont cottonwood, Goodding's willow, and tamarisk. The water table can be high here, indicated by standing ponds, water-filled side channels, and extensive bands of mature Goodding's willow. There is minimal visitor activity in summer and some vehicle traffic on the main road to the south. There were seven survey detections at this site in 2015, including one PRB territory.

Site: Borrow Pit (BWBP) ***37.8 ha (93.4 ac)***

Section: Borrow Pit

This site follows a trail along an old river channel paralleling the west end access road. The survey was conducted from the dry river channel and bluffs overlooking the habitat. This site connects Cross River to the west and Sandy Wash to the east. The habitat in the southern half contains mature riparian cottonwood-willow forest with a dense tamarisk understory. The northern half includes occasional dense stands of tall cottonwoods and willows and extensive dense tamarisk. There were no survey detections at this site in 2015.

Site: Sandy Wash (BWSW) ***80.8 ha (199.7 ac)***
Section: Sandy Wash

This site connects Gibraltar Rock to the southeast, Fox Wash to the north, and Cross River to the northwest. This section of the refuge gradually widens into a flood plain laced with dry river channels. The transect loops around the eastern end of the broad flood plain, following an old road and river channel. This site is structurally diverse, with an overstory of tall cottonwoods and willows, and a tamarisk-dominated understory on the southern edge, mature tamarisk in the central part, and tall dense native-dominated cottonwood-willow to the east. Hikers and researchers frequently use this easily accessible route. There were two survey detections at this site in 2015, including one POS territory.

Parker, Arizona

Area: ‘Ahakhav Tribal Preserve
Colorado River Indian Tribe lands

The ‘Ahakhav Tribal Preserve lies along the Colorado River approximately 3.5 km (2.2 mi) southwest of Parker, Arizona. The site is bordered by Mojave Road to the south and agricultural fields to the east and west. Established in 1995, the preserve comprises 507 ha (1,253 ac) of mixed native habitat, restored river channels, and a park.

Site: CRIT 09 (AKC9) ***62.5 ha (154.4 ac)***
Section: CRIT 09

Over 54 ha (133 ac) of riparian forest has been planted at this site since 2001. Periodic revegetation in some previously restored areas has resulted in multi-layer patches of varying canopy height. Species composition consists of 45 ha (111 ac) of mosaic plantings of cottonwood and Goodding’s willow and approximately 15 ha (37 ac) of honey and screwbean mesquite. Ground cover is sparse, with little understory and sandy soil. There is generally no standing water during visits. The survey route follows roads around the perimeter and interior of this site. There were three survey detections at this site in 2015.

Blythe, California

Area: Palo Verde Ecological Reserve
Riverside County

The PVER is located 12 km (7.5 mi) north of Blythe, California. The 547-ha (1,351-ac) area was acquired by the State of California in 2004. Riparian restoration activities are being implemented by Reclamation, with public use and

hunting managed by the California Department of Fish and Wildlife. Details of planting and management are outlined in the Palo Verde Ecological Reserve Restoration Development Plan Overview (Reclamation 2006), including the specific development plans for each phase (see www.lcrmscp.gov). Phases 01 to Phase 07 were surveyed in 2015, comprising almost 400 contiguous ha (988 ac) of potential breeding habitat spread over 5 linear km (3.1 mi) bordering the LCR. The phases were surveyed as they became potential breeding habitat, with Phase 07 first surveyed completely in 2014. All sites experienced farming activity in adjacent fields, which can be noisy during planting and harvesting, as well as overhead crop dusting. Farm equipment frequently travels along the main road and all perimeter and some interior roads during the breeding season. The first session of dove hunting in California is September 1–15. During this period, all surveyed phases from Phase 01 to Phase 07 experienced hunting-related disturbance, including increased human and vehicle traffic, dust, and increased noise from gunshots, humans, and vehicles, on at least two boundaries.

Site: Phase 01 (PVP1) ***13 ha (32.1 ac)***
Section: C2337

Phase 01 was planted in 2006 as a nursery plot. The trees are predominately large Fremont cottonwood and Goodding's willow. The southern edge includes a dense planting of coyote willow. The site is bordered by dirt access roads on all sides. An agricultural field borders the north, and newly constructed marsh habitat lies to the south. There were four survey detections at this site in 2015, including one POS territory.

Site: Phase 02 (PVP2) ***31.6 ha (78.0 ac)***
Sections: C2340 and C2339

Phase 02 was planted in 2007. The site consists mostly of alternating Goodding's willow, coyote willow, and Fremont cottonwood plantings. The plantings were designed to maximize the amount of edge between Goodding's willow and coyote willow, considered preferred habitat for the southwestern willow flycatcher (Reclamation 2006). The eastern half of Section C2340 contains a small field planted with genetically diverse cottonwood trees (unlike the other plots, which were planted from nursery pole cuttings). The site is bordered on all sides by dirt access roads and irrigation canals on the west, east, and south. The northern road is now overgrown and no longer accessible by vehicle. There were 14 survey detections at this site in 2015, including 2 POS, 2 PRB, and 2 COB territories.

Site: Phase 03 (PVP3) ***34 ha (84 ac)***
Sections: C2341 and C2342

Phase 03 was planted with cottonwood and willow strips for southwestern willow flycatcher habitat in 2008 and 2009. The species composition and density was planted to mimic a natural riparian landscape when fully mature. This site is bordered by dirt access roads on all sides and to the east by the river and newly created marsh area. The southern edge is bordered by a large cleared and partially developed housing development. There were 11 survey detections at this site in 2015, including one COB (nest).

Site: Phase 04 (PVP4) ***41.2 ha (102 ac)***
Sections: C2343, C2344, C2345

Phase 04 was planted with cottonwood and willow strips in 2009. It is bordered by actively farmed agriculture fields to the west and north. Dirt access roads surround the perimeter, and irrigation canals are present on the west and north sides. There were 24 survey detections at this site in 2015, including 1 POS, 2 PRB, and 5 COB territories (4 nests and 1 fledgling).

Site: Phase 05 (PVP5) ***87.4 ha (216 ac)***
Sections: C2346, C2347, C2348, C2349, and C2350

Phase 05 was planted with cottonwood and willow strips in 2010. This site is slightly different from other PVER phases, which have more contiguous canopy cover, as this site has several open meadows. It is bordered by agricultural fields to the west and the LCR to the east. Dirt access roads surround the perimeter, and an irrigation canal is on the western boundary. There were 43 survey detections at this site in 2015, including 6 POS, 1 PRB, and 5 COB territories.

Site: Phase 06 (PVP6) ***89 ha (220 ac)***
Sections: C2351, C2352, C2353, C2354, and C2355

Phase 06 was planted with cottonwood, willow, and *Baccharis* spp., and open areas of native grasses, quail bush, and mesquite in 2011. This site is bordered by agricultural fields, an irrigation canal to the west, and the LCR to the east. Dirt access roads surround the perimeter. There were 72 survey detections at this site in 2015, with 8 POS, 7 PRB, and 16 COB territories including 11 nests found.

Site: Phase 07 (PVP7) ***91.6 ha (226 ac)***
Sections: C2356, C2357, C2358, C2359, and C2360

Phase 07 was planted with cottonwood, Goodding's willow, coyote willow, *Baccharis* spp., and open areas of native grasses, quail bush, and mesquite in 2012. This site is bordered by agricultural fields to the west and north, the LCR to the east, and Phase 06 to the south. Dirt access roads surround the perimeter. There were 55 survey detections at this site in 2015, including 5 POS, 4 PRB, and 12 COB territories with nests found (figure 3).

Cibola Valley, Arizona

Area: Cibola Valley Conservation Area
La Paz County

The Cibola Valley Conservation Area (CVCA) is located 24.2 km (15 mi) south of Blythe, California, south and east of the Colorado River and the California/Arizona border. Within Cibola Valley, 412.4 ha (1,019 ac) of land owned by the Mohave County Water Authority have been identified for riparian restoration as outlined in the Cibola Valley Conservation Area Restoration Development Plans (Reclamation 2007a–d, 2008b, 2009, 2012). Riparian restoration has been implemented by Reclamation, with hunting and public access managed by the Arizona Game and Fish Department. Since 2006, 101 ha (250 ac) of native riparian trees have been planted in three phases. Three sites were surveyed in 2015: Phase 01, Phase 02, and Phase 03. Phases 01 and 02 are located in adjacent fields, and Phase 03 is approximately 2.6 km (1.6 mi) to the west. Agricultural fields dominate the area surrounding the sites.

Site: Phase 01 (CVP1) ***37.2 ha (91.9 ac)***
Sections: C2525 and C2526

This site consists of six fields planted in 2006 (Reclamation 2007b). The LCR flows approximately 100 m (328 ft) from the northern edge of the site. The dominant tree species include Fremont cottonwood, Goodding's willow, and coyote willow. River Road, Highway 78, and several dirt access roads define the perimeter of Phase 01, and additional interior dirt roads cross the site. The northern, southern, and western boundaries have cement-lined irrigation canals. There were nine survey detections at this site in 2015, including three POS territories.

Site: Phase 02 (CVP2) ***27.5 ha (67.9 ac)***
Sections: C2339 and C2340

Phase 02 was planted in 2008 (Reclamation 2007c). The site is adjacent and south of Phase 01, separated by a dirt access road and a concrete-lined irrigation ditch. Fremont cottonwood and Goodding's willow are the co-dominant trees. Agricultural fields are located to the east and south, and Highway 78 is directly to the east. There were 10 survey detections at this site in 2015, including 2 POS territories.

Site: Phase 03 (CVP3) ***43.9 ha (109 ac)***
Sections: C2529, C2530

Phase 03 is located 2.6 km (1.6 mi) west of Phase 01 and Phase 02, and 400 m (1,312 ft) east of the Colorado River. This site was planted in 2007 with Fremont cottonwood, Goodding's willow, and coyote willow (Reclamation 2007d). Dirt access roads line the perimeter and bisect the plantings, restored or native vegetation surrounds three sides of the site, and an agricultural field is located to the west. There were two survey detections at this site in 2015, including 1 nest.

Cibola National Wildlife Refuge, Arizona

Area: Cibola NWR Unit #1
La Paz County (Colorado River drainage)

The Cibola National Wildlife Refuge is 29.8 km (18.5 mi) south of Blythe, California, within the historical flood plain of the Colorado River. The refuge, covering more than 6,475 ha (16,000 ac), was created in 1964 and includes both the historical river channel and a channel constructed in the late 1960s. The old channel still receives irrigation, and portions are maintained as wildlife habitat, while the new channel carries the main Colorado River flow and is extensively levied. Within the refuge, fields of alfalfa and grain border tamarisk and mesquite-dominated uplands. Most YBCU habitat on the refuge is in habitat creation sites, receiving varying degrees of irrigation. Five sites surveyed in 2015 were all in Cibola NWR Unit #1.

Site: Cottonwood Genetics (CNCG) ***16.5 ha (40.8 ac)***
Section: Cottonwood Genetics

Ten thousand trees at this site planted in 2005 were propagated at a Northern Arizona University research greenhouse in association with Reclamation. The

planted area was used to assess the influence of stand-level genetic diversity on communities and ecosystem processes. There were two survey detections at this site in 2015.

Site: CW-North (CNCWN) ***7.3 ha (18 ac)***
Section: CW-North

CW-North is a small, open, structurally homogeneous site with a cottonwood overstory and ground cover dominated by Bermuda grass. The site is bordered on the north by Baseline Road and agricultural fields. Fallow fields of sparse tamarisk, arrowweed, and quail bush extend east and west. The Mass Transplanting Site is 200 m (656 ft) southwest, separated by an agricultural field. The Nature Trail is 580 m (1,903 ft) to the south, separated by three agricultural fields. There were no survey detections at this site in 2015.

Site: Hippy Burn (CNU1) ***29.1 ha (72 ac)***
Section: Hippy Burn

The purpose of developing upper Hippy Burn (Area 2) was to create riparian habitat managed for southwestern willow flycatchers, YBCUs, and other LCR MSCP covered species. Approximately 30 ha (75 ac) of active agricultural fields were converted to cottonwood-willow, coyote willow, honey mesquite, seep willow, Salt grass *(Distichlis spitica)* and Alkali sacaton (*Sporobolus airoides)* (Reclamation 2013). This site grew rapidly and was intermittently checked for YBCUs in 2014, with no detections. The site was first surveyed in 2015, with three survey detections and one POS territory.

Site: Mass Transplanting (CNMT) ***8.1 ha (20 ac)***
Section: Mass Transplanting

This site is west of and adjacent to the Nature Trail. It was planted in 2005 and 2006 and consists of a grove of cottonwoods and willows, with some open grassy areas. Approximately 1,821 seedlings per ha (4,500 per acre) were planted to inhibit the growth of non-native species, although some open areas are now invaded by non-native Johnson grass. There were no survey detections in 2015.

Site: Nature Trail (CNNT) ***14.5 ha (35.8 ac)***
Section: Nature Trail

This site was first planted in 1999. The transect follows a gravel trail winding through the habitat. Species composition and height vary across the site, creating

structural diversity. Cottonwood dominates the higher canopy. The understory includes Goodding's willow, honey and screwbean mesquite, seep willow, coyote willow, and young cottonwood. Much of the surrounding area is agricultural, and bordering the site to the north and east are seasonally flooded fields for wintering waterfowl. The site is heavily invaded with Johnson grass. There were three survey detections at this site in 2015, including one POS territory in 2015.

Site: Crane Roost (CNCR) ***57.3 ha (142 ac)***
Sections: C2726, C2727, and C2728

Two sections of this site are similar and encompass an older area planted in 2005. The site consists of cottonwoods, a grove of dense mesquites, and a mix of seep willow, mesquite, tamarisk, and tall emergent cottonwoods. Both sections also contain a younger plot planted in 2009, consisting of cottonwood, Goodding's willow, and coyote willow. Section C2726 is bordered on the north by an access road and an agricultural field. Section C2727 is bordered on the west by an access road and irrigation canal. Section 2728 comprises more recently planted (Reclamation 2009) fields of mixed cottonwood and willows just south of Section C2726 and east of Section C2727. The section contains surface salt deposits, and riparian plantings are shorter and sparser in this section. There were 33 survey detections at this site in 2015, including 1 POS, 1 PRB, and 4 COB territories.

One nest (CNCR-03) was outside the designated boundary of the Crane Roost site, just east of the boundary between C2726 and C2728, in a windbreak between two agricultural fields. (See the "Population Monitoring" section for more information.)

Picacho State Recreation Area, California

Area: Picacho
Imperial County (Colorado River drainage)

Picacho State Recreation Area is a historical mining town site, currently State owned and managed by the California State Parks Department. It is 38.6 km (24 mi) north of Winterhaven, California, on the Colorado River.

Site: Lago Tres (POLT) ***14.8 ha (36.6 ac)***
Section: Lago Tres

Lago Tres is a cottonwood-willow dominated restoration site situated where Picacho Wash flows into the Colorado River. The structurally diverse vegetation planted after tamarisk clearing in 1996 appears naturalized and is not irrigated.

Fremont cottonwood, Goodding's willow, and honey and screwbean mesquite dominate the 6 to 17 m tall canopy, averaging 30% cover. A diverse understory of arrowweed, quail bush, blue palo verde (*Cercidium floridum*), seep willow, mesquite, willow, and cottonwood provides approximately 50% cover. The site is bordered by mature tamarisk-dominated Picacho State Recreational Campground and adjacent Sonoran Desert uplands to the west and the river to the east. There was one survey detection at this site in 2015.

Imperial National Wildlife Refuge, Arizona

Area: Imperial South

Yuma County (Colorado River drainage)

The Imperial National Wildlife Refuge was established in 1941 and encompasses 10.43 ha (25.77 ac) of riparian area and associated Sonoran Desert uplands. The headquarters is 40.3 km (25 mi) north of Yuma off Martinez Lake Road. The refuge follows 48.3 km (30 mi) of the Colorado River, including some of the last remaining unchannelized stretches. Refuge management activities include protecting backwater lakes, managing marshes, farming crops for wintering waterfowl, and restoring wetlands and riparian vegetation. One site, Fisher's Landing, was surveyed in 2015.

