



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

2014 Annual Report



March 2015

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Lower Colorado River Multi-Species Conservation Program

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

2014 Annual Report

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ACRONYMS AND ABBREVIATIONS

ac	acre(s)
ASU	Arizona State University
Bill Williams River NWR	Bill Williams River National Wildlife Refuge
BLCA	Beal Lake Conservation Area
Cibola NWR	Cibola National Wildlife Refuge
CNU1	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)
Havasu NWR	Havasu National Wildlife Refuge
km	kilometer(s)
LCR	lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
MAPS	Monitoring Avian Productivity and Survivorship
Mittry Lake WMA	Mittry Lake Wildlife Management Area
m	meter(s)
n =	sample size
NWR	National Wildlife Refuge
Overton WMA	Overton Wildlife Management Area
oz	ounce(s)
POS	possible breeding territory
PRB	probable breeding territory
PVER	Palo Verde Ecological Reserve
Reclamation	Bureau of Reclamation
SSRS	Southern Sierra Research Station
USFWS	U.S. Fish and Wildlife Service
YBCU	yellow-billed cuckoo (<i>Coccyzus americanus</i>)

Symbols

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

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Attachment

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- 3 Birds Encountered During Yellow-billed Cuckoo Surveys, 2014

EXECUTIVE SUMMARY

In December 2013, the Bureau of Reclamation (Reclamation) contracted Parametrix, Inc., 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 (Reclamation 2004a). Parametrix, Inc., subcontracted 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 of November 3, 2014. The species has declined dramatically over the past century following extensive riparian forest loss. This report details field work conducted in 2014 to provide a reference for the status of the LCR YBCU population utilizing created habitat and to determine if the population on the LCR is increasing due to Reclamation's restoration activities. This work may also help guide future habitat creation 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 electronic mobile field forms and creating data dictionaries, metadata, and quality assurance/quality control processes following completion of field work each year (after the 2014 field season, all data will be collected electronically).
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 the annual presence/absence of YBCUs; nest searching and monitoring will be used to measure nest success, breeding density, and productivity; and mark-recapture will be used to measure survival rates.

Between mid-June and mid-August 2014, call-broadcast surveys were conducted at 42 sites along the lower Colorado, Muddy, and Bill Williams Rivers, covering approximately 1,600 hectares (3,954 acres) of potentially suitable breeding habitat. Surveyors recorded 348 total detections, and 58 breeding territories were confirmed in 4 areas, including 35 nests found (29 at the Palo Verde Ecological Reserve) (PVER). Clutch size averaged 2.8 ($n = 30$), and productivity averaged 1.59 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.

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Forty-two adult YBCUs were captured in 2014, including 10 that were banded in previous years; another 3 individuals were resighted, including one at Beal Lake Conservation Area that had dispersed at least 118 kilometers (73 miles) from its 2012 hatch site. This is the farthest natal dispersal distance recorded to date. The oldest YBCU was also recorded when an after-sixth-year male was recaptured in PVER Phase 06. He was banded as an adult in 2009 in Phase 02, nested in Phases 04 and 05 in 2012 and 2013, and nested in Phase 06 in 2014. An additional 38 young were banded from 15 nests in 2014, bringing the total number of YBCUs banded since 2008 to 284 (134 adults and 150 young). Completion of this 5-year study will result in 11 years of banding data, which, when combined with multi-year nest and breeding territory data, will be used to estimate adult and juvenile survival, productivity, and the growth rate of the LCR YBCU population.

INTRODUCTION

Lower Colorado River Multi-Species Conservation Program

In 2005, the Lower Colorado River Multi-Species Conservation Program (LCR MSCP), a multi-agency group, “was created to balance the use of the 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 for 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 LCR MSCP.

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

The yellow-billed cuckoo (*Coccyzus americanus*, YBCU) has 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 YBCU population as a threatened species under the ESA.

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 the loss of its preferred riparian habitat. YBCUs are among the last of the 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 as well as tree frogs and small lizards (Bent 1940; Hamilton and Hamilton 1965; Nolan and Thompson 1975; Hughes 1999).

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Nesting usually occurs between late June and late July but can begin as early as late May and can continue until late September (Hughes 1999). In the lower Colorado River (LCR) region, the nesting period tends to be late June to early August and peaks in mid- to late July. Nesting at the Palo Verde Ecological Reserve (PVER), however, has recently been documented in September (McNeil et al. 2013), and adults tending to young may occur in this area until early October.

The main nesting tree species in this region are Goodding's willow (*Salix gooddingii*), Fremont cottonwood (*Populus fremontii*), and tamarisk (*Tamarix* spp.). Other trees or large shrubs are also used (McNeil et al. 2013).

Nests are built by both sexes and consist of a loose platform of sticks. Clutch size ranges from 1 to 5 (Payne 2005), averaging 2 to 3 (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 (Sechrist et al. 2012), 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 resighting. 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 true variation 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 resighted, by area and site. A more thorough analysis of the data from multiple years will be presented in the final summary (2014–18) report.

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 to estimate breeding territory abundance and breeding density (McNeil et al. 2013). These methods are discussed further 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 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.