Site: Fisher's Landing (ISFL) ***24.4 ha (60.3 ac)***

Sections: Imperial 20A, Imperial 50, Imperial Nursery, and Imperial NW

Imperial 20A was planted in 1995, 560 m (1,837 ft) from the main body of Martinez Lake. Stunted Fremont cottonwoods form a sparse canopy, averaging 20% cover. The overstory varies from 4 to 14 m (13 to 45.9 ft) high and is interspersed with mesquite. A thick ground cover of salt grass (*Distichlis spicata*), Bermuda grass, and common reed *(Phragmites australis*) provide 90% ground cover. The site is bordered by seasonally flooded wildlife ponds to the north, mixed native marshland to the east, and fields to the south and west.

Imperial 50 (4.2 ha, 10.4 ac) was planted in 2010. It consists of densely planted cottonwood and mesquite and a dense quail bush perimeter. It is surrounded on three sides by agricultural fields and on one side by restored marsh. A gravel road and two dirt roads surround the perimeter, with an irrigation canal to the north. It is approximately 200 m (656 ft) southwest of Imperial 20A.

Imperial Nursery (13 ha, 32 ac) consists of a small native nursery planted in 1994 and a band of 5 to 15 m (16.4 to 49 ft) high Fremont cottonwood and Goodding's willow, and mesquite lining a finger of Martinez Lake, with approximately 60% canopy closure. There is a low, sparse (about 5% cover) understory of young

cottonwood, mesquite, arrowweed, common reed, seep willow, and tamarisk. Surrounding vegetation includes an open field, impoundment ponds, and a mix of tamarisk, willow, and a marsh to the north. The survey follows perimeter roads and tamarisk-willows to the north. There were two detection at this site in 2015.

Yuma, Arizona

Area: Laguna

Yuma County (Colorado River drainage)

The Laguna area includes the Mittry Lake WMA, managed by the Arizona Game and Fish Department for wildlife habitat and outdoor recreation. The Mittry Lake Wildlife Management Area is 24.2 km (15 mi) northeast of Yuma, between Laguna and Imperial Dams on the LCR, and is composed of open water, marsh, and planted riparian habitat. One site within this area was surveyed in 2015.

Site: Mittry (LGMPR) ***12.2 ha (30.1 ac)***

Section: Pratt Restoration Site

Mittry is a cooperative restoration site first planted in 1999 on a Bureau of Land Management agricultural lease. The overstory consists of Fremont cottonwood and Goodding's and coyote willows. There is an understory of seep willow, Goodding's willow, mesquite, cottonwood, and tamarisk. Actively farmed fields border the north and east sides of the site, and a younger restoration patch abuts the southeastern edge. Fires regularly impact the surrounding tamarisk-dominated vegetation. The Pratt Restoration Site is partly protected by surrounding roads, concrete canals, and firefighting efforts. There were three survey detections at this site in 2015 during the first survey period. YBCUs were likely using this spot as a stopover, with no other detections noted during the remainder of the season.

Presence/Absence Surveys

From June 15 to August 20, 2015, 173 presence/absence surveys were conducted across 5 survey periods at 37 sites, yielding 330 survey detections (figure 2; tables 6–9). The PVER sites dominated the detection totals throughout the season (223 detections, 68 percent [%] of all survey detections) (table 8), covering just 27% of the surveyed habitat.

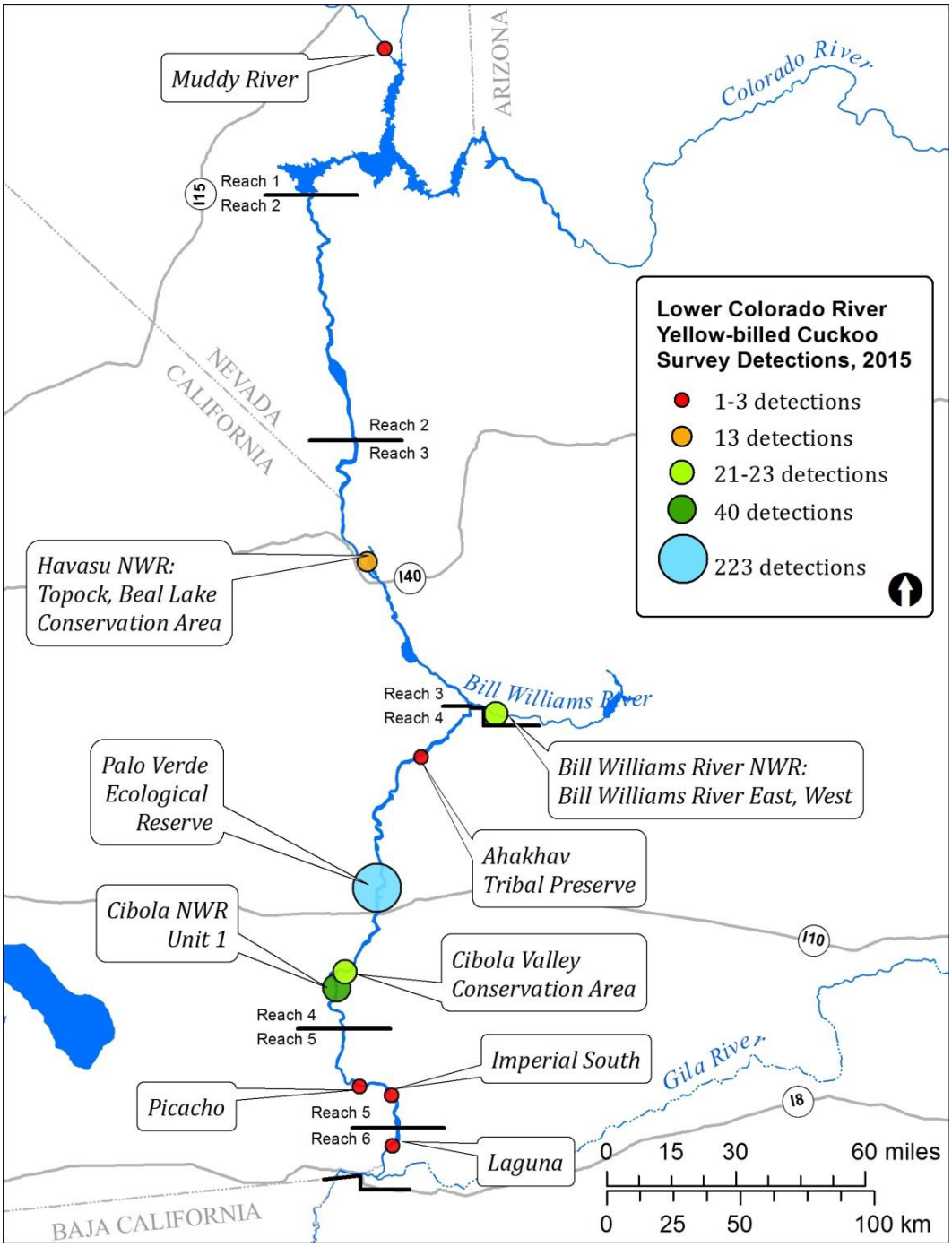

Figure 2.—Map of Lower Colorado River Multi-Species Conservation Program YBCU detections by area, 2015.

Table 6.—Lower Colorado River YBCU survey detections and territory estimates for reach 1 through reach 3 sites (Muddy River, Beal Lake Conservation Area, and Topock), 2015

Site	Detections per survey period (2015 dates in parentheses)					Total	Estimated territories			Size (ha)	Detections per ha / 20 ha	Minimum territories per ha / 20 ha
	1	2	3	4	5		POS	PRB	COB			
Overton Wildlife	0 (6/23)	0 (7/07)	1 (7/19)	0 (8/04)	NA	1	0	0	0	40.0	0.03 / 0.50	0 / 0
CPhase 05	0 (6/15)	3 (6/30)	2 (7/14)	1 (7/27)	0 (8/14)	6	0	1	1	19.7	0.30 / 6.10	0.05 / 1.02
CPhase 06	1 (6/15)	0 (6/30)	0 (7/14)	0 (7/27)	0 (8/14)	1	0	0	0	15.8	0.06 / 1.26	0 / 0
Pintail Slough	1 (6/19)	1 (7/03)	1 (7/16)	0 (7/31)	NA	3	1	0	0	22.3	0.13 / 2.69	0 / 0
Topock Platform	2 (6/26)	0 (7/08)	1 (7/22)	0 (8/06)	0 (8/19)	3	1	0	0	9.3	0.32 / 6.43	0 / 0
Total	**4**	**4**	**5**	**1**	**0**	**14**	**2**	**1**	**1**	**107.1**	**0.13 / 2.61**	**0.01 / 0.19**

Table 7.—Lower Colorado River YBCU survey detections and territory estimates for reach 3 sites (Bill Williams River East and West), 2015

Site	Detections per survey period (2015 dates in parentheses)					Total	Estimated territories			Size (ha)	Detections per ha / 20 ha	Minimum territories per ha / 20 ha
	1	2	3	4	5		POS	PRB	COB			
Cave Wash	0 (6/17)	0 (6/29)	0 (7/14)	0 (7/27)	N/A	0	0	0	0	44.9	0 / 0	0 / 0
Cougar Point	0 (6/22)	0 (7/06)	0 (7/22)	0 (8/04)	N/A	0	0	0	0	49.7	0 / 0	0 / 0
Esquerra Ranch	1 (6/16)	1 (6/29)	0 (7/14)	0 (7/27)	0 (8/10)	2	1	0	0	73.9	0.03 / 0.54	0 / 0
Honeycomb Bend	0 (6/17)	1 (6/29)	1 (7/14)	0 (7/27)	0 (8/10)	2	2	1	0	24.8	0.08 / 1.61	0 / 0
Kohen Ranch	0 (6/22)	0 (7/06)	0 (7/22)	0 (8/04)	N/A	0	0	0	0	43.4	0 / 0	0 / 0
Mineral Wash	0 (6/16)	0 (6/29)	3 (7/14)	3 (7/27)	0 (8/10)	6	2	0	2	41.0	0.15 / 2.93	0.05 / 0.98
Total Bill Williams River East	**1**	**2**	**4**	**3**	**0**	**10**	**5**	**1**	**2**	**277.7**	**0.04 / 0.72**	**0.01 / 0.14**
Borrow Pit	0 (6/18)	0 (7/01)	0 (7/15)	0 (7/29)	N/A	0	0	0	0	37.8	0 / 0	0 / 0
Bill Williams Marsh (BM March)	1 (6/29)	1 (7/13)	0 (7/28)	0 (8/11)	0 (8/20)	2	1	0	0	18.4	0.11 / 2.18	0 / 0
Cross River	0 (6/16)	0 (7/01)	0 (7/15)	0 (7/29)	N/A	0	0	0	0	50.5	0 / 0	0 / 0
Mosquito Flats	1 (6/25)	2 (7/09)	1 (7/21)	3 (8/05)	N/A	7	0	1	0	58.9	0.12 / 2.38	0 / 0
North Burn	0 (6/18)	2 (7/02)	0 (7/15)	0 (7/29)	0 (8/13)	2	0	0	0	42.1	0.05 / 0.95	0 / 0
Sandy Wash	1 (6/15)	1 (7/01)	0 (7/15)	0 (7/29)	0 (8/11)	2	1	0	0	80.8	0.02 / 0.50	0 / 0
Total Bill Williams River West	**3**	**6**	**1**	**3**	**0**	**13**	**2**	**1**	**0**	**288.5**	**0.05 / 0.90**	**0 / 0**
Total Bill Williams River	**4**	**8**	**5**	**6**	**0**	**23**	**7**	**2**	**2**	**566.2**	**0.04 / 0.81**	**0.004 / 0.07**

Table 8.—Lower Colorado River YBCU survey detections and territory estimates for reach 4 sites (‘Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1 Conservation Area), 2015

Site	Detections per survey period (2015 dates in parentheses)					Total	Estimated territories			Size (ha)	Detections per ha / 20 ha	Minimum territories per ha / 20 ha
	1	2	3	4	5		POS	PRB	COB			
‘Ahakhav Tribal Preserve	0 (6/19)	3 (7/01)	0 (7/15)	0 (7/29)	0 (8/11)	3	0	0	0	62.5	0.05 / 0.96	0 / 0
Cottonwood Genetics	0 (6/22)	0 (7/06)	1 (7/20)	0 (8/03)	0 (8/18)	1	0	0	0	16.5	0.06 / 1.21	0 / 0
Crane Roost	5 (6/16)	7 (6/30)	10 (7/14)	7 (7/28)	4 (8/10)	33	1	1	4	57.3	0.58 / 11.52	0.07 / 1.40
Mass Transplanting	0 (6/22)	0 (7/06)	0 (7/20)	0 (8/03)	0 (8/18)	0	0	0	0	8.1	0 / 0	0 / 0
Nature Trail	2 (6/22)	0 (7/06)	0 (7/20)	1 (8/03)	0 (8/18)	3	1	0	0	14.5	0.21 / 4.14	0 / 0
CW-North	0 (6/22)	0 (7/06)	0 (7/20)	0 (8/03)	0 (8/18)	0	0	0	0	7.3	0 / 0	0 / 0
Hippy Burn	1 (6/26)	0 (7/10)	2 (7/20)	0 (8/04)	0 (8/20)	3	1	0	0	29.1	0.10 / 2.06	0 / 0
CVCA Phase 01	1 (6/24)	4 (7/06)	2 (7/20)	2 (8/03)	0 (8/17)	9	3	0	0	37.1	0.24 / 4.84	0 / 0
CVCA Phase 02	4 (6/24)	2 (7/06)	1 (7/20)	3 (8/03)	0 (8/17)	10	2	0	0	27.5	0.36 / 7.27	0 / 0
CVCA Phase 03	0 (6/17)	0 (7/01)	2 (7/15)	0 (7/29)	0 (8/12)	2	0	0	0	43.9	0.05 / 0.91	0 / 0
PVER Phase 01	0 (6/19)	2 (7/03)	2 (7/17)	0 (7/31)	0 (8/13)	4	1	0	0	13.0	0.31 / 6.14	0 / 0
PVER Phase 02	3 (6/25)	3 (7/09)	5 (7/21)	2 (8/04)	1 (8/20)	14	2	2	2	31.5	0.44 / 8.87	0.06 / 1.27
PVER Phase 03	1 (6/25)	2 (7/08)	5 (7/22)	3 (8/05)	0 (8/20)	11	0	0	1	34.0	0.32 / 6.47	0.03 / 0.59
PVER Phase 04	4 (6/19)	3 (7/03)	7 (7/17)	8 (7/31)	2 (8/13)	24	1	2	5	41.2	0.58 / 11.64	0.12 / 2.42
PVER Phase 05	8 (6/23)	10 (7/07)	11 (7/21)	11 (8/04)	3 (8/18)	43	6	1	5	87.4	0.49 / 9.83	0.06 / 1.14
PVER Phase 06	14 (6/18)	13 (7/02)	16 (7/16)	17 (7/30)	12 (8/13)	72	8	7	16	89.0	0.81 / 16.19	0.18 / 3.60
PVER Phase 07	4 (6/15)	18 (6/29)	13 (7/13)	13 (7/28)	7 (8/10)	55	5	4	12	91.6	0.60 / 12.00	0.13 / 2.62
Total	**47**	**67**	**77**	**67**	**29**	**287**	**31**	**17**	**45**	**691.5**	**0.41 / 8.30**	**0.07 / 1.30**

Table 9.—Lower Colorado River YBCU survey detections and territory estimates for reach 5 and reach 6 sites (Lago Tres to Mittry), 2015

Site	Detections per survey period (2015 dates in parentheses)					Total	Estimated territories			Size (ha)	Detections per ha / 20 ha	Minimum territories per ha / 20 ha
	1	2	3	4	5		POS	PRB	COB			
Lago Tres	–	0 (7/12)	1 (7/24)	0 (8/10)	N/A	1	0	0	0	14.8	0.07 / 1.35	0 / 0
Fisher's Landing	0 (6/22)	2 (7/08)	0 (7/22)	0 (8/05)	N/A	2	0	0	0	24.4	0.08 / 1.64	0 / 0
Mittry	3 (6/23)	0 (7/11)	0 (7/23)	0 (8/09)	N/A	3	0	0	0	12.2	0.25 / 4.92	0 / 0
Total	**3**	**2**	**1**	**0**	**N/A**	**6**	**0**	**0**	**0**	**51.4**	**0.12 / 2.34**	**0 / 0**