In 2014, Reclamation instituted a three-tiered naming convention to be used for all projects conducted within the LCR MSCP (table 1; attachment 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

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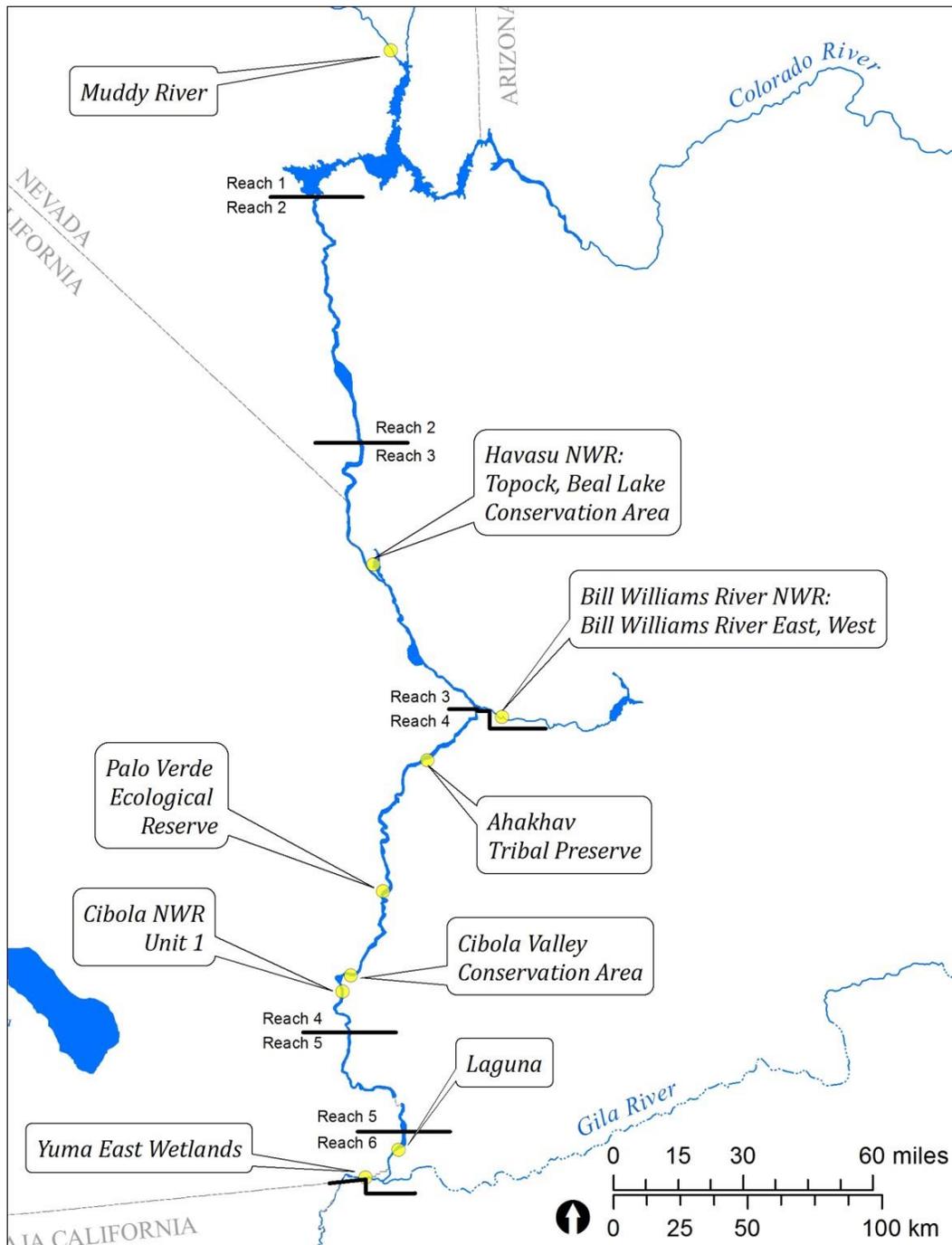


Figure 1.—Lower Colorado River yellow-billed cuckoo study area.
Horizontal black lines show river reach boundaries, and yellow circles represent areas surveyed in 2014. Sites are clustered within areas.

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suitable YBCU habitat. For the YBCU project, a Global Positioning System (GPS) receiver was used to determine the boundaries of suitable habitat within each section. Where boundaries were inaccessible, georeferenced 2004–13 aerial imagery was used to estimate the boundaries. Once suitable habitat was identified within a section, survey transects were established (as described below).

Table 1.—Definitions for study area, river reach, survey area, survey site, and survey point

Term	Definition
Study area	Potentially suitable YBCU breeding habitat along a 322-km (200-mile) stretch of the LCR and tributaries, from the Overton WMA, Nevada, to Yuma, Arizona.
River reach (reach)	An 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 report.
Survey area (area)	A collection of clustered monitored sites (see figure 1).
Survey site (site)	At least 20 ha (49 ac) of suitable 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 an area, one or more linear transects can be traversed.
Section	A spatially explicit location that may include transects, survey points, plots, net lanes, trap lines, etc., used for different projects under the LCR MSCP.
Transect	Spatially explicit trails spaced 200–250 m (656–820 ft) throughout suitable habitat from which YBCU surveys were conducted.
Survey point (point)	A spatially explicit location where cuckoo call broadcasts were played to elicit responses. Points are spaced 100 m (328 ft) apart along transects (Halterman et al. 2011).

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, habitat conditions will be re-evaluated to determine when and if surveys should resume. Forty-two sites were surveyed in 2014 (see figure 1, table 2).

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Table 2.—Lower Colorado River yellow-billed cuckoo survey sites, 2014

Geographic area	Area	Site	Size (ha)	River reach
Overton Wildlife Management Area	Muddy River	Overton Wildlife	40 ^a	1
Havasu National Wildlife Refuge	Beal Lake Conservation Area ^b	CPhase 05, CPhase 06	35.5	3
		Topock		
			Pintail Slough	22.3
Bill Williams River National Wildlife Refuge	Bill Williams River East	Topock Platform	9.3	3
		Cave Wash	44.9	3
		Cougar Point	49.7	3
		Esquerra Ranch	73.9	3
		Gibraltar Rock	90.1	3
		Honeycomb Bend	24.8	3
	Bill Williams River West	Kohen Ranch	43.4	3
		Mineral Wash	41.0	3
		Borrow Pit	37.8	3
		BW Marsh	18.4	3
		Cross River	50.5	3
		Fox Wash	90.8	3
		Middle Delta	39.2	3
Mosquito Flats Site 12	23.6	3		
Mosquito Flats Site 13	35.3	3		
North Burn	42.1	3		
Sandy Wash	80.8	3		
Parker	'Ahakhav Tribal Preserve	CRIT ^c 09	62.5	4
Blythe	Palo Verde Ecological Reserve ^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	Cibola Valley Conservation Area ^b	Phase 01	37.2	4
		Phase 02	27.5	4
		Phase 03	43.9	4
		Phase 04W ^d	24.4	4
Cibola National Wildlife Refuge	Cibola National Wildlife Refuge Unit 1 Conservation Area ^b	Cottonwood Genetics	16.5	4
		Crane Roost	57.3	4
		CW-North	7.3	4
		Mass Transplanting	8.1	4
		Nature Trail	14.5	4
Yuma	Laguna	Mittry	12.2	6
	Yuma East Wetlands ^b	South AC, South C, I	109.3	6

^a Overton WMA is > 40 ha (99 ac) but comprises mostly unsuitable YBCU breeding habitat. Around 40 ha (99 ac) were surveyed.

^b Area managed under the LCR MSCP.

^c CRIT = Colorado River Indian Tribe.

^d Cibola Valley Conservation Area Phase 04W surveyed in period 1 only and then dropped due to lack of suitability.

Presence-Absence Surveys

Five standard YBCU broadcast call surveys (Haltermann et al. 2011) were conducted at each site every 12 to 16 days (attachment 2). One survey was conducted during each survey period at most sites (table 3). Only four surveys were conducted if no detections occurred during four consecutive surveys. 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 cuckoo. Radios were used to communicate among surveyors when adjacent patches were surveyed at the same time.

Table 3.—Yellow-billed cuckoo survey period dates, lower Colorado River, 2014

Survey period	Dates
1	June 15 – June 29
2	June 30 – July 13
3	July 14 – July 28
4	July 29 – August 11
5	August 12 – August 25

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 the transect. Most transects traversed through the habitat patches; however, some ran along edges such as adjacent roads to exploit greater visual detectability or because the interior of the habitat was inaccessible. Garmin GPS units (± 6 m horizontal accuracy) were used to locate survey points, and 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 observation and listening. If a YBCU was detected, call-playbacks were immediately discontinued, and surveyors recorded the true bearing and estimated distance from the surveyor to the bird, time of detection, number of calls broadcasted, response type, behavior, vocalizations, and presence and/or color

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Table 4.—LCR MSCP avian species recorded during all field work, 2014

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

¹ American Ornithologists' Union.

combination of 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 cuckoo 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 behavior 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 (Southern Sierra Research Station [SSRS] 2012, personal observation). Because the number of survey detections are positively correlated to the number of breeding territories (McNeil et al. 2013), the survey detection count can be used as a rough index of nesting territories. However, in higher-density areas, using a distance of 300 m (984 ft) results in undercounting individuals. 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 species encountered during surveys were recorded (attachment C). To standardize the data, the number of detections per ha (2.5 ac) and the detections per 20 ha (49 ac), 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, sites were called potential breeding sites if detections occurred during two or more survey periods. A single YBCU detection in an area was considered an unreliable indicator of breeding status due to the transience 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 area as a possible (POS), probable (PRB), or confirmed (COB) breeding territory (table 5). All detections were used to estimate breeding territories, including incidental, survey, and followup observations. Incidental observations included detections before, during, or after a survey; followup visits included all activities outside call-broadcast surveys, including nest searching, mist netting, telemetry, and resight attempts (see “Population and Monitoring”). POS and PRB territories were re-examined whenever possible (especially immediately after surveys) to increase the likelihood of confirming breeding. Any fledglings or juveniles found that were likely to have come from a COB already counted were not counted as new breeding territories.

Breeding Territory Designation Changes

The POS, PRB, and COB designations used for 2008 through 2013 (McNeil et al. 2013) have been refined, following a review of breeding behaviors observed by SSRS biologists, as well as an analysis of detection probability within breeding territories (McNeil et al. 2013, Chapter 4). These changes are as follows:

- *Stick/food carry*: Previously considered to confirm breeding, may represent failed attempts at courtship only. During courtship, males of many cuckoo species, including YBCUs, present food or sticks to females as gifts (Payne 2005). These activities may occur without a female accepting an offering, or a nest being built. Therefore, these single observations were downgraded to a PRB. Confirmed breeding now requires multiple observations of food carries in an area (i.e., feeding young) or multiple stick carries (i.e., nest building).

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Table 5.—Definitions for yellow-billed cuckoo breeding territory estimation (Probable [PRB] and confirmed [COB] definitions were updated from those used from 2008–12 [McNeil et al. 2013]. Changes are in **bold**.)

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 YBCUs 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 cuckoos 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 (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.

- *Distraction display*: Previously considered a PRB, now a COB. Based on monitoring many YBCU nests, the collective opinion of SSRS researchers is that distraction displays are only given near an active nest or recently fledged young. Distraction displays are given by adults to an assumed predator to draw attention away from a nest or young. YBCUs may feign injury (such as a broken wing), drop to the ground, or drop low and hop from bush to bush, sometimes accompanied by harsh distress calls. They may attempt to lure a predator away by remaining visible and moving as the predator approaches, or using vocalizations combined with movement.