Table 10.—Lower Colorado River YBCU survey detections and territories by river reach/area, 2015 (summary of tables 6–9)

Reach No (#).	Detections per survey period					Total survey detections	Estimated territories			Detections per ha / 20 ha	Minimum territories per ha / 20 ha
	1	2	3	4	5		POS	PRB	COB		
Reach 1 (Muddy River)	0	0	1	0	N/A	1	0	0	0	0.03 / 0.50	0 / 0
Reach 3 (Beal Lake Conservation Area, Topock)	4	4	4	1	0	13	2	1	1	0.19 / 3.87	0.01 / 0.30
Reach 3 (Bill Williams River East, West)	4	8	5	6	0	23	7	2	2	0.04 / 0.81	0.004 / 0.07
Reach 3 total	**8**	**12**	**9**	**7**	**0**	**36**	**9**	**3**	**3**	**0.06 / 1.14**	**0.005 / 0.09**
Reach 4 ('Ahakhav Tribal Preserve)	0	3	0	0	0	3	0	0	0	0.05 / 0.96	0 / 0
Reach 4 (PVER)	34	51	59	54	25	223	23	16	41	0.57 / 11.50	0.11 / 2.11
Reach 4 (Cibola Valley Conservation Area)	5	6	5	5	0	21	5	0	0	0.19 / 3.87	0 / 0
Reach 4 (Cibola National Wildlife Refuge Unit #1 Conservation Area)	8	7	13	8	4	40	3	1	4	0.30 / 6.03	0.03 / 0.60
Reach 4 total	**47**	**67**	**77**	**67**	**29**	**287**	**31**	**17**	**45**	**0.41 / 8.30**	**0.07 / 1.30**
Reach 5 (Picacho, Imperial South)	0	2	1	0	N/A	3	0	0	0	0.08 / 1.53	0 / 0
Reach 6 (Laguna)	3	0	0	0	N/A	3	0	0	0	0.25 / 4.92	0 / 0
All sites	**58**	**81**	**88**	**74**	**29**	**330**	**40**	**20**	**48**	**0.23 / 4.66**	**0.03 / 0.68**

Breeding Territory Estimates and Proportion of Habitat Occupied

Based on the timing, location, and persistence of all detections, up to 108 YBCU breeding territories were estimated within the surveyed parts of the study area. These included 40 POS, 20 PRB, and 48 COB territories (figure 3; tables 6–10). The most common evidence of breeding was observed nests (n = 39) (see the "Population Monitoring" section). Another nine territories were confirmed by locating fledglings or juveniles. The overall proportion of surveyed habitat occupied by YBCUs was 55% (41 of 75 sample units). By geographic area, the proportion of surveyed habitat occupied was:

- 0% at Muddy River (0 of two sample units surveyed)
- 50% at the Beal Lake Conservation Area (one of two sample units)
- 100% at Topock (two of two sample units)
- 29% at Bill Williams River East (4 of 14 sample units)
- 23% at Bill Williams River West (3 of 13 sample units)
- 0% at the 'Ahakhav Tribal Preserve (zero of two sample units)
- 96% at the PVER (22 of 23 sample units)
- 67% at the Cibola Valley Conservation Area (four of six sample units)
- 63% at the Cibola National Wildlife Refuge Unit 1 Conservation Area (Cibola NWR Unit #1) (five of eight sample units)
- 0% in Picacho, Imperial South, and Laguna (zero of three sample units surveyed).

Discussion

Over the past several years, detections (see figure 2) and breeding territories (see figure 3) have increased in LCR MSCP habitat creation areas, generally in line with the continuing new availability of LCR MSCP-created habitat planted from 2005 to 2012 (mainly plantings at the CVCA initially, then the PVER in later years). In 2015, survey detections dropped slightly, and decreased earlier in the season. This corresponds to no active nests being observed in September

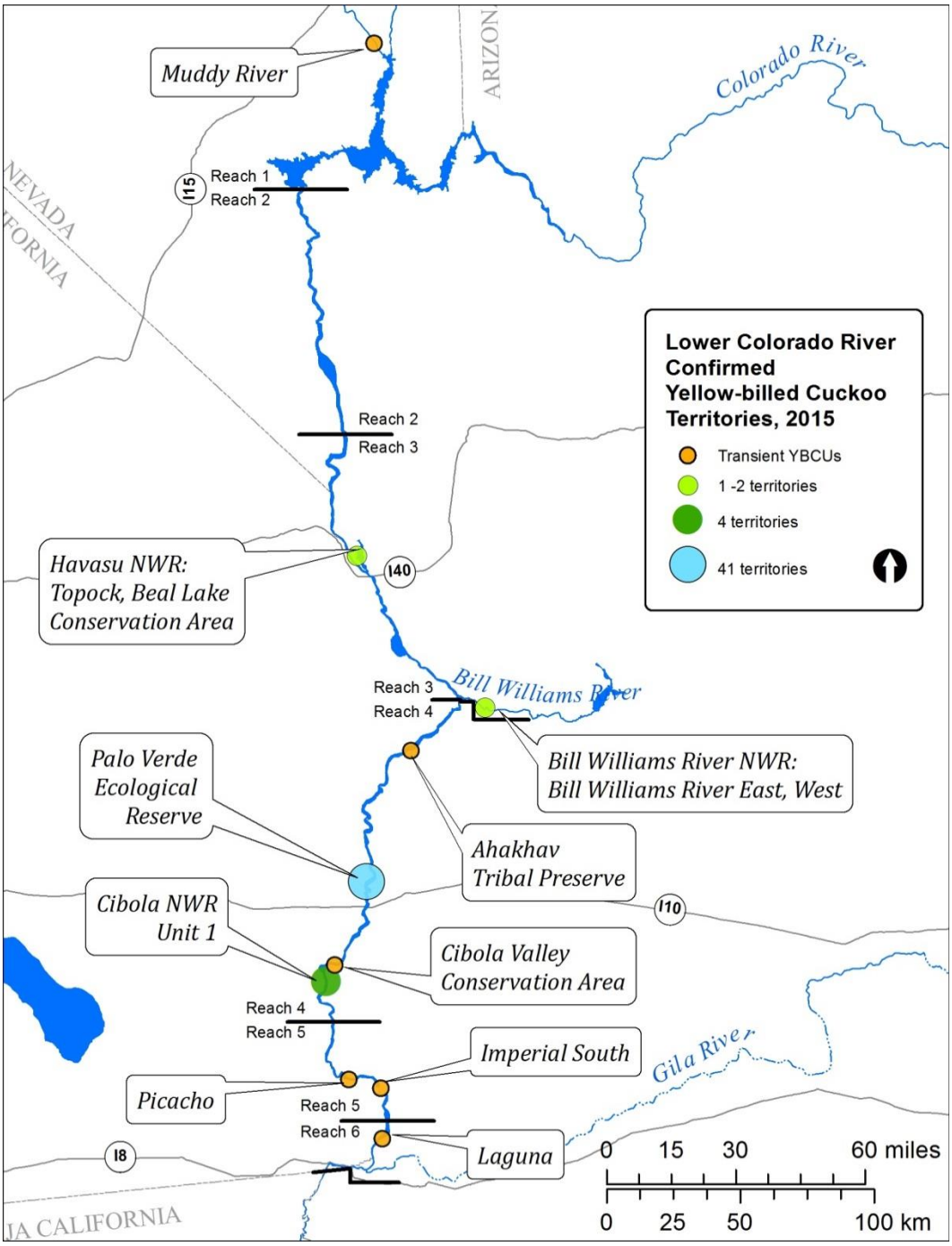

Figure 3.—Lower Colorado River minimum (confirmed) YBCU breeding territories by survey area, 2015.

compared to 2012 and 2014 (see the "Population Monitoring" section for more information). Increased densities of survey detections and confirmed breeding territories were previously observed in the youngest (2 to 4 year old) cottonwood-willow plantings (McNeil et al. 2013; McNeil and Tracy 2013). This apparent preference for young plantings continued in 2015, with PVER Phase 05 to Phase 07 (aged 3 to 5 years) contributing to most of the detections and COBs, while covering just 19 % of the surveyed area. At the same time, survey detections and estimated territories have continued to decrease at the Bill Williams River since 2010. These results may be related to differences in food availability; natural pioneer cottonwood-willow forests are maintained by periodic flood disturbance (Stromberg 2001), which may support an insect community that generally favors young vegetation (Raupp and Denno 1983). With no large flood released on the Bill Williams River since 2006, a lack of succession may be reducing YBCU prey biomass and potentially reducing habitat suitability. A similar pattern was also observed in the numbers of survey detections and territories at the CVCA, where planting of cottonwood and willow stopped after 2008 and irrigation was reduced.

With the planting of cottonwood-willow at the PVER completed in 2012, this area may also experience reduced YBCU activity once the majority of trees in all phases are older than 4 years unless some existing habitat is set back to a younger stage through adaptive management. The next preferred area may become the Laguna Division Conservation Area (Reclamation 2012), the latest riparian area to be planted under the LCR MSCP. This area is scheduled to be surveyed in 2016. A comparison of survey detections by area from 2008 through 2015 is shown in figure 4.

POPULATION MONITORING

Introduction

Objectives from the Yellow-billed Cuckoo Monitoring Statement of Work were to utilize population parameters to: (1) assess whether YBCUs are increasing due to LCR MSCP habitat creation activities, (2) provide a reference for the status of YBCUs utilizing created habitat, and (3) assess habitat quality (determination of habitat quality through vegetation monitoring has since been removed from the scope of this contract). In general, wildlife population status and trends should be defined in terms of site and habitat specific measures of productivity, density, and survival (Van Horne 1983). Annual productivity and reproductive success are measured by finding and monitoring nests. Population density is estimated from a combination of surveys (see the "Presence/Absence Surveys and Habitat Occupancy" section) and intensive searches for nests and other breeding evidence. Survival is measured through the analysis of multi-year mark-recapture (banding) data.

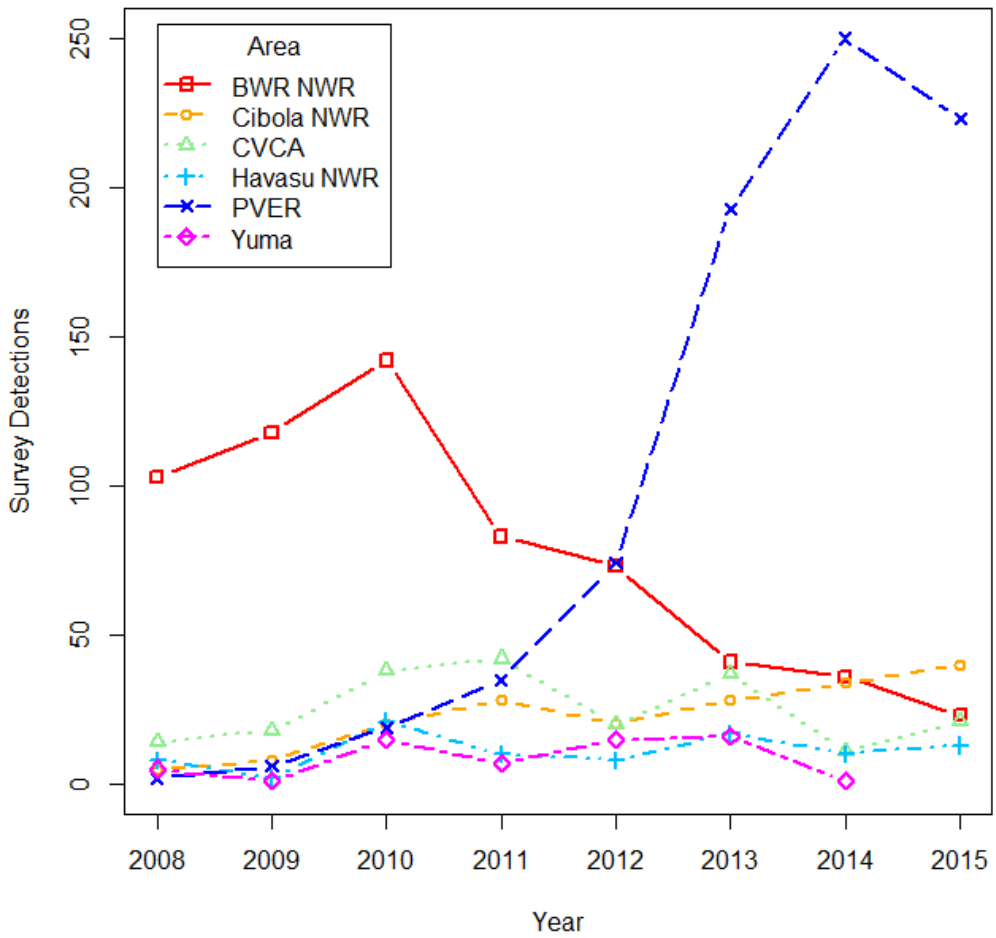

Figure 4.—Lower Colorado River YBCU survey detections by geographic area and year, 2008 to 2015.
2008 to 2014 data are from McNeil et al. (2013), McNeil and Tracy (2013), and Parametrix and SSRS (2015).

Locating and monitoring a sufficient number of nests enables comparisons of nest success and productivity across sites, habitats, and years. The widely used Mayfield (1975) estimator of nest survival accounts for nests that fail before being found and is almost always more accurate than apparent nest success, especially for species such as the YBCU, whose nests are rarely discovered at initiation. Mayfield produces similar estimates to other more complicated methods (Hensler and Nichols 1981; Jehle et al. 2004); however, potential factors affecting nest success, such as year, weather, season, and site-related covariates, are not considered. An analysis of nest survival, including covariates within program MARK (White and Burnham 1999) will be undertaken for the summary report.

Annual survivorship is a measure of non-breeding-season survival and requires mark-recapture or band re-sighting data (Lebreton et al. 1992). Annual survivorship is a critical measure of population stability, annual growth rate, and

habitat quality. Of several suggested measures of habitat quality, only adult and juvenile survival, and annual productivity, are found to be correlated with population growth rates (Knutson et al. 2006). To date, no estimates of survival in YBCUs exist. To accurately estimate annual survivorship for most wild bird populations, at least 10 years of continuous mark-re-sight data are necessary (Amstrup et al. 2005), giving an adequate sample size of marked birds. Seven years of banding and re-sighting YBCUs has already been undertaken in the LCR MSCP study area from 2008 to 2014 (McNeil et al. 2013; McNeil and Tracy 2013; Parametrix and SSRS 2015), resulting in the banding of 284 individual western YBCUs, which currently represents the largest number of banded YBCUs in 1 watershed. Estimates for survival, productivity, population growth rate, and dispersal patterns may be calculated in the final year of this project.

Before arrival to the breeding grounds and post-breeding, YBCU movements are poorly understood and could potentially provide important information regarding stopover habitat use affecting the conservation of this population. To gain a better understanding of pre- and post-breeding habitat use, GPS units are attached to a subset of annually captured birds. PinPoint GPS tags (Lotek Systems Inc., Ontario) are lightweight electronic data loggers capable of measuring and storing geographical location data for up to 12 months, including areas a bird may migrate to or overwinter, identifying areas that may benefit from additional habitat management. The data remain on the data logger indefinitely, but birds must be recaptured to retrieve the data. The units record and store geographic locations (latitude and longitude) on pre-designated dates, averaging 10 m (33 ft) accuracy in open areas, and up to 50 m (164 ft) under dense canopy cover. PinPoint units can include transmitters, which may help to locate returning birds through telemetry and increase the likelihood of recapture.

Methods

Nest Searching and Monitoring

All field work followed The Ornithological Council's guidelines for the use of wild birds in research (Fair et al. 2010). Field personnel were trained in safe and effective techniques for locating YBCU nests, emphasizing safety and minimization of disturbance to breeding birds. YBCUs may be subtle in their distress signals, and can abandon nests if disturbed (Halterman 2000). If a bird showed repeated alarm calls or distraction displays for over 5 minutes, observers moved at least 100 m (328 ft) away, returning cautiously and quietly after a minimum of 30 minutes.