- *Detections in two survey periods (combined with other evidence)*: Previously indicated a PRB, now requires detections in three survey periods. This change is based on the 5-year analysis of survey detection probability (McNeil et al. 2013, Chapter 4); YBCUs were detected on at least three surveys on average within known breeding territories. Areas with detections during just two surveys are less likely to be breeding territories.

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 (Haltermann 2009). Also, following a successful or failed nest, one or both adults may re-nest. Referring to second nesting attempts 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

Presence-Absence Surveys

From June 16 to August 19, 2014, 180 presence-absence surveys were conducted across 5 survey periods at 42 sites, yielding 348 survey detections (figure 2; tables 6–10). Site descriptions and maps showing transects and detections are below. PVER Phases 05–07 dominated the detection totals throughout the season (216 detections, 62 percent of all survey detections) (see table 8), covering just over 16 percent of all surveyed habitat.

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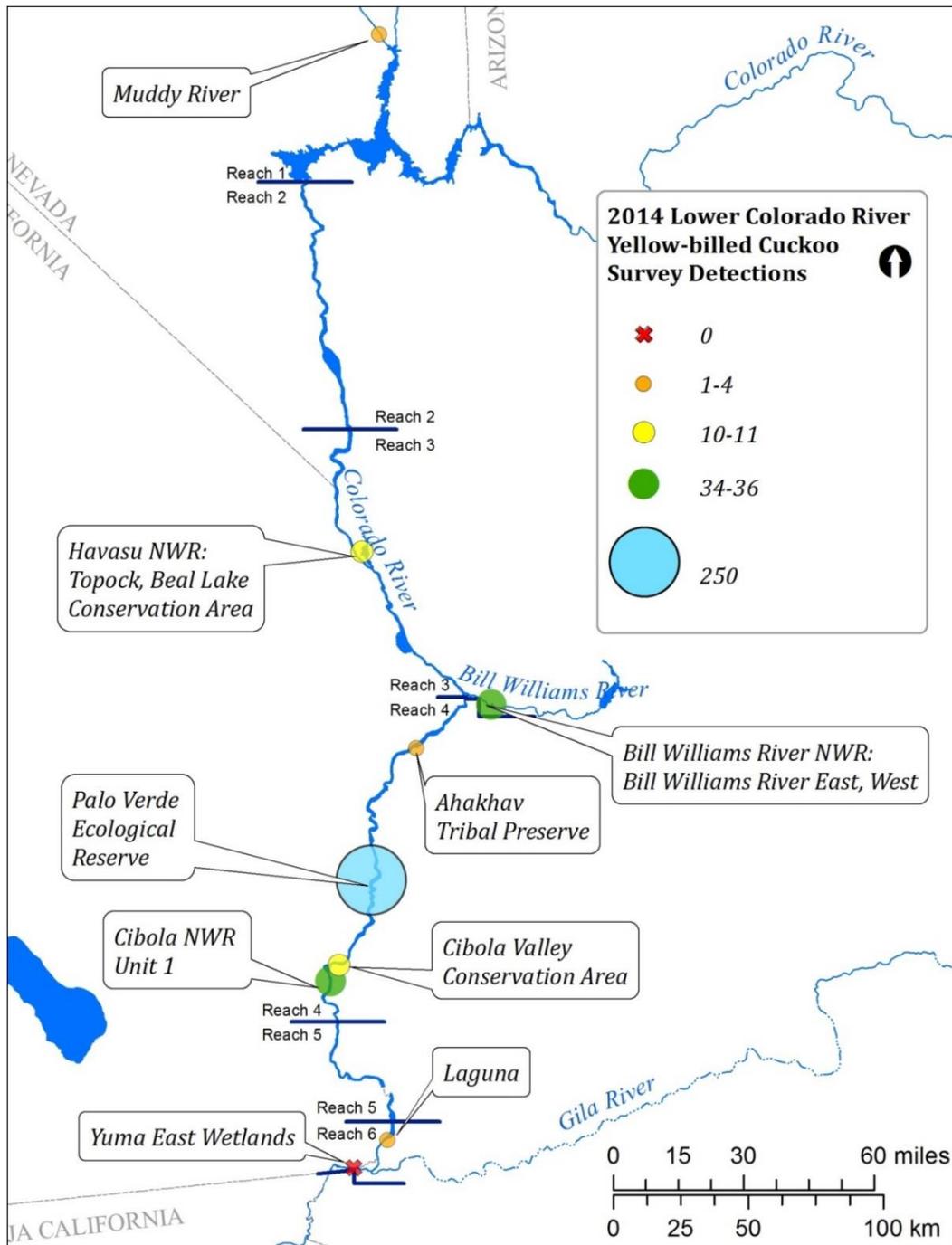


Figure 2.—Lower Colorado River yellow-billed cuckoo survey detections by survey area, 2014.