Given the potential for temperatures lethal to bird eggs (40.5 to 44 °C; 104.9 to 111.2 °F) (Conway and Martin 2000; Webb 1987), care was taken not to deter adults from incubating, and field activities ceased when ambient temperature reached 40 °C (104 °F). Nest observers checked for predators before

nest visits and minimized the time spent at nests. Because flagging may increase predation risk, it was used sparingly and placed at least 10 m (32.8 ft) away from nests when possible.

A number of techniques were used to search for nests every 2 to 4 days at sites with current YBCU activity. YBCUs may respond to broadcast survey calls from their nest, during or after surveys; therefore, surveyors briefly searched in all accessible suitable vegetation surrounding detection locations. Known nest substrates (within suitable woody riparian habitat) in the study area include Fremont cottonwood, Goodding's willow, honey mesquite, tamarisk, coyote willow, and seep willow. Nesting pairs share incubation duties (Potter 1980; Hughes 1999; Halterman 2009), often vocalizing during nest exchanges or before feeding young. One or more observers waited in an area of a suspected nest, beginning pre-dawn, and continued throughout the morning triangulating and searching for locations of calling birds. Localized activity or behavioral clues were also followed (e.g., food and stick carries, and repeated alarm calls), and areas within 100 m (328 ft) were intensively searched. When possible, systematic searches were also performed in areas of suspected nesting, whereby all suitable vegetation was scanned. Because YBCUs may show an affinity for edges (Hamilton and Hamilton 1965; Parker et al. 2005), systematic searches were concentrated within edge and structural transition zones, such as borders between different species or height classes, and within 50 m (164 ft) of habitat boundaries adjacent to upland areas, agricultural fields, or roads. In addition, radio telemetry was used to locate nests.

YBCU nests can appear similar to nests of mourning doves (*Zenaida macroura*) and other dove species. YBCUs and doves may also use each other's old nests (Jay 1911; McNeil et al. 2013; SSRS 2010, personal observation). YBCU nests were identified as those containing one or more bluish eggs or YBCU chicks. Recently used YBCU nests were identified by the presence of bluish egg fragments remaining in or directly below the nest.

After finding a nest, flagging was placed at least 10 m away, and the GPS location was recorded. A basic description of the nest was recorded, including the species of nest substrate, approximate substrate height, and nest height, to assist in relocating the nest. Information on the nesting stage and the banded status of adults was also recorded when possible. Telescoping mirrors or camera poles were used to determine the stage and contents of nests every 2 to 4 days. Nests that were too high in a tree to see into with the telescoping mirror or camera pole were monitored with binoculars from a distance to determine the stage of the nest. All observations made during nest visits were completed as quickly as possible to reduce the potential to disturb nesting birds. Sometimes data were recorded in a field notebook first, and then entered into a MEFF at a later time when observers were away from the nest. For example, when the canopy cover was too thick for a GPS unit to acquire satellites quickly, data were recorded in a field notebook.

Clutch size was recorded as the total number of eggs known to have been laid in each nest. For nests with an indeterminate number of eggs (such as nests too high to see into), the average of the estimated minimum and maximum possible number of eggs was calculated. In these cases, a nest was assumed to have a minimum and maximum clutch size of 1 to 4 eggs respectively, with an average of 2.5 eggs per clutch. Nest fate was considered successful if at least one young fledged, which was determined by a fledgling or adult being detected near the nest within 2 days of the estimated fledge date. Young YBCUs leave the nest before they can fly, climbing or hopping onto nearby branches where they may remain for several days, and can sometimes be located near their nests at this time. Nests were classified as failed when there was no evidence of fledglings, nests were damaged or destroyed, large eggshell fragments or remains were observed nearby, or the nest was empty before the earliest possible fledge date (approximately 6 days after hatching), with no further activity detected nearby. Nests were determined abandoned if intact eggs or live chicks remained at the nest and no further parental activity was observed.

Apparent nest success was calculated as the number of successful nests divided by the total number of successful and unsuccessful nests. Because apparent nest success usually overestimates true success, overall Mayfield (1975) nest survival was also calculated using the formula:

$$nest\ survival\ = \left(\frac{total\ exposure\ days - failed\ nests}{total\ exposure\ days}\right)^{nesting\ period}$$

assuming constant daily survival and an average nesting period of 18 days. Exposure days were calculated as the interval from the discovery date until the midpoint of the last known active date and the subsequent visit (Mayfield 1975). The Mayfield estimate was also calculated for each area with at least 20 nests found (Hensler and Nichols 1981).

Nest productivity was calculated as the average number of young fledged from each nest. For nests with an unknown number fledged, the minimum and maximum possible number of YBCU fledged were estimated as follows. The minimum number of YBCU fledged was the number of young seen or heard outside the nest, or 1 if no fledglings were detected but an adult was agitated near the empty nest. The maximum possible number of fledged was estimated as all possible eggs or young that could have fledged minus any eggs or young known not to have fledged. For example, if the number of eggs were estimated to be between 1 and 4 (because the nest was too high to see into), and 1 egg was found on the ground, 2 chicks were seen in the nest, and 1 fledgling was heard above the nest, the minimum and maximum number of eggs, nestlings, and fledglings would be 2 to 4, 2 to 3, and 1 to 3.

Once nests were inactive, basic nest attributes were measured, including nest substrate height, diameter at breast height of substrate, and nest height. Spherical densiometers were used to measure canopy cover at 10 points including: 1 measurement was taken directly above the nest, 1 measurement was taken directly below the nest, 4 measurements were taken at 5 m (16.4 ft) and 4 measurements were taken at 10 m (32.8 ft) from the center of the nest in all 4 cardinal directions. Some measurements were not collected at nests destroyed by weather or if nests were too high to reach by ladder.

Mist Netting, Color Banding, and Re-sights

The health and welfare of wild birds is paramount, and the guidelines recommended in North American Bird Banding Techniques Volume II (Canadian Wildlife Service and USFWS 1977) and the Guidelines to the Use of Wild Birds in Research (Fair et al. 2010) were followed. Mist netting is a safe, common, and effective means of capturing adult birds (Spotswood et al. 2011), and all netting and banding were conducted by experienced, federally permitted banders or subpermittees. All banders and banding assistants attended YBCU survey training as well as specialized mist net setup and banding training.

After locating a responsive adult, a suitable net lane was established, and a target mist net technique modified from Sogge et al. (2001) was used. Two to four stacked, 7.8 to 12 m high, (25.6 to 39.4 ft) nets ranging in length from 9 to 18 m (29.5 to 59 ft) were attached between two canopy poles (Bat Conservation and Management, Inc.), and placed in a vegetation gap of similar canopy height. Recorded YBCU vocalizations were broadcast from speakers on either side of the mist net to lure the YBCUs toward the net. Capture attempts ceased when temperatures reached 40 °C (104 °F), or when cuckoos became unresponsive.

To increase the number of unique leg band color combinations available, the Federal aluminum bands were color anodized. Different colors have been used in previous years, including gold (Ag) from 2008–10, mid-blue (mB) in 2011, magenta (Mg) in 2012–13 (McNeil et al. 2013; McNeil and Tracy 2013), and red (R) in 2014 (Parametrix and SSRS 2015). In 2015, newly captured YBCUs were banded with an unanodyzed Federal (silver, S) band on one leg and a pinstriped (two or three striped) aluminum band on the other leg to form a unique color combination. Non-targeted species were immediately released from nets without banding. Nestling YBCUs were also banded if reachable (i.e., from nests less than around 7 m [23 ft] high and safely accessible by ladder), at 3 to 6 days old when their tarsi were long enough to hold a leg band.

A stopped wing rule was used to measure wing and tail length, calipers were used to measure bill length, and a 100-gram (g) Pesola® or a 400-g Acculab digital scale was used to weigh the birds. For adults, molt, feather wear, orbital ring color, cloacal protuberance score, and brood patch score were also recorded

following the Monitoring Avian Productivity and Survivorship protocol (DeSante et al. 2014). Details of net attempts and captures were entered into a banding MEFF. A data sheet was also used as a backup.

Sexing of captured birds is required for population demographic measurement, including sex based survival rates; however, the sexes look alike, and although females average slightly larger than males (Pyle 1997), individuals cannot be reliably sexed by morphology. To sex birds, a small amount of blood was extracted from the brachial vein of each bird and placed on PermaCode™ cards or filter paper and dried. Deoxyribonucleic acid (DNA) was extracted from each dried blood sample and sexed by S. McNeil at the Culver Laboratory of Conservation Genetics, University of Arizona, following a universal avian sexing method (Han et al. 2009).

During all field work, field crews attempted to re-sight previously banded YBCUs throughout the season by observing birds with binoculars or photographing the legs of all YBCUs detected. Re-sight data were recorded into a field notebook, then transferred into a MEFF after either the color combination was confirmed or the banded bird was no longer able to be detected.

Radio Telemetry

To increase the number of nests found, a subset of captured adults was fitted with Lotek Biotrack PicoPip Ag 392 radio transmitters weighing 1.1 to 1.2 g (0.04 ounces [oz], < 2.5% total body mass). The transmitters were operational for 6 to 10 weeks. Kevlar thread was used to stitch the transmitters to the two central rectrices (tail feathers), approximately 1 centimeter (0.39 inch) from each feather base to avoid the uropygial gland, with knots secured by a small drop of cyanoacrylate glue (Pitts 1995; Woolnough et al. 2004). The transmitters fall off the birds when their central rectrices are replaced annually during the non-breeding season (Pyle 1997; Rohwer and Wood 2013). Communications Specialists Model R1000 telemetry receivers and Communications Specialists RA-150 Folded Yagi directional antennae were used to monitor the radioed YBCUs.

During telemetry sessions, GPS locations, bearings, estimated distances to the signal, and observed behaviors were entered into a telemetry MEFF. The data were then imported into ArcMap and spatially visualized to aid in nest finding. If an observer suspected that their presence was disturbing a bird, the observer moved up to 50 m (164 ft) away from the bird and triangulated 2 to 3 bearings approximately 90 degrees apart to estimate the bird's location. When a radio signal was no longer detected at the capture site, observers searched for the signal either on foot or by vehicle for the remainder of the season. If a signal was lost without any additional re-sights, the bird was assumed to have left the area, although transmitter failure was also possible.

PinPoint GPS Units

In 2014 and 2015, PinPoint Host version 2.1.0.15 software (Fowler 2014) was used to program the PinPoint-10 GPS units to record locations on up to 10 (2014) or 20 (2015) specific dates outside the peak breeding season (tables 11 and 12). PinPoint units were given slightly different schedules to reduce the chance of extensive data loss due to a poor satellite signal on a specific day. Each built in transmitter was tested before being deployed, with the frequency emitting the strongest signal recorded.

Table 11.—Example of PinPoint-10 schedule, 2014 to 2015

GPS point #	Date	Stage
1	September 7, 2014	Post-breeding
2	September 17, 2014	Post-breeding/fall migration
3	September 27, 2014	Post-breeding/fall migration
4	October 5, 2014	Fall migration
5	October 15, 2014	Fall migration
6	January 31, 2015	Wintering
7	May 15, 2015	Spring migration
8	May 26, 2015	Spring migration
9	June 6, 2015	Spring migration/pre-breeding
10	June 16, 2015	Spring migration/pre-breeding

Seven YBCUs were fitted with PinPoint units in both 2014 (Parametrix and SSRS 2015) and 2015. Breeding birds, or those suspected of breeding, were targeted to increase the likelihood of recapture the following year (due to the observed site fidelity of many breeding YBCUs). The PinPoint-10 GPS units weighed 1.1 g (0.04 oz), and the transmitters weighed 0.7 g (0.02 oz), totaling 1.8 g (2.0 g [0.07 oz] with harness, ≤ 3% total body mass). The attachment weight limit of 3% of total mass required the birds to weigh at least 65.5 g (2.3 oz), which is more likely for females. The transmitters were programmed to activate on June 30 of the following year, when most birds should have returned to their breeding grounds and should still be responsive to playback calls used to lure birds into mist nets. On activation, the transmitters should emit a radio signal for 7 to 14 days. To test the functionality of the transmitters (i.e., transmission of a signal during the programmed period), an additional two control transmitters were programmed each year to activate on the same date as the deployed units.

Table 12.—Example of PinPoint-10 schedule, 2015 to 2016

GPS point #	Date	Stage
1	September 2, 2015	Post-breeding
2	September 16, 2015	Post-breeding/fall migration
3	October 2, 2015	Fall migration
4	October 16, 2015	Fall migration
5	October 23, 2015	Fall migration
6	October 30, 2015	Fall migration
7	November 6, 2015	Fall migration
8	November 13, 2015	Fall migration/wintering
9	December 2, 2015	Wintering
10	January 16, 2016	Wintering
11	March 16, 2016	Wintering
12	April 16, 2016	Wintering/spring migration
13	May 16, 2016	Spring migration
14	May 23, 2016	Spring migration
15	May 30, 2016	Spring migration
16	June 6, 2016	Spring migration
17	June 13, 2016	Spring migration/pre-breeding
18	June 20, 2016	Spring migration/pre-breeding
19	June 27, 2016	Spring migration/pre-breeding
20	June 29, 2016	Spring migration/pre-breeding

The PinPoint units were attached to lower-back, leg-loop harnesses made of a 1-millimeter elastic cord, fitted to each YBCU, and secured with Kevlar thread and cyanoacrylate glue on the knots (Rappole and Tipton 1991). Each transmitter was thoroughly examined before the YBCU was released to ensure proper fit of the harness. Birds were monitored from a distance of at least 10 m (32.8 ft) for up to 30 minutes to confirm the bird accepted the transmitter and resumed normal behavior and flight. Banding crews were instructed that should any YBCU captured appear agitated by the harness or seem unable to fly, they should immediately try to recapture the bird and remove the attachment. To date, this has never been an issue of concern on this project.

Recapture is required to retrieve the PinPoint units to download the data. During 2015, field crews searched previous capture sites and adjacent areas to relocate birds fitted with PinPoint units in 2014. If one was re-sighted or suspected to be in an area, targeted netting was used to recapture the bird. On recapture, the

PinPoint GPS unit and harness were removed, and the area of attachment was thoroughly examined for any signs of injury or abrasion. PinPoint Host software (Fowler 2014) was used to download the stored GPS data to text files, and ArcMap™ version 10.3.1 (copyright © Esri) was used to map the locations.

Results

Nests

Between July 3 and August 11, 2015, 39 YBCU nests were found in the study area (table 13). These included 33 nests at the PVER (Phases 02 to Phase 07), 3 at Cibola NWR Unit #1 (Crane Roost), 2 at Bill Williams River East (Mineral Wash), and 1 at the Beal Lake Conservation Area (CPhase 05). Most nests were located by telemetry (n = 22) or by behavioral cues (n = 14). Known nesting activity began June 25 at PVER Phase 07 and ended around August 27 at PVER Phase 05. Nesting activity peaked the week of July 15 to July 21, with 27 active nests (see figure 5).

Most nests were located in Fremont cottonwoods (n = 24), followed by Goodding's willow (n = 9), honey mesquite (n = 4) and tamarisk (n = 2). For the first time, a YBCU nest at the PVER was found in a mesquite. Nest trees ranged in height from 4 m (13.1 ft) to 26 m (85 ft) and averaged 12.0 m (39.4 ft). Nest heights ranged from 1.3 m (4.3 ft) to 17 m (55 ft), averaging 6.9 m (22.5 ft).

Overall apparent nest success was 56%, and Mayfield success was 43% (n = 39). At the PVER, the only area with at least 20 nests found, apparent and Mayfield nest success were 55 and 42% respectively (n = 33). Depredation was the assumed cause of most nest failures, though the identities of predators were never confirmed. Potential predators incidentally observed during the season included king snakes (*Lampropeltis getula californiae*), Cooper's hawks (*Accipiter cooperii*), and common ravens (*Corvus corax*). In addition a white-nosed coati (*Nasua narica*) was observed for the first time on the YBCU project by Diane Tracy on July 30, near a recently failed nest in PVER Phase 06. Wind and rain were implicated in two nest failures. At least three nests failed to hatch any eggs despite both parents incubating long past the normal 10 day period (see table 13).

Clutch size averaged 2.88 (range 2 to 4, n = 33 nests with known clutch size, table 14). Nest productivity averaged 1.08 young fledged per nest, and between 43 and 49 young fledged from the nests monitored in 2015. Double-brooding by individual banded birds was observed at Cibola NWR Unit #1 Crane Roost and PVER Phases 04 to Phase 07, although no bird had more than one successful nest. The number of days between consecutive nests ranged from 4 to 21 (mean = 14).

Table 13.—Details of YBCU nests located within the LCR MSCP study area, 2015
(See the "Methods" section for further information on # eggs, # hatch, and # fledge)

Site	Nest #	Male[a]	Female[a]	Date found	Tree sp.	1st egg	# eggs min-max[b]	# hatch min-max[b]	# fledge min-max[b]
CPhase 05	1	UNK	UNK	14-Jul	PROGLA	3-Jul	3-3	2-3	2-2
Mineral Wash	1	UNK	UNK	10-Jul	TAMSPP	3-Jul	2-2	1-2	0-0
Mineral Wash	2	UNK	UNK	16-Jul	TAMSPP	8-Jul	3-3	2-2	2-2
Crane Roost	1	CHE	UNK	6-Jul	PROGLA	5-Jul	3-3	1-2	0-0
Crane Roost	2	JER	UNB	16-Jul	PROGLA	7-Jul	3-3	3-3	3-3
Crane Roost	3	CHE	SAL	3-Aug	POPFRE	28-Jul	2-2	1-2	1-1
PVER 02[c]	1	GFK	UNB	13-Jul	SALGOO	3-Jul	2-4	1-4	0-0
PVER 02	2	UNB	UNK	15-Jul	POPFRE	10-Jul	2-2	1-2	0-0
PVER 03	1	UNK	UNK	16-Jul	POPFRE	14-Jul	3-3	2-3	2-3
PVER 04	1	TAC	CLE	16-Jul	SALGOO	15-Jul	1-4	0-0	0-0
PVER 04	2	TAC	CLE	24-Jul	POPFRE	23-Jul	1-4	0-0	0-0
PVER 04	3	UNK	CHU	30-Jul	POPFRE	21-Jul	3-3	2-2	2-2
PVER 04	4[c]	UNK	CLE	5-Aug	POPFRE	5-Aug	1-3	0-0	0-0
PVER 05	1[c]	DUM	BEL	21-Jul	POPFRE	19-Jul	3-3	0-0	0-0
PVER 05	2	UNK	UNK	1-Aug	SALGOO	23-Jul	2-2	2-2	0-0
PVER 05	3[c]	DUM	UNK	11-Aug	POPFRE	10-Aug	2-2	0-0	0-0
PVER 06	1	SER	UNB	3-Jul	POPFRE	30-Jun	4-4	3-4	1-3
PVER 06	2	TAS	UNB	6-Jul	POPFRE	3-Jul	2-2	2-2	2-2
PVER 06	3	B1	UNK	13-Jul	SALGOO	UNK	2-4	1-4	0-0
PVER 06	4	PIE	B?	15-Jul	POPFRE	4-Jul	2-3	2-2	2-2
PVER 06	5[d]	PIS	UNB	16-Jul	SALGOO	14-Jul	4-4	2-2	0-0
PVER 06	6	UNK	JWZ	18-Jul	SALGOO	12-Jul	3-3	2-2	0-0
PVER 06	7	SNP	UNK	24-Jul	PROGLA	11-Jul	3-3	3-3	2-2
PVER 06	8[e]	JTK	UNK	26-Jul	POPFRE	8-Jul	2-4	2-4	2-4
PVER 06	9	TAS	UNK	31-Jul	POPFRE	25-Jul	2-2	2-2	0-0

Table 13.—Details of YBCU nests located within the LCR MSCP study area, 2015
(See the "Methods" section for further information on # eggs, # hatch, and # fledge)

Site	Nest #	Male[a]	Female[a]	Date found	Tree sp.	1st egg	# eggs min-max[b]	# hatch min-max[b]	# fledge min-max[b]
PVER 06	10	UNB	ONY	31-Jul	POPFRE	28-Jul	2-2	2-2	2-2
PVER 06	11	PIE	PUS	1-Aug	SALGOO	25-Jul	3-3	3-3	0-0[c]
PVER 07	1	FRL	UNB	6-Jul	SALGOO	25-Jun	3-3	3-3	3-3
PVER 07	2	CRU	UNB	6-Jul	POPFRE	3-Jul	3-3	2-2	2-2
PVER 07	3	HAL	WWW	9-Jul	POPFRE	8-Jul	3-3	0-0	0-0[a]
PVER 07	4	DOR	UNK	9-Jul	SALGOO	8-Jul	3-3	2-2	2-2
PVER 07	5	MRP	UNB	10-Jul	POPFRE	10-Jul	4-4	2-2	2-2
PVER 07	6	TFU	UNB	13-Jul	POPFRE	4-Jul	4-4	2-2	2-2
PVER 07	7	JKY	BRO	20-Jul	POPFRE	15-Jul	3-3	2-2	2-2
PVER 07	8	GOR	ELE	21-Jul	POPFRE	15-Jul	3-3	2-2	0-0[a]
PVER 07	9	STR	CHC	22-Jul	POPFRE	19-Jul	4-4	4-4	2-3
PVER 07	10	PAN	BOO	1-Aug	POPFRE	24-Jul	3-3	2-3	2-2
PVER 07	11	CHZ	UNK	3-Aug	POPFRE	24-Jul	3-3	2-2	2-2
PVER 07	12	HAL	WWW	10-Aug	POPFRE	5-Aug	2-2	1-2	1-1

[a] Identity of nesting adults: UNB = unbanded, and UNK = unknown; otherwise, three-letter ID of banded birds.
[b] Minimum and maximum possible number of eggs, nestlings, and fledglings for each nest. (See the "Methods" section for more information.)
[c] No eggs hatched despite incubation longer than the known maximum of 11 days.
[d] A coati (*Nasua narica*) was observed on the ground near the failed nest.
[e] Nest was found after chicks had fledged.

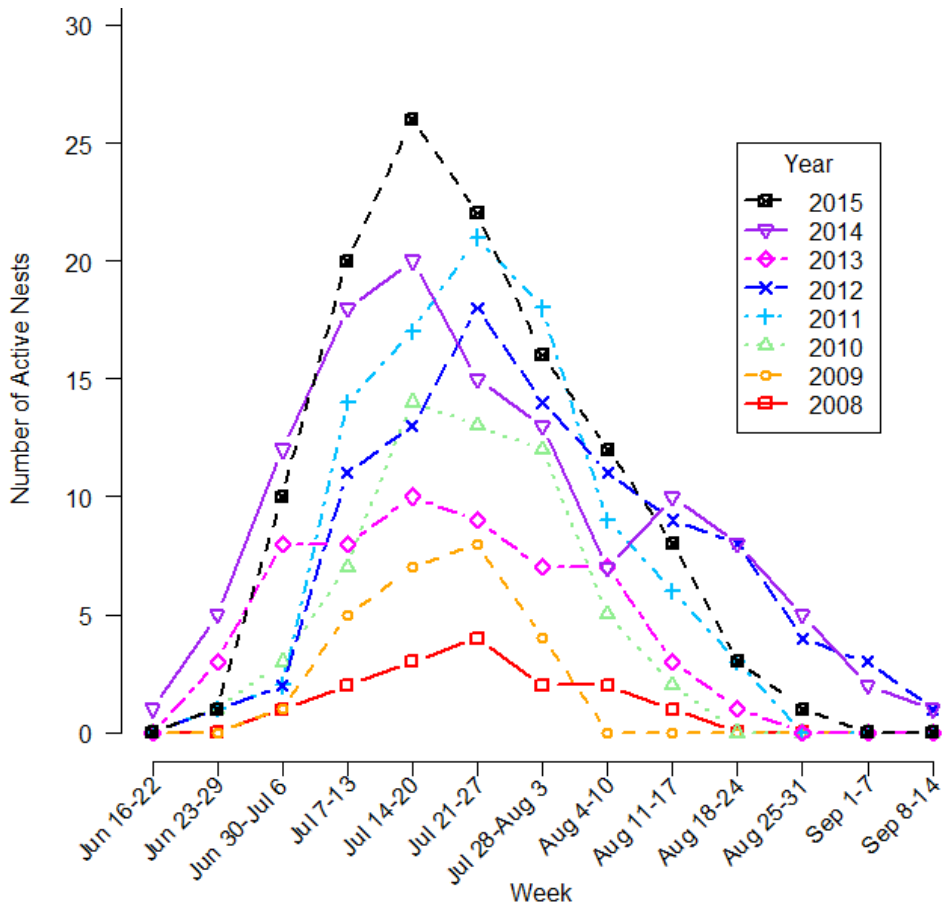

Figure 5.—Number of active YBCU nests monitored weekly within the LCR MSCP study area, 2008–2015.

One nest was outside the designated boundary of the Crane Roost site, between two agricultural fields to the east. This nest was unusual as it was located in a long thin cottonwood-willow windbreak less than 12 m (39.47 ft) wide. Through radio-tracking, both adults were regularly observed foraging in the nearby Crane Roost site.

Color Banding, Recaptures, and Re-sights

Between June 17 and August 17, 2015, a total of 45 adult YBCUs were captured, including 32 new and 13 previously banded birds (tables 15 and 16), equating to a recapture rate of 28.9 %. An additional 39 young were banded from 20 nests (table 17).

Table 14.—Summary by site of clutch size, productivity, and fates of thirty-nine YBCU nests monitored on the LCR, 2015

Site	# of nests	Mean clutch size	Total # of eggs		Total # hatched		Total # fledged		Mean productivity[a]	Nest fate	
			Min.	Max.	Min.	Max.	Min.	Max.		# fledged	# failed
CPhase 05	1	3.00	3	3	2	3	2	2	2.00	1	0
Mineral Wash	2	2.50	5	5	3	4	2	2	1.00	1	1
Crane Roost	3	2.67	8	8	5	7	4	4	1.33	2	1
PVER 02	2	2.00	4	6	2	6	0	0	0	0	2
PVER 03	1	3.00	3	3	2	3	2	3	2.50	1	0
PVER 04	4	3.00	6	14	2	3	2	2	0.50	1	3
PVER 05	3	2.30	7	7	2	2	0	0	0	0	3
PVER 06	11	2.89	29	34	24	30	11	15	0.90	6	5
PVER 07	12	3.17	38	38	24	26	20	21	1.75	10	2
All PVER	33	2.93	87	102	56	70	35	41	1.03	18	15
All sites	**39**	**2.88**	**103**	**118**	**66**	**84**	**43**	**49**	**1.08**	**22**	**17**

[a] Mean productivity = the average number of young fledged per nest for each site. For nests with an unknown number of fledglings, the average of the minimum and maximum possible number of fledglings (see the Methods section for more information).

Of five returning birds banded as young (n = 3 second-year, n = 1 third year, and n = 1 eighth-year), four returned to their natal area; the other was banded as a chick in 2008 at Cibola Valley Conservation Area Phase 01. This male was recaptured at Cibola NWR Unit #1 Crane Roost and nested successfully. Of eight recaptured birds originally banded after their hatching year (4 female and 4 male adults of unknown age), all were banded at the PVER and returned to nest there (tables 15 and 16).

Two previously banded birds were re-sighted at the Beal Lake Conservation Area: a male originally banded at the Cibola Valley Conservation Area in 2012 (likely a transient), approximately 152 km (94.5 mi) south of the Beal Lake Conservation Area, was observed copulating above the nest found at the CPhase 05 site (seetable 13), and a female originally banded at Cibola NWR Unit #1 Crane Roost (approximately 157.5 km [97.9 mi south]) in 2014 (table 16).

Table 15.—Adult YBCU captured or recaptured in the LCR MSCP study area, 2015

Band code[a]	C/R #[b]	Date	Site	LCR MSCP section	Bird ID	Band #	Color bands[c]	Age[d]	Sex[e]	Transmitter / PinPoint #[f]
N	1	17-Jun	Crane Roost	C2726	SCB	1713-67953	S / W-lB	AHY	M	T99
N	2	19-Jun	PVER Phase 05	C2347	FLI	1713-67955	S / W-Ag	AHY	M	T105
N	3	19-Jun	PVER Phase 06	C2351	TAS	1713-67954	S / W-G-W	AHY	M	T93
N	4	22-Jun	PVER Phase 07	C2358	TFU	1713-67956	S / R-W	AHY	M	T97
N	5	23-Jun	Crane Roost	C2726	CHE	1713-67957	S / Ag-Lv-Ag	AHY	M	T108
N	6	24-Jun	PVER Phase 07	C2356	DOR	1352-59049	S / lB-R	AHY	M	T94
N	7	30-Jun	PVER Phase 05	C2346	MRP	1352-59050	S / lB-W	AHY	M	T112
N	8	2-Jul	Crane Roost	C2726	CHP	1352-59051	S / V-R	AHY	F	T106
N	9	2-Jul	PVER Phase 07	C2356	JKY	1352-59055	S / O-W	AHY	M	T92
N	10	3-Jul	PVER Phase 07	C2359	FRL	1352-59052	S / Lv-Ag-Lv	AHY	M	T111
N	11	6-Jul	PVER Phase 07	C2356	CHU	1352-59053	S / O-R	AHY	F	T100
N	12	6-Jul	PVER Phase 05	C2346	CLE	1352-59056	S / mB-Y	AHY	F	T114
N	13	7-Jul	Crane Roost	C2727	PEA	1352-59057	S / lB-W	AHY	U	N/A
N	14	13-Jul	PVER Phase 06	C2351	MLS	1713-67947	S / V-O-V	AHY	F	T98
N	15	13-Jul	Crane Roost	C2726	POP	1352-59059	S / Lv-lB	AHY	F	T103
N	16	13-Jul	Crane Roost	C2726	SAL	1352-59058	S / mB-R	AHY	F	T104
N	17	14-Jul	PVER Phase 07	C2358	TWK	1352-59054	S / lB-Ag	AHY	F	T95
N	18	17-Jul	PVER Phase 05	C2347	DUM	1352-59069	S / Bk-V	AHY	M	T73
N	19.1	17-Jul	PVER Phase 06	C2354	PIE	1352-59060	S / mB-lB	AHY	M	T107
N	20	20-Jul	PVER Phase 07	C2356	GOG	1713-67958	S / Ag-Lv	AHY	F	T75
N	21	20-Jul	PVER Phase 07	C2356	HOT	1352-59063	S / lB-mB	AHY	M	T120
N	22	21-Jul	PVER Phase 07	C2358	AMS	1352-59070	S / R-O	AHY	F	T71

Table 15.—Adult YBCU captured or recaptured in the LCR MSCP study area, 2015

Band code[a]	C/R #[b]	Date	Site	LCR MSCP section	Bird ID	Band #	Color bands[c]	Age[d]	Sex[e]	Transmitter / PinPoint #[f]
N	23	28-Jul	PVER Phase 06	C2352	SNP	1713-67904	S / Ag-R-Ag	AHY	M	N/A
N	24	29-Jul	PVER Phase 07	C2359	BRO	1713-67948	S / Bk-V-Bk	AHY	F	P40247
N	25	29-Jul	PVER Phase 07	C2356	CHC	1713-67959	S / lB-G	AHY	F	P40246
N	26	29-Jul	PVER Phase 07	C2356	STR	1352-59062	S / V-Bk	AHY	M	T115
N	27	30-Jul	PVER Phase 07	C2357	CHZ	1352-59071	S / Y-R	AHY	M	T70
N	28	31-Jul	PVER Phase 05	C2346	BAB	1713-67949	S / NoB	AHY	F	P40245
N	29	31-Jul	PVER Phase 07	C2358	GOR	1352-59061	S / Y-lB	AHY	M	N/A
N	30	3-Aug	PVER Phase 06	C2352	PAT	1352-59072	S / NoB	AHY	F	P40251
N	31	4-Aug	PVER Phase 07	C2359	PAN	1713-67950	S / NoB	AHY	M	P40249
N	32	5-Aug	PVER Phase 07	C2359	BOO	1352-59073	S / R-V	AHY	F	T74
R	1	22-Jun	PVER Phase 06	C2354	JTK	1713-67926	Mg / O-lB	ATY	M	N/A
R	2	24-Jun	PVER Phase 07	C2356	CRU	1222-90574	R / Bk-Y	ASY	M	T109
R	3	25-Jun	Crane Roost	C2727	JER	1212-13725	lB-V / Ag	8Y	M	T102
R	4.1	26-Jun	PVER Phase 05	C2349	SER	1713-67901	S / W-Lv	ATY	M	T116
R	5	29-Jun	PVER Phase 06	C2351	TAC	1352-59017	Y-Lv-Y / R	SY	M	T113
R	6	30-Jun	PVER Phase 07	C2356	JWZ	1352-59001	R / G-Ag-G	ASY	F	P30102[g], T101
R	7.1	1-Jul	PVER Phase 07	C2359	HAL	1222-90586	R / W-G	ASY	M	T96
R	8	7-Jul	Crane Roost	C2727	ORE	1222-90594	mB-G / R	SY	M	N/A
R	9.1	9-Jul	PVER Phase 06	C2355	ONY	1352-59029	O / R	SY	F	T110
R	10	24-Jul	PVER Phase 07	C2358	ELE	1222-90581	R / V	ASY	F	P30100[g]
R	11	28-Jul	PVER Phase 06	C2353	PIS	1202-68016	G-Bk-G / Mg	TY	M	T126
R	12	7-Aug	PVER Phase 06	C2354	PUS	1222-90580	R / lB	ASY	F	P30108[g]