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Table 6.—Lower Colorado River yellow-billed cuckoo survey detections and territory estimates for Reach 1–3 sites (Muddy River, Beal Lake Conservation Area, and Topock), 2014

Site	Detections per survey period (2014 dates in parentheses)					Total	Estimated territories ^a			Size (ha)	Detections (per ha / 20 ha)	Minimum territories (per ha / 20 ha)
	1	2	3	4	5		POS	PRB	COB			
Overton Wildlife	0 (6/24)	1 (7/08)	1 (7/20)	0 (8/01)	0 (8/13)	2	1	0	0	40	0.05 / 1.0	0
Pintail Slough	0 (6/19)	0 (7/02)	2 (7/16)	1 (7/29)	0 (8/12)	3	1	0	0	22.4	0.13 / 2.69	0
Topock Platform	0 (6/26)	1 (7/11)	0 (7/23)	0 (8/04)	0 (8/16)	1	0	0	0	9.3	0.11 / 2.14	0
CPhase 05-06	1 (6/17)	2 (6/30)	2 (7/14)	1 (7/27)	0 (8/08)	6	0	1	0	35.5	0.17 / 3.38	0
Total	1	4	5	2	0	12	2	1	0	107.2	0.11 / 2.24	0

Note: For location codes prior to 2014, see attachment 1.

^a POS = possible territory, PRB = probable territory, and COB = confirmed breeding territory.

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Table 7.—Lower Colorado River yellow-billed cuckoo survey detections and territory estimates for Reach 3 sites (Bill Williams River East and West), 2014

Site	Detections per survey period (2014 dates in parentheses)					Total	Estimated territories ^a			Size (ha)	Detections (per ha / 20 ha)	Minimum territories (per ha / 20 ha)
	1	2	3	4	5		POS	PRB	COB			
Bill Williams River East												
Cave Wash	0 (6/19)	0 (7/02)	1 (7/18)	0 (7/29)	0 (8/11)	1	0	0	0	44.9	0.02/0.45	0
Cougar Point	0 (6/18)	0 (7/01)	0 (7/16)	0 (7/28)	–	0	0	0	0	49.7	0	0
Esquerra Ranch	0 (6/16)	1 ^b (6/30)	1 ^b (7/15)	0 (7/30)	1 ^b	3 ^b	1	0	0	73.9	0.04/0.81	0
Gibraltar Rock	0 ^c (6/18)	0 (7/01)	0 (7/16)	0 (7/28)	0 (8/10)	0 ^b	0	0	0	90.1	0	0
Honeycomb Bend	0 (6/19)	1 (7/02)	0 (7/15)	3 (7/29)	3 (8/11)	7	1	0	1	24.8	0.28/5.63	0.04/0.80
Kohen Ranch	1 ^c (6/18)	1 (6/30)	0 (7/14)	0 (7/28)	0 (8/10)	2 ^b	1	0	0	43.4	0.05/0.92	0
Mineral Wash	2 (6/16)	1 ^b (6/30)	2 ^b (7/14)	2 (7/29)	2 ^b (8/11)	9 ^b	0	0	3	41.0	0.22/4.39	0.07/1.46
Bill Williams River West												
Borrow Pit	1 (6/16)	1 (7/01)	0 (7/15)	0 (7/28)	0 (8/11)	2	1	0	0	37.8	0.05/1.06	0
BW Marsh	0 (6/27)	0 (7/10)	0 (7/24)	0 (8/06)	–	0	0	0	0	18.4	0	0
Cross River	0 (6/24)	2 (7/08)	0 (7/20)	0 (8/02)	0 (8/14)	2	0	0	0	50.5	0.04/0.79	0
Fox Wash	1 (6/24)	0 (7/08)	0 (7/22)	1 (8/05)	–	2	0	0	0	90.8	0.02/0.44	0
Middle Delta	0 (6/25)	0 (7/09)	0 (7/22)	1 (8/05)	–	1	0	0	0	39.2	0.03/0.51	0
Mosquito Flats Site 12	1 (6/20)	0 (7/03)	0 (7/17)	1 (7/30)	1 (8/11)	3	1	0	0	23.6	0.13/2.54	0
Mosquito Flats Site 13	0 (6/20)	0 (7/03)	0 (7/17)	0 (7/30)	–	0	0	0	0	35.3	0	0
North Burn	0 (6/18)	0 (7/01)	0 (7/15)	0 (7/28)	–	0	0	0	0	42.1	0	0
Sandy Wash	1 (6/25)	3 (7/08)	0 (7/23)	0 (8/04)	0 (8/16)	4	1	0	0	80.8	0.05/0.99	0
Total East	3	4	4	5	6	22	3	0	4	367.8	0.06/1.2	0.01/0.22
Total West	4	6	0	3	1	14	3	0	0	418.5	0.03/0.67	0
Total	7	10	4	8	7	36	6	0	4	786.3	0.05/0.92	0.005/0.10

Note: For locations codes used prior to 2014, see attachment 1.

^a Estimated territories: POS = possible territory, PRB = probable territory, and COB = confirmed breeding territory.

^b Survey detections during Mineral Wash survey attributed to adjacent Esquerra Ranch site.

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Table 8.—Lower Colorado River yellow-billed cuckoo survey detections and territory estimates for Reach 4 sites ('Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1 Conservation Area), 2014