Table 15.—Adult YBCU captured or recaptured in the LCR MSCP study area, 2015

Band code[a]	C/R #[b]	Date	Site	LCR MSCP section	Bird ID	Band #	Color bands[c]	Age[d]	Sex[e]	Transmitter / PinPoint #[f]
R	13	17-Aug	PVER Phase 07	C2356	WWW	1713-67938	R / Ag-lB	ASY	F	P40250
R*	4.2	27-Jul	PVER Phase 06	C2355	SER	1713-67901	S / W-Lv	ATY	M	N/A
R*	7.2	27-Jul	PVER Phase 07	C2357	MRP	1352-59050	S / lB-W	AHY	M	N/A
R*	9.2	13-Jul	PVER Phase 06	C2353	ONY	1352-59029	O / R	SY	F	N/A
R*	9.3	14-Jul	PVER Phase 06	C2355	ONY	1352-59029	O / R	SY	F	N/A
R*	9.4	15-Aug	PVER Phase 06	C2351	ONY	1352-59029	O / R	SY	F	P40248
R*	19.2	7-Aug	PVER Phase 06	C2354	PIE	1352-59060	S / mB-lB	AHY	M	N/A
R*	21.2	21-Jul	PVER Phase 06	C2355	HOT	1352-59063	S / lB-mB	AHY	M	N/A

[a] Band code: N = new, R = recapture, and R* = same-year recapture.
[b] C/R # = sequential capture (C) or recapture (R) number.
[c] Color bands: Ag = gold, Bk = black, G = green, lB = light blue, Lv = lavender, mB = mid blue, Mg = magenta, NoB = no band, O = orange, R = red, S = silver , V = violet, W = white, and Y = yellow. A hyphen (-) indicates a split band consisting of two or three colors.
[d] Age (O = oldest YBCU record): AHY = after hatching year, ASY = after 2nd year, 8Y = eighth year, ATY = after 3rd year, SY = second year, and TY = third year.
[e] Sex (confirmed by DNA test): M = male, F = female, and U = unknown (blood not collected).
[f] Transmitter (T) or PinPoint GPS unit (P) number, N/A = not applicable, g = GPS unit was deployed in 2014 and retrieved in 2015.

Table 16.—Capture history of YBCUs recaptured or re-sighted in the LCR MSCP study area, 2015

Bird ID	Sex[a]	Age[b]	Year banded	2015 re-sight date	Original capture / nest site	2015 return / nest site	Distance (m) re-sighted between years
JTK	M	ATY	2013	22-Jun	PVER Phase 05	PVER Phase 06[c]	1,280
CRU	M	ASY	2014	24-Jun	PVER Phase 05 / 07	PVER Phase 07[c]	239
JER	M	8Y[O]	2008	25-Jun	CVCA Phase 01	Crane Roost[c]	5,487
LLL[S]	F	A4Y	2012	25-Jun	CVCA 01 / Crane Roost	PVER Phase 06	36,361
SER	M	ATY	2013	26-Jun	PVER Phase 05/06	PVER Phase 06[c]	238
TAC	M	SY	2014	29-Jun	PVER Phase 06	PVER Phase 06 / 04[c]	1,513
JWZ	F	ASY	2014	30-Jun	PVER Phase 06	PVER Phase 06[c]	178
HAL	M	ASY	2014	1-Jul	PVER Phase 05/06	PVER Phase 07[c]	816
ORE	M	SY	2014	7-Jul	Crane Roost	Crane Roost	74
ONY	F	SY	2014	9-Jul	PVER Phase 06	PVER Phase 06[c]	279
GFK	M	A4Y	2012	13-Jul	PVER Phase 05	PVER Phase 02[c]	2,743
NIL[S]	F	ASY	2014	14-Jul	Crane Roost	CPhase 05	157,494
KIM[S]	M	A4Y	2012	23-Jul	CVCA Phase 01	CPhase 05[c]	151,960
ELE	F	ASY	2014	24-Jul	PVER Phase 07	PVER Phase 07[c]	313
PIS	M	TY	2013	28-Jul	PVER Phase 06	PVER Phase 06[c]	760
PUS	F	ASY	2014	7-Aug	PVER Phase 06	PVER Phase 06[c]	171
WWW	F	ASY	2014	17-Aug	PVER Phase 07	PVER Phase 07[c]	90

[a] Sex (confirmed by DNA test): M = male, and F = female.
[b] Age: ATY = after 3rd year, ASY = after 2nd year, 8Y[O] = eighth year (oldest record), A4Y = after 4th year, SY = second year, and TY = third year.
[c] Breeding evidence was observed in 2015.
[S] Bird re-sighted, not recaptured.

Table 17.—YBCU young banded in the LCR MSCP study area, 2015

Site	Section	Nest ID	Chick ID	Band date	Band number	Color bands[a]
CPhase 05	C1505	1	1	17-Jul	1352-59077	lB-W-lB / S
CPhase 05	C1505	1	2	17-Jul	1352-59078	Lv-Ag-Lv / S
Crane Roost	C2726	2	1	23-Jul	1352-59088	R-V-R / S
Crane Roost	C2726	2	2	23-Jul	1352-59090	O-R-O / S
Crane Roost	C2726	2	3	23-Jul	1352-59091	V-O / S
Crane Roost	C2727	3	1	13-Aug	1212-27511	W-V-W / S
Mineral Wash	Mineral Wash	2	1	24-Jul	1352-59092	Y-O-Y / S
Mineral Wash	Mineral Wash	2	2	24-Jul	1352-59093	V-lB / S
PVER Phase 04	C2344	3	1	5-Aug	1352-59099	V-W-V / S
PVER Phase 04	C2344	3	2	6-Aug	1212-27505	O-Y-O / S
PVER Phase 06	C2352	2	1	18-Jul	1352-59084	Ag-W-Ag / S
PVER Phase 06	C2352	2	2	18-Jul	1352-59080	Ag-mB / S
PVER Phase 06	C2354	4	1	18-Jul	1352-59081	Ag-Lv-Ag / S
PVER Phase 06	C2354	4	2	18-Jul	1352-59083	Ag-lB / S
PVER Phase 06	C2352	7	1	27-Jul	1352-59096	mB-Ag-mB / S
PVER Phase 06	C2352	7	2	27-Jul	1352-59097	V-O-V / S
PVER Phase 06	C2355	10	1	10-Sep	1212-27513	S / NoB
PVER Phase 06	C2354	11	1	11-Aug	1212-27510	G-V-G / S
PVER Phase 07	C2359	1	1	9-Jul	1202-68072	O-R / Mg
PVER Phase 07	C2359	1	2	9-Jul	1202-68073	R-V / Mg
PVER Phase 07	C2359	1	3	9-Jul	1202-68075	V-W / Mg
PVER Phase 07	C2358	2	1	18-Jul	1352-59086	G-mB / S
PVER Phase 07	C2358	2	2	18-Jul	1352-59085	Lv-Ag / S
PVER Phase 07	C2356	4	1	22-Jul	1352-59087	lB-mB / S
PVER Phase 07	C2356	4	2	22-Jul	1352-59089	lB-Lv / S
PVER Phase 07	C2357	5	1	26-Jul	1352-59094	Y-R-Y / S

Table 17.—YBCU young banded in the LCR MSCP study area, 2015

Site	Section	Nest ID	Chick ID	Band date	Band number	Color bands[a]
PVER Phase 07	C2357	5	2	26-Jul	1352-59095	lB-V-lB / S
PVER Phase 07	C2357	6	1	19-Jul	1352-59082	V-Y-V / S
PVER Phase 07	C2357	6	2	20-Jul	1352-59079	W-Lv-W / S
PVER Phase 07	C2358	8	1	28-Jul	1352-59098	mB-Ag / S
PVER Phase 07	C2358	8	2	28-Jul	1352-59100	lB-Ag-lB / S
PVER Phase 07	C2358	9	1	5-Aug	1713-67952	W-R / S
PVER Phase 07	C2358	9	2	5-Aug	1713-67951	W-O / S
PVER Phase 07	C2358	9	3	5-Aug	1352-59074	W-mB / S
PVER Phase 07	C2359	10	1	10-Aug	1212-27508	lB-Ag / S
PVER Phase 07	C2359	10	2	10-Aug	1212-27509	V-G-V / S
PVER Phase 07	C2357	11	1	7-Aug	1212-27506	lB-V-lB / S
PVER Phase 07	C2357	11	2	7-Aug	1212-27507	V-lB-V / S
PVER Phase 07	C2356	12	1	20-Aug	1212-27512	V-R / S

[a] Color bands: Ag = gold, G = green, lB = light blue, Lv = lavender, mB = mid blue, Mg = magenta, NoB = no band, O = orange, R = red, S = silver, V = violet, W = white, and Y = yellow. A hyphen (-) indicates a split band consisting of two or three colors.

PinPoint GPS Units

Of seven YBCUs captured at the PVER and fitted with GPS units in 2014 (six females and one male) (Parametrix and SSRS 2015), three females were recaptured at the PVER in 2015 (table 15). All were examined and appeared in good health; two were nesting when recaptured, and the other was unmated when recaptured and nested later in the season. Data were successfully downloaded from the first 2 units, with 8 and 10 points downloaded. The third GPS unit was unresponsive and was returned to the manufacturer, who successfully download two points from the unit. Due to a bug identified in the firmware, not all locations were recorded for the programmed dates. However, this fault was corrected in the units deployed in 2015. A map of recorded GPS locations from August 2014 to July 2015 is shown in figure 6.

In 2015, another seven birds were fitted with PinPoint-10 GPS units, including six females and one male (tables 15 and 18). All birds were monitored for up to 30 minutes after release, with no significant effects observed. Information on the recapture of these birds will be reported in future years.

Discussion

While the number of found nests increased slightly from 2014 (from 35 to 39 overall, from 29 to 33 at the PVER), the number of confirmed territories decreased between 2014 and 2015, from 58 to 48 territories overall, and from 49 to 41 at the PVER (Chapter 2, Parametrix and SSRS 2015). The cause of this decrease is unclear, due to changes in data collection methods in 2015. It may be related to known nesting ending slightly earlier in 2015 than in 2012 or 2014 (McNeil et al. 2013, 2014; Parametrix and SSRS 2015) (in 2013 nest searching and monitoring were not part of scheduled activities, and field work was completed by August 31). Though some unfound nests may have occurred into September, survey detections also dropped substantially by August (from 74 to 29, table 10), suggesting the nesting season ended earlier.

A nest found at the Cibola National Wildlife Refuge, in a thin cottonwood-willow windbreak less than 12 m (39 ft) wide, somewhat conflicts with previously reported minimum width of breeding habitat necessary for this species, which includes 105 m (344 ft) (Gaines 1974), 201 m (659 ft) (Laymon and Halterman 1989), 100 m (328 ft) (Holmes et al. 2008), and no known breeding in habitat patches less than 10 to 20 m (33 to 66 ft) wide (Halterman et al. 2015). The pair may not have nested here if it was more isolated. This is the first time a pair was observed nesting in a patch this narrow over the past 7 years in this study area. The adults were regularly observed through radio telemetry foraging in the nearby Crane Roost site, indicating use of both areas. Also, just one egg survived to

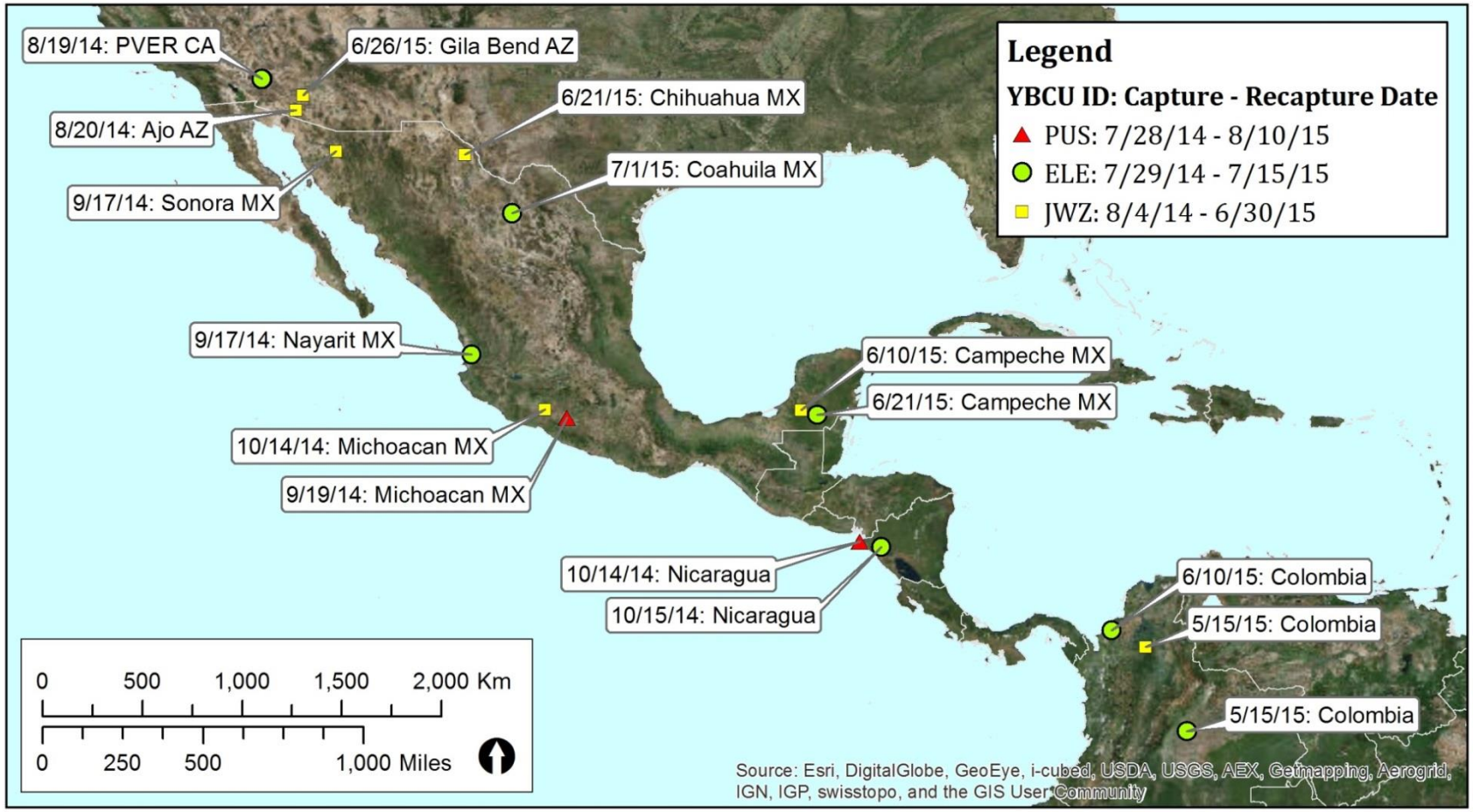

Figure 6.—Map of migratory locations recorded from August 2014 to July 2015 by PinPoint-10 GPS units attached to three YBCUs captured at the PVER.

(YBCU IDs – PUS, ELE, and JWZ are unique identifiers of each individual bird).

Table 18.—Summary of Lower Colorado River YBCU captures and attachments by site, 2015

Site	Newly banded adults	Recaptures	Banded chicks	Transmitters	GPS units
CPhase 05	NA	NA	2	NA	NA
Mineral Wash	NA	NA	2	NA	NA
Crane Roost	6	2	4	6	NA
PVER 04	NA	NA	2	NA	NA
PVER 05	5	1	NA	5	1
PVER 06	5	5	8	6	2
PVER 07	16	5	21	15	4
Total	**32**	**13**	**39**	**32**	**7**

fledge. An egg found on the ground was probably lost during high winds that often occur at the site. In the future, field technicians should be aware of YBCUs potentially nesting in small patches of habitat away from larger patches.

Of additional interest was the first YBCU nest found in a mesquite at the PVER. In 2015, cottonwood and willow were the most common nest trees, as in previous years (McNeil et al. 2013). This may indicate the most common suitable nest substrates currently available. In other areas, such as the Cibola National Wildlife Refuge and Beal Lake Conservation Area, suitable mesquite is already used for nesting by YBCUs. Mesquites are slower to mature into nest substrate compared to cottonwoods and willows, but due to their lower water requirements, given that higher temperatures and reduced water availability predicted to occur in this region are already occurring (Seager et al. 2007), planting a mosaic of species that includes a greater mesquite component may enable restoration of YBCU habitat to continue.

The Mayfield nest survival rates of 43 % overall, and 42 % at the PVER, are lower than previous years' estimates of 59 % overall and 52 % at the PVER from 2008–12 (McNeil et al. 2013) and 55 % overall and 47.9 % at the PVER in 2014 (Parametrix and SSRS 2015). The average productivity of 1.08 young per nest is also lower than previous years (averaging 1.6 in 2008–12 and 2014). However, it is unknown whether this year's results are due to annual variation in resources or the predator community, or if they portend the start of a downward trend. Entire clutches failing to hatch, as well as lower hatching and nestling viability rates, may be signs of inbreeding depression (Sittman et al. 1966; Greenwood et al. 1978, Hemmings et al. 2012a). Other causes may include poor maternal condition (Hemmings et al. 2012b), or environmental conditions such as high

temperatures (Webb 1987). Understanding the cause of hatching failures is important for determining conservation strategies for threatened and endangered birds (Hemmings et al. 2012b), and continued nest monitoring is recommended.

The sighting at the PVER of a white-nosed coati for the first time on the YBCU project may be of some concern. Coati are omnivores and eat birds, nestlings, and eggs. One coati was also observed at the PVER Phase 02 site on June 10, 2014 (A. Pellegrini 2015, personal communication). Considered rare in California, sightings are generally thought to be released pets (R. Kim 2015, personal communication). Arizona range maps show no sightings in the three Arizona counties bordering the LCR (Hoffmeister 1986). The Arizona Game and Fish Department does not track coati sightings in its Heritage database (L. Piest 2015, personal communication).

The recaptured eighth-year male is now the oldest YBCU recorded (based on data from USGS Patuxent Wildlife Research Center [2013]). First banded in 2008 at Cibola Valley Conservation Area Phase 01, from the first nest found in an LCR MSCP conservation area (see Halterman et al. 2009), he was not seen again until 2015. He is assumed to have been in the study area during the breeding seasons in between, giving some insight into the low overall detectability of individual YBCUs. Long-term banding has led to this new data on longevity, and documentation of his successful fledging of three young is the first confirmation of the ability of YBCUs to breed in their eighth year.

The 32 new adult and 39 young YBCUs banded in 2015 bring the total banded in the study area since 2008 to 355, 166 adults and 189 young (2008–14 data from McNeil et al. 2013, McNeil and Tracy 2013, and Parametrix and SSRS 2015). The long-term mark-recapture data of the LCR YBCU population should enable survival rates of this population to be estimated. Population viability is indirectly related to the quality and size of breeding habitat. Nest monitoring and banding are successful tools for obtaining accurate estimates of survival, productivity, and overall population viability, and should be considered if these factors are needed for management and decisionmaking.

ACKNOWLEDGEMENTS

We thank the following organizations and individuals for their support and assistance with this project: Bob Achee (Arizona Game and Fish Department), Sue Barney (California State Parks), Catherine Bell (USFWS), Kathleen Blair (USFWS), Nate Caswell (USFWS), Curt Kessler (USFWS), Christopher Dodge (Reclamation), Steven Farinella (Reclamation), Lauren Harter (Great Basin Bird Observatory), Christy Klinger (Nevada Department of Wildlife), Glenn Klingler (USFWS), Gail Iglitz (Reclamation), Elaine Johnson (USFWS), Sonja Kokos (Reclamation), Brandon Melton (USFWS), Darrin Miller (Reclamation), Jerry Mulcahy (California Department of Fish and Wildlife), Linda Miller (USFWS), Anne Pellegrini (SWCA), Barbara Raulston (Reclamation), Michelle Reilly (Reclamation), Bill Singleton (Reclamation), Joe Sims (‘Ahakhav Tribal Preserve), Erika Stewart (Bureau of Land Management), Vance Wolf (USFWS), and Brenda Zaun (USFWS). Funding was provided by Reclamation under the LCR MSCP.

We also thank our 2015 field crews and personnel of Parametrix and the SSRS: Alicia Arcidiacono, Keith Brennan, Wanda Bruhns, Marissa Buschow, Ruby Hammond, Cheryl Henke, Eric Hough, Michelle Johnson, Joshua Lefever, Sean McElaney, Spencer Schubert, Kacie Shopnitz, Margaret Spence, Jenna Stanek, John Stanek, Aaron Steed, Jennifer Tobin, Michelle Tobin, Christina Van Oosten, Bryn Webber, and Mary Whitfield.

LITERATURE CITED

Amstrup, S.C., T.L. McDonald, and B.F. Manly. 2005. Handbook of Capture-recapture Analysis. Princeton University Press, Princeton, New Jersey.

Anderson, B.W. and R.D. Ohmart. 1984. Vegetation Type Maps: Lower Colorado River. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

Bent, A.C. 1940. Life histories of North American cuckoos, goatsuckers, hummingbirds and their allies. Smithsonian Institution United States National Museum Bulletin 176:54–66.

Canadian Wildlife Service and U.S. Fish and Wildlife Service. 1977. North American Bird Banding Techniques. Volume II. Canadian Wildlife Service, Ottawa and U.S. Fish and Wildlife Service, Washington, D.C. (parts revised, 1986).

Chesser, R.T., R.C. Banks, C. Cicero, J.L. Dunn, A.W. Kratter, I.J. Lovette, A.G. Navarro-Sigüenza, P.C. Rasmussen, J.V. Remsen Jr., J.D. Rising, D.F. Stotz, and K. Winker. 2014. Fifty-fifth Supplement to the American Ornithologists' Union Check-list of North American Birds. The Auk 131:CSi-CSxv.

Conway, C.J. and T.E. Martin. 2000. Effects of ambient temperature on avian incubation behavior. Behavioral Ecology 11:178–188.

DeSante, D.F., K.M. Burton, P. Velez, D. Froehlich, and D. Kaschube. 2014. MAPS Manual 2014 Protocol. The Institute for Bird Populations, Point Reyes Station, California.

Fair, J., E. Paul, and J. Jones, eds. 2010. Guidelines to the Use of Wild Birds in Research. Washington, D.C.: Ornithological Council. www.nmnh.si.edu/BIRDNET/guide (accessed on February 13, 2013)

Fowler, G. 2014. PinPoint Host Software for the PinPoint GPS User Manual, 31.6 Revision 03. © Lotek Wireless Inc.

Gaines, D. 1974. Review of the status of the yellow-billed cuckoo in California: Sacramento Valley populations. The Condor 76:204–209.

Greenwood, P.J., P.H. Harvey, and C.M. Perrins. 1978. Inbreeding and dispersal in the Great Tit. Nature 271:52–54.

Halterman, M.D. 2000. Population Status of the Yellow-billed Cuckoo at the Bill Williams River NWR, Alamo Dam, Arizona, and Southern Nevada: Summer 2000. Report submitted to the Bureau of Reclamation, Lower Colorado River Region.

_____. 2009. Sexual dimorphism, detection probability, home range, and parental care in the yellow-billed cuckoo. Dissertation. University of Nevada, Reno, USA.

Halterman, M.D., E.T. Rose, S.E. McNeil, and D. Tracy. 2009. Yellow-billed Cuckoo distribution, abundance and habitat use on the lower Colorado River and tributaries, 2008 annual report. Bureau of Reclamation, Lower Colorado River Multi-Species Conservation Program, Boulder City, NV.

Halterman, M.D., M.J. Johnson, and J.A. Holmes. 2015. A Natural History Summary and Survey Protocol for the Western Distinct Population Segment of Yellow-billed Cuckoo: U.S. Fish and Wildlife Techniques and Methods. 45 p. www.fws.gov/southwest/es/Documents/R2ES/YBCU_SurveyProtocol_FINAL_DRAFT_22Apr2015.pdf

Hamilton, W.J. and M.E. Hamilton. 1965. Breeding characteristics of yellow billed cuckoos in Arizona. Proceedings of the California Academy of Sciences, Fourth Series 32:405–32.

Han, J.I., J.H. Kim, S. Kim, S.R. Park, and K.J. Na. 2009. A simple and improved DNA test for avian sex determination. Auk 126:779–783.

Hemmings, N.L., J. Slate, and T.R. Birkhead. 2012a. Inbreeding causes early death in a passerine bird. Nature Communications 3:863.

Hemmings, N., M. West, and T.R. Birkhead. 2012b. Causes of hatching failure in endangered birds. Biology Letters 8:964–967.

Hensler, G.L. and J.D. Nichols. 1981. The Mayfield method of estimating nesting success: a model, estimators and simulation results. Wilson Bulletin 93:42–53.

Hoffmeister, D.F. 1986. Mammals of Arizona. University of Arizona Press.

Holmes, J.A., C. Calvo, and M.J. Johnson. 2008. Yellow-billed Cuckoo Distribution, Abundance, Habitat Use, and Breeding Ecology in the Verde River Watershed of Arizona, 2004–2005. Final Report to Arizona Game and Fish Department, Heritage Department, Phoenix, Arizona. 34 p.

Hughes, J.M. 1999. Yellow-billed Cuckoo (*Coccyzus americanus*) in A. Poole and F. Gill (eds). The Birds of North America Online (No. 418). Cornell Lab of Ornithology, Ithica, New York. http://bna.birds.cornell.edu/bna/species/418

Jay, A. 1911. Nesting of the California Cuckoo in Los Angeles County, California. The Condor 13:69–73.

Jehle, G., A.A. Yackel Adams, J.A. Savidge, and S.K. Skagen. 2004. Nest survival estimation: a review of alternatives to the Mayfield estimator. The Condor 106:472–484.

Johnson, M.J., J.A. Holmes, C. Calvo, I. Samuels, S. Krantz, and M.K. Sogge. 2007. Yellow-Billed Cuckoo Distribution, Abundance, and Habitat Use Along the Lower Colorado River and Tributaries, 2006 Annual Report. U.S. Geological Survey Open-File Report 2007–1097.

Kim, R. 2015. California Department of Fish and Wildlife, Environmental Scientist, Blythe, California, personal communication.

Knutson M.G., L.A. Powell, R K. Hines, M.A. Friberg, and G.J. Niemi. 2006. An assessment of bird habitat quality using population growth rates. The Condor 108:301–314.

Laymon, S.A. 1998. Yellow-billed Cuckoo (*Coccyzus americanus*) *in* Riparian Habitat Joint Venture. The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian-Associated Birds in California. California Partners in Flight.

Laymon, S.A. and M.D. Halterman. 1985. Yellow-billed Cuckoos in the Kern River Valley: 1985 Population, Habitat Use, and Management Recommendations. Report to the Nature Conservancy, Sacramento, California.

_____. 1989. A proposed management plan for yellow-billed cuckoos in California. Pages 272–277 *in* D. Abell, Technical Coordinator. Proceedings of the California Riparian Systems Conference: Protection, Management, and Restoration for the 1990s. U.S. Department of Ariculture, Forest Service, General Technical Report PSW-110, Berkeley, California.

Laymon, S.A., P.L. Williams, and M.D. Halterman. 1997. Breeding Status of the Yellow-billed Cuckoo in the South Fork Kern River Valley, Kern County, California: Summary Report 1985–1996. Prepared for the U.S. Department of Agriculture Forest Service, Sequoia National Forest, Cannell Meadow Ranger District.

Bureau of Reclamation (Reclamation). 2004a. Lower Colorado River Multi-Species Conservation Program, Volume II: Habitat Conservation Plan, Final. December 17 (J&S 00450.00). Sacramento, California.

_____. 2004b. Lower Colorado River Multi-Species Conservation Program, Volume III: Biological Assessment, Final. December 17 (J&S 00450.00). Sacramento, California.

_____. 2006. Palo Verde Ecological Reserve Restoration Development Plan: Overview. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

_____. 2007a. Cibola Valley Conservation Area Restoration Development Plan: Overview. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

_____. 2007b. Cibola Valley Conservation Area Restoration Development Plan: Phase 1. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

_____. 2007c. Cibola Valley Conservation Area Restoration Development Plan: Phase 2. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

_____. 2007d. Cibola Valley Conservation Area Restoration Development Plan: Phase 3. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

_____. 2008. Beal Riparian and Marsh Restoration 2006 Annual Report. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

_____. 2009. Cibola Valley Conservation and Wildlife Area (CVCA) Restoration Development and Monitoring Plan: Phase 5. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

_____. 2010. Lower Colorado River Multi-Species Conservation Program, Beal Riparian and Monitoring Restoration Plan: Overview. www.lcrmscp.gov/reports/2010/e1_overview_mar10.pdf

_____. 2012. Laguna Division Conservation Area Restoration Development and Monitoring Plan. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada. www.lcrmscp.gov/reports/2011/e27_laguna_dev_mon_plan_aug12.pdf

_____. 2013. CNWR Unit 1 Conservation Area Restoration Development and Monitoring Plan: Upper Hippy Burn. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada. www.lcrmscp.gov/reports/2013/e24_cnwr_hippy_burn_dec12.pdf

Lebreton, J.D., K.P. Burnham, J. Clobert, and D.R. Anderson. 1992. Modeling survival and testing biological hypotheses using marked animals: a unified approach with case studies. Ecological Monographs 62:67–118.

MacKenzie, D.I., J.D. Nichols, J.A. Royle, K.H. Pollock, L.L. Bailey, and J.E. Hines. 2006. Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence. Academic Press. USA.

Mayfield, H.F. 1975. Suggestions for calculating nest success. Wilson Bulletin 87:456–466.

McNeil, S.E. and D. Tracy 2013. Yellow-billed Cuckoo Distribution, Abundance and Habitat Use on the Lower Colorado River and Tributaries, 2013 Final Report. Submitted for the Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada, by the Southern Sierra Research Station. www.lcrmscp.gov/reports/2013/d7_annrep_13.pdf

McNeil, S.E., D. Tracy, J.R. Stanek, and J.E. Stanek. 2013. Yellow-billed Cuckoo Distribution, Abundance and Habitat Use on the Lower Colorado River and Tributaries, 2008–2012 Summary Report. Submitted to the Bureau of Reclamation, Lower Colorado River Multi-Species Conservation Program, Boulder City, Nevada, by the Southern Sierra Research Station. www.lcrmscp.gov/reports/2012/d7_sumrep_08-12.pdf

Nolan, V.N.J. and C.F. Thompson. 1975. The occurrence and significance of anomalous reproductive activities in two North American non-parasitic cuckoos (*Coccyzus* spp.) Ibis 117:496–503.

Parametrix, Inc. (Parametrix), and Southern Sierra Research Station (SSRS). 2015. Yellow-billed Cuckoo Surveys and Population Monitoring on the Lower Colorado River and Tributaries, 2014 Annual Report. Submitted to the Bureau of Reclamation, Boulder City, Nevada. Prepared by S.E. McNeil and D. Tracy, Southern Sierra Research Station, Weldon, California, and J. Lisignoli and T. Hurt, Parametrix, Inc., Albuquerque, New Mexico. March 2015. www.lcrmscp.gov/reports/2014/d7_annrep_2014.pdf

Parker, T.H., B.M. Stansberry, D. Becker and P.S. Gipson. 2005. Edge and area effects on the occurrence of migrant forest songbirds. Conservation Biology 19:1157–1167.