Site	Detections per survey period (2014 dates in parentheses)					Total	Estimated territories ^a			Size (ha)	Detections (per ha / 20 ha)	Minimum territories (per ha / 20 ha)
	1	2	3	4	5		POS	PRB	COB			
CRIT09	1 (6/20)	1 (7/03)	2 (7/17)	0 (7/31)	0 (8/13)	4	1	0	0	62.5	0.06/1.28	0
PVER Phase 01	0 (6/25)	0 (7/08)	1 (7/23)	0 (8/05)	0 (8/18)	1	0	0	0	13.0	0.08/1.54	0
PVER Phase 02	0 (6/18)	3 (7/03)	2 (7/17)	1 (7/30)	1(8/11)	7	1	0	0	31.6	0.22/4.44	0
PVER Phase 03	2 (6/23)	1 (7/07)	0 (7/21)	0 (8/04)	0 (8/15)	3	1	0	0	34.0	0.09/1.76	0
PVER Phase 04	5 (6/25)	5 (7/08)	6 (7/23)	2 (8/05)	5 (8/18)	23	2	0	4	41.2	0.56/11.15	0.10/1.94
PVER Phase 05	11 (6/23)	16 (7/07)	19 (7/21)	20 (8/01)	12 (8/14)	78	6	6	10	87.4	0.89/17.84	0.11/2.29
PVER Phase 06	9 (6/18)	24 (7/01)	17 (7/15)	19 (7/29)	17 (8/12)	86	5	1	25	89.0	0.97/19.34	0.28/5.62
PVER Phase 07	4 (6/17)	7 (6/30)	13 (7/14)	17 (7/28)	11 (8/11)	52	5	2	10	91.6	0.57/11.35	0.11/2.18
CVCA ^b Phase 01	0 (6/19)	5 (7/02)	2 (7/16)	1 (7/30)	0 (8/12)	8	1	1	0	37.2	0.22/4.30	0
CVCA Phase 02	0 (6/19)	1 (7/02)	0 (7/17)	2 (7/30)	0 (8/11)	3	0	0	1	27.5	0.11/2.18	0.04/0.73
CVCA Phase 03	0 (6/25)	0 (7/08)	0 (7/23)	0 (8/05)	–	0	0	0	0	43.9	0	0
CVCA Phase 04W	0 (6/25)	–	–	–	–	–	–	–	–	24.4 ^c	–	–
CVCA ^b Phase 01	0 (6/19)	5 (7/02)	2 (7/16)	1 (7/30)	0 (8/12)	8	1	1	0	37.2	0.22/4.30	0
Cottonwood Genetics	2 (6/24)	0 (7/07)	0 (8/02)	0 (8/15)	–	2	0	0	0	16.5	0.12/2.43	0
Crane Roost	3 (6/26)	4 (7/09)	6 (7/23)	6 (8/06)	9 (8/19)	28	1	2	3	57.3	0.49/9.77	0.05/1.05
CW-North	1 (6/24)	0 (7/07)	0 (7/22)	0 (8/04)	0 (8/15)	1	0	0	0	7.3	0.14/2.76	0
Mass Transplanting	0 (6/24)	0 (7/07)	0 (7/22)	0 (8/04)	0 (8/15)	0	0	0	0	8.1	0	0
Nature Trail	2 (6/24)	0 (7/07)	1 (7/22)	0 (8/04)	0 (8/15)	3	0	0	1	14.5	0.21/4.14	0.07/1.38
Total	40	67	69	68	55	299	23	12	54	662.6	0.45/9.02	0.05/1.07

Note: For location codes used prior to 2014, see attachment 1.

^a Estimated territories: POS = possible territory, PRB = probable territory, and COB = confirmed breeding territory.

^b CVCA = Cibola Valley Conservation Area.

^c Hectares for CVCA Phase 04W not included in total calculations; only surveyed once on June 25.

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Table 9.—Lower Colorado River yellow-billed cuckoo survey detections and territory estimates for Reach 6 sites (Laguna and Yuma East Wetlands), 2014

Site	Detections per survey period (2014 dates in parentheses)					Total	Estimated territories ^a			Size (ha)	Detections (per ha / 20 ha)	Minimum territories (per ha / 20 ha)
	1	2	3	4	5		POS	PRB	COB			
Mittry	1 (7/01)	0 (7/16)	0 (7/29)	0 (8/10)	–	1	0	0	0	12.4	0.08/1.61	0
South AC/C, I	0 (7/02)	0 (7/15)	0 (7/28)	0 (8/10)	–	0	0	0	0	48.0	0	0
Total	1	0	0	0	–	1	0	0	0	60.4	0.02/0.33	0

Note: For location codes used prior to 2014, see attachment 1.

^a Estimated territories: POS = possible territory, PRB = probable territory, COB = confirmed breeding territory.

Table 10.—Lower Colorado River yellow-billed cuckoo survey detections and territories by river reach/area, 2014 (summary of tables 6–9)

River reach	Detections per survey period					Total survey detections	Estimated territories ^a			Detections (per ha / 20 ha)	Minimum territories (per ha / 20 ha)
	1	2	3	4	5		POS	PRB	COB		
Reach 1 (Muddy River)	0	1	1	0	0	2	1	0	0	0.05/1.0	0
Reach 3 (Beal Lake, Topock)	1	3	4	2	0	10	1	1	0	0.15/2.98	0
Reach 3 (Bill Williams River East and West)	7	10	4	8	7	36	6	0	4	0.05/0.92	0.005/0.10
Reach 3 total	8	13	8	10	7	46	7	1	4	0.05/1.08	0.005/0.09
Reach 4 ('Ahakhav Tribal Preserve)	1	1	2	0	0	4	1	0	0	0.06/1.28	0
Reach 4 (Palo Verde Ecological Reserve)	31	56	58	59	46	250	20	9	49	0.64/12.89	0.13/2.53
Reach 4 (Cibola Valley Conservation Area)	0	6	2	3	0	11	1	1	1	0.10/2.03	0.01/0.18
Reach 4 (Cibola National Wildlife Refuge Unit 1 Conservation Area)	8	4	7	6	9	34	1	2	4	0.33/6.56	0.04/0.77
Reach 4 total	40	67	69	68	55	299	23	12	54	0.45/9.02	0.08/1.63
Reach 6 (Laguna, Yuma East Wetlands)	1	0	0	0	0	1	0	0	0	0.02/0.33	0
All sites:	49	81	78	78	62	348	31	13	58	0.22/4.31	0.04/0.72

Note: For location codes used prior to 2014, see attachment 1.