Payne, R.B. 2005. The Cuckoos. Oxford University Press, Oxford, United Kingdom.

Pellegrini, A. 2015. SWCA, Flagstaff, Arizona, personal communication.

Piest, L. 2015. Arizona Game and Fish Department, Wildlife Specialist, Yuma, Arizona, personal communication.

Pitts, T.D. 1995. A tail-mounted radio transmitter for eastern bluebirds. North American Bird Bander 20:106–110.

Potter, E.F. 1980. Notes on nesting yellow-billed cuckoos. Journal of Field Ornithology 51:17–29.

_____. 1981. Effects of cool weather on nesting behavior and development in the yellow-billed cuckoo. Chat 45:15–16.

Pyle, P. 1997. Identification Guide to North American Birds, Part I. Slate Creek Press, Bolinas, California.

Rappole, J.H. and A.R. Tipton. 1991. New harness design for attachment of radio transmitters to small passerines. Journal of Field Ornithology 62:335–337.

Raupp, M.J. and R.F. Denno. 1983. Leaf Age as a predictor of herbivore distribution and abundance. Pages 91–124 *in* R.F. Denno and M.S. McLure (eds). Variable Plants and Herbivores in Natural and Managed Systems. Academic Press, New York.

Rohwer, S. and C.S. Wood. 2013. Abundant early-summer breeding in Sinaloa does not suggest post-migration breeding in three potential double breeders. Wilson Journal of Ornithology 125:243–250.

Seager, R., M. Ting, I. Held, Y. Kushnir, J. Lu, G. Vecchi, H.P. Huang, N. Harnik, A. Leetmaa, N.C. Lau, C. Li, J. Velez, and N. Naik. 2007. Model projections of an imminent transition to a more arid climate in southwestern North America. Science 316:1181–1184.

Sittman, K., H. Abplanalp, and R.A. Fraser. 1966. Inbreeding depression in Japanese quail. Genetics 54:371–379.

Sogge, M.K., J. Owen, E.H. Paxton, T.J. Koronkiewicz, and S.M. Langridge. 2001. A Targeted Mist Net Capture Technique for the Willow Flycatcher. Western Birds 32:167–172.

Spotswood, E., K.R. Goodman, J. Carlisle, R. Cormier, D. Humple, J. Rousseau, S. Guers, and G. Barton. 2011. How safe is mist netting? Evaluating the risk of injury and mortality to birds. Methods in Ecology and Evolution 3:29–38.

Stromberg, J.C. 2001. Restoration of riparian vegetation in the south-western United States: importance of flow regimes and fluvial dynamism. Journal of Arid Environments 49:17–34.

U.S. Fish and Wildlife Service. 2014. Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*). Federal Register 79:59992-60038.

U.S. Geological Survey Patuxent Wildlife Research Center. 2013. Longevity Records of North American Birds.

Van Horne, B. 1983. Density as a misleading indicator of habitat quality. Journal of Wildlife Management 47:893–901.

Webb, D.R. 1987. Thermal tolerance of avian embryos: a review. The Condor 89:874–898.

White, G.C. and K.P. Burnham. 1999. Program MARK: Survival estimation from populations of marked animals. Bird Study 46 Supplement:120–138.

Woolnough, A.P., W.E. Kirkpatrick, T.J. Lowe, and K. Rose. 2004. Comparison of three techniques for the attachment of radio transmitters to European starlings. Journal of Field Ornithology 75:330–336.

ATTACHMENT 1

Crosswalk Table

Table 1-1.—Crosswalk table

LCR MSCP[1] code	SSRS[2] site code	Area	Site	Section
AKC9C9	CRIT	‘Ahakhav Tribal Preserve	CRIT 09	CRIT 09
ALKPKP1	KEYPIT	Alamo	Key Pittman WMA	Key Pittman WMA 1
ALPPS	PAHSTH	Alamo	Pahranagat NWR	Pahranagat South
ALPPN	PAHNTH	Alamo	Pahranagat NWR	Pahranagat North
ALPPW	PAHSTH	Alamo	Pahranagat NWR	Pahranagat West
BLCP5C1505	HAVBR	Beal Lake Conservation Area	CPhase 05	C1505
BLCP6C1506	HAVBR	Beal Lake Conservation Area	CPhase 06	C1506
BECWCW	BWCW	Bill Williams River East	Cave Wash	Cave Wash
BECPCP	BWPT	Bill Williams River East	Cougar Point	Cougar Point
BEERER	BWER	Bill Williams River East	Esquerra Ranch	Esquerra Ranch
BEGRGR	BWGR	Bill Williams River East	Gibraltar Rock	Gibraltar Rock
BEHBHB	BWHB	Bill Williams River East	Honeycomb Bend	Honeycomb Bend
BEKRKR	BWKR	Bill Williams River East	Kohen Ranch	Kohen Ranch
BEMWMW	BWMW	Bill Williams River East	Mineral Wash	Mineral Wash
BWBPBP	BWBP	Bill Williams River West	Borrow Pit	Borrow Pit
BWBWMBWM	BWMA	Bill Williams River West	BW Marsh	BW Marsh
BWCRCR	BWCR	Bill Williams River West	Cross River	Cross River
BWFWFW	BWFW	Bill Williams River West	Fox Wash	Fox Wash
BWMDMD	BWMD	Bill Williams River West	Middle Delta	Middle Delta
BWMFS13	BWMF	Bill Williams River West	Mosquito Flats	Site 13
BWMFS12	BWMF	Bill Williams River West	Mosquito Flats	Site 12
BWNBNB	BWNB	Bill Williams River West	North Burn	North Burn
BWSWSW	BWSW	Bill Williams River West	Sandy Wash	Sandy Wash
CNNTNT	CIBCNT	Cibola National Wildlife Refuge Unit #1 Conservation Area	Nature Trail	Nature Trail

Table 1-1.—Crosswalk table

LCR MSCP[1] code	SSRS[2] site code	Area	Site	Section
CNCRC2728	CIBCR	Cibola National Wildlife Refuge Unit #1 Conservation Area	Crane Roost	C2728
CNCRC2726	CIBCR	Cibola National Wildlife Refuge Unit #1 Conservation Area	Crane Roost	C2726
CNCRC2727	CIBCR	Cibola National Wildlife Refuge Unit #1 Conservation Area	Crane Roost	C2727
PSPVCE	CIBEUC	Palo Verde Valley South	Palo Verde	Cibola Eucalyptus
CNCGCG	CIBGEN	Cibola National Wildlife Refuge Unit #1 Conservation Area	Cottonwood Genetics	Cottonwood Genetics
PSMWPM	CIBIPM	Palo Verde Valley South	Milpitas Wash	Perri Marsh
CNMTMT	CIBMT	Cibola National Wildlife Refuge Unit #1 Conservation Area	Mass Transplanting	Mass Transplanting
PSMWCIS	CIBSTH	Palo Verde Valley South	Milpitas Wash	Cibola Island South
CNCWNCWN	CIBNTH	Cibola National Wildlife Refuge Unit #1 Conservation Area	CW-North	CW-North
CVP1C2525	CVCA1	Cibola Valley Conservation Area	Phase 01	C2525
CVP1C2526	CVCA1	Cibola Valley Conservation Area	Phase 01	C2526
PVP1C2337	CVCA1	Palo Verde Ecological Reserve	Phase 01	C2337
PVP1C2338	CVCA1	Palo Verde Ecological Reserve	Phase 01	C2338
CVP2C2527	CVCA2	Cibola Valley Conservation Area	Phase 02	C2527
CVP2C2528	CVCA2	Cibola Valley Conservation Area	Phase 02	C2528
CVP3C2529	CVCA3	Cibola Valley Conservation Area	Phase 03	C2529
CVP3C2530	CVCA3	Cibola Valley Conservation Area	Phase 03	C2530
CVP4EC2533	CVCA4	Cibola Valley Conservation Area	Phase 04E	C2533
CVP4WC2532	CVCA4	Cibola Valley Conservation Area	Phase 04W	C2532
CVP4WC2531	CVCA4	Cibola Valley Conservation Area	Phase 04W	C2531

Table 1-1.—Crosswalk table

LCR MSCP[1] code	SSRS[2] site code	Area	Site	Section
GVBYWW	YUWW	Gila Valley	Bard	Yuma West Wetland
HHCL1CL1	YUHH	Hunters Hole Conservation Area	Cell 01	Cell 01
HHCL2CL2	YUHH	Hunters Hole Conservation Area	Cell 02	Cell 02
HHCL3CL3	YUHH	Hunters Hole Conservation Area	Cell 03	Cell 03
HHCL4CL4	YUHH	Hunters Hole Conservation Area	Cell 04	Cell 04
HHCL5CL5	YUHH	Hunters Hole Conservation Area	Cell 05	Cell 05
ISFLME	IMPML	Imperial South	Fisher's Landing	Martinez East
ISFLI50	IMP50	Imperial South	Fisher's Landing	Imperial #50
ISFLI20A	IMP20	Imperial South	Fisher's Landing	Imperial 20A
ISFLIN	IMPSTH	Imperial South	Fisher's Landing	Imperial Nursery
ISFLINW	IMPNW	Imperial South	Fisher's Landing	Imperial NW
LGLWL3	LAG3	Laguna	Laguna West	Laguna 03
LGLWLW	LAG2	Laguna	Laguna West	Laguna West
LGLWMW	LAGMW	Laguna	Laguna West	Mittry West
LGMLKERd	MLEA	Laguna	Mittry	Mittry Lake East Rd
CVP5C2536	CVCA5	Cibola Valley Conservation Area	Phase 05	C2536
LHNKWP	LHWP	Lake Havasu North	Kiowa	Willow Patch
LFLBLB	LITBR	Littlefield	Littlefield Bridge	Littlefield Bridge
MMVRSVRS	MOME	Mormon Mesa	Virgin River South	Virgin River South
MROHWMOP	OVRWP	Muddy River	Overton Above High-Water Mark	Overton WMA Pond
MROWOW	OVRW	Muddy River	Overton Wildlife	Overton Wildlife
CVP5C2535	CVCA5	Cibola Valley Conservation Area	Phase 05	C2535
CVP6C2537	CVCA6	Cibola Valley Conservation Area	Phase 06	C2537
CVP6C2538	CVCA6	Cibola Valley Conservation Area	Phase 06	C2538

Table 1-1.—Crosswalk table

LCR MSCP[1] code	SSRS[2] site code	Area	Site	Section
CVP4EC2534	CVVA4	Cibola Valley Conservation Area	Phase 04E	C2534
LGMPR	MLPR	Laguna Division Conservation Area	Mittry	Pratt Restoration
PVP2C2340	PVER2	Palo Verde Ecological Reserve	Phase 02	C2340
PVP2C2339	PVER2	Palo Verde Ecological Reserve	Phase 02	C2339
PVP3C2341	PVER3	Palo Verde Ecological Reserve	Phase 03	C2341
PVP3C2342	PVER3	Palo Verde Ecological Reserve	Phase 03	C2342
PVP4C2345	PVER4	Palo Verde Ecological Reserve	Phase 04	C2345
PVP4C2344	PVER4	Palo Verde Ecological Reserve	Phase 04	C2344
PVP4C2343	PVER4	Palo Verde Ecological Reserve	Phase 04	C2343
PVP5C2347	PVER5	Palo Verde Ecological Reserve	Phase 05	C2347
PVP5C2350	PVER5	Palo Verde Ecological Reserve	Phase 05	C2350
PVP5C2346	PVER5	Palo Verde Ecological Reserve	Phase 05	C2346
PVP5C2348	PVER5	Palo Verde Ecological Reserve	Phase 05	C2348
PVP5C2349	PVER5	Palo Verde Ecological Reserve	Phase 05	C2349
PVP6C2355	PVER6	Palo Verde Ecological Reserve	Phase 06	C2355
PVP6C2351	PVER6	Palo Verde Ecological Reserve	Phase 06	C2351
PVP6C2352	PVER6	Palo Verde Ecological Reserve	Phase 06	C2352
PVP6C2353	PVER6	Palo Verde Ecological Reserve	Phase 06	C2353
PVP6C2354	PVER6	Palo Verde Ecological Reserve	Phase 06	C2354
PVP7C2357	PVER7	Palo Verde Ecological Reserve	Phase 07	C2357
PVP7C2358	PVER7	Palo Verde Ecological Reserve	Phase 07	C2358
PVP7C2359	PVER7	Palo Verde Ecological Reserve	Phase 07	C2359
PVP7C2360	PVER7	Palo Verde Ecological Reserve	Phase 07	C2360
PVP7C2356	PVER7	Palo Verde Ecological Reserve	Phase 07	C2356

Table 1-1.—Crosswalk table

LCR MSCP[1] code	SSRS[2] site code	Area	Site	Section
PVP8P8	PVER8	Palo Verde Ecological Reserve	Phase 08	Phase 08
PKDEWDW	DSWA	Parker Dam	Eureka Wash	DeSilt Wash
POLTPSRA	PICSRA	Picacho	Lago Tres	Picacho SRA
PRPRWCP	BWCP	Planet Ranch	Planet Ranch West	Cottonwood Patch
TKPSND	HAVPS	Topock	Pintail Slough	North Dike
TKPSPS	HAVPS	Topock	Pintail Slough	Pintail Slough
TKTMGB	HAVGH	Topock	Topock Marsh	Glory Bird
TKTMFDR	HAVFDR	Topock	Topock Marsh	Farm Ditch Road
TKTPTP	HAVTPR	Topock	Topock Platform	Topock Platform
TGSCRHNE	HAVTPG	Topock Gorge-South	Castle Rock	Havasu NE
YWANCC4708	YUEW	Yuma East Wetlands	A North Channel	C4708
YWDC4704	YUEW	Yuma East Wetlands	D	C4704
YWFC4705	YUEW	Yuma East Wetlands	F	C4705
YWFGC4712	YUEW	Yuma East Wetlands	FG	C4712
YWIC4702	YUEW	Yuma East Wetlands	I	C4702
YWJC4703	YUEW	Yuma East Wetlands	J	C4703
YWSACC4711	YUEW	Yuma East Wetlands	South AC	C4711
YWSCC4710	YUEW	Yuma East Wetlands	South C	C4710

[1] Lower Colorado River Multi-Species Conservation Program.
[2] Southern Sierra Research Station.

ATTACHMENT 2

Focal Birds Encountered During Yellow-billed Cuckoo Field Work, 2015

Table 2-1.—Focal birds encountered during yellow-billed cuckoo field work, 2015
(The number of times each species was recorded is displayed for each site.)

Site	Bell's vireo	Black rail	Ridgway's rail	Elf owl	Gilded flicker	Gila woodpecker	Least bittern	Summer tanager	Vermilion flycatcher	Willow flycatcher	Yellow warbler
Overton Wildlife Management Area	6									1	10
CPhase 05	7					1		3			6
CPhase 06	3		1			3		1			3
Pintail Slough	15					7		3	2		5
Topock Platform						4		2	1		
Cave Wash	6					22	1	8			1
Cougar Point	14				4	22		7			
Esquerra Ranch	32				2	34		2			18
Honeycomb Bend	31					13	6	40		5	44
Kohen Ranch	21					34		6			4
Mineral Wash	26			1		21		14			14
Borrow Pit	14					21		3			4
BW Marsh						5		1			1
Cross River	2					5		2			2
Mosquito Flats	9					11		2			7
North Burn	4					4		1			3
Sandy Wash	9					38		8			3
CRIT 09	1					1		22	23	1	
Palo Verde Ecological Reserve Phase 02	5							2			
Palo Verde Ecological Reserve Phase 03								1			
Palo Verde Ecological Reserve Phase 04										1	2
Palo Verde Ecological Reserve Phase 05						1		2	1	1	3
Palo Verde Ecological Reserve Phase 06											16
Palo Verde Ecological Reserve Phase 07										1	3
Cibola Valley Conservation Area Phase 01						1		3			1
Cibola Valley Conservation Area Phase 02								1			
Cottonwood Genetics										1	
Crane Roost	1									1	2
Hippy Burn											1
Nature Trail	7					1					
Lago Tres						3				1	
Fisher's Landing	2	3	8			12	2	3			1
Mittry						1					1