^a Estimated territories: POS = possible territory, PRB = probable territory, COB = confirmed breeding territory.

Breeding Territory Estimates and Proportion of Habitat Occupied

Based on the timing, location, and persistence of all detections, up to 101 YBCU breeding territories were estimated within the surveyed parts of the study area. These included 30 POS, 13 PRB, and 58 COB territories (figure 3; see tables 6–10). The most common evidence of breeding was observed nests ($n = 35$) (see “Population and Monitoring”). Another 23 territories were confirmed by locating fledglings or juveniles or by observing copulations. The overall proportion of surveyed habitat occupied by YBCUs was 59.2 percent (45 of 76 sample units). By geographic area, the proportion of surveyed habitat occupied was:

- 100 percent at Overton WMA (2 of 2 sample units surveyed)
- 75 percent at Havasu National Wildlife Refuge (Havasu NWR) (3 of 4 sample units)
- 35 percent at Bill Williams River National Wildlife Refuge (Bill Williams River NWR) (12 of 34 sample units)
- 100 percent at Blythe (PVER) (21 of 21 sample units)
- 40 percent at Cibola Valley (Cibola Valley Conservation Area [CVCA]) (2 of 5 sample units)
- 80 percent at Cibola National Wildlife Refuge (Cibola NWR) (4 of 5 sample units)
- 0 percent in Yuma (0 of 3 sample units surveyed)

Site Descriptions and Maps

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 project area locations is provided on figure 3. Site codes used in previous years (2008–13) are in parentheses after the site name (see attachment 1; McNeil et al. 2013; and McNeil and Tracy 2013). Following each site description are maps showing 2014 survey transects and detections; some maps may contain several sites.

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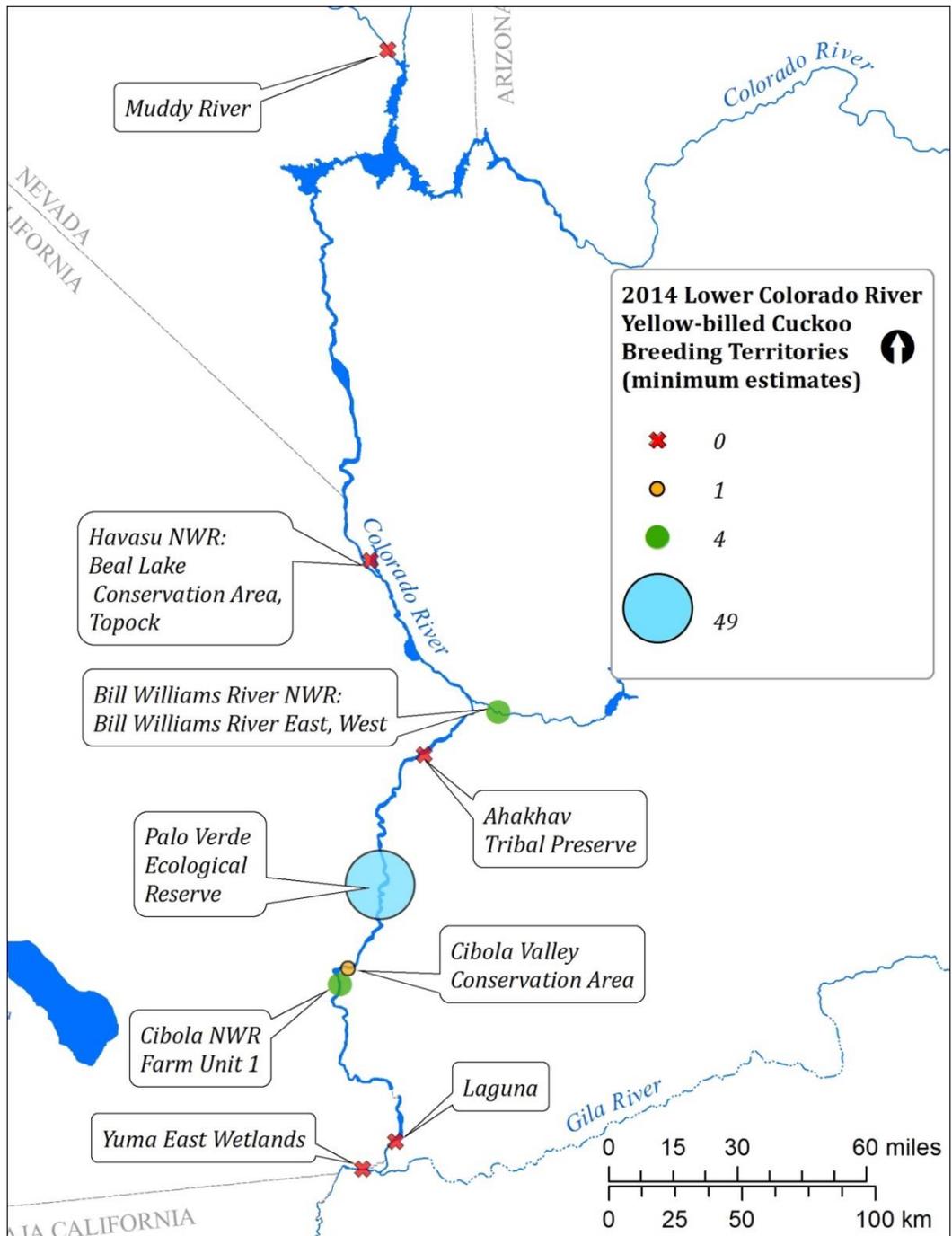


Figure 3.—Lower Colorado River yellow-billed cuckoo minimum (confirmed) breeding territories by survey area, 2014.

Overton WMA

Area: Muddy River

Clark County, Nevada

The Muddy River area lies within the Muddy River drainage in Moapa Valley about 3.2 km (1.9 miles) south of Overton on SR 169. The Nevada Department of Wildlife manages the Overton WMA as wildlife habitat, and it 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 (*Hordum 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 2014 (figure 4).

Site: Overton Wildlife (OVRW)

40 ha (99 ac)

Section: Overton Wildlife

The survey follows a line of cottonwoods between 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 lining the main channel and scrubby tamarisk forming a dense understory. Several fields to the west are dry during the breeding season and flooded in the 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 were two survey detections here in 2014 (figure 4).

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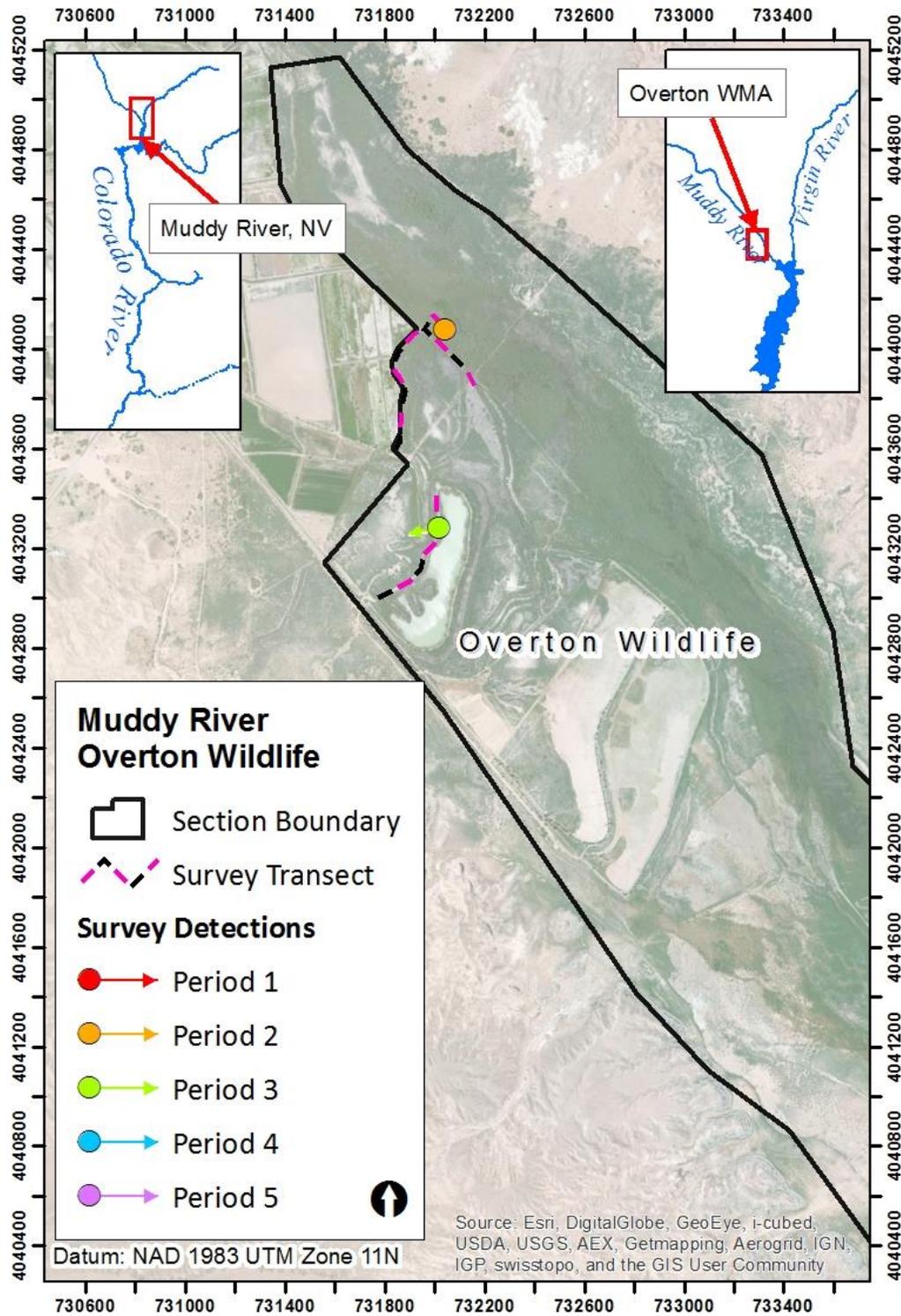


Figure 4.—Muddy River, Overton Wildlife yellow-billed cuckoo survey site showing transects and survey detections, 2014.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

Havasu NWR

The Havasu NWR was established in 1941 and encompasses over 48 km (30 river miles) of the Colorado River 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 historic river meander east of the main river channel currently managed as wildlife habitat. Water levels are seasonally manipulated to benefit wildlife and recreation. There were two areas within the refuge surveyed in 2014: Beal Lake Conservation Area (BLCA) and Topock.

Area: BLCA

Mohave County, Arizona (Colorado River drainage)

Sites: *CPhase05, CPhase06 (HAVBR)*

35.7 ha (87.7 ac)

Sections: *C1505, C1506*

The BLCA lies approximately 3 km (1.9 miles) south of Topock Platform between Beal Lake and Topock Marsh and contains two sites surveyed together. These 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 2008a, 2010) are surveyed for YBCUs. Multiple access roads cross these 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 six survey detections here in 2014 (figure 5).

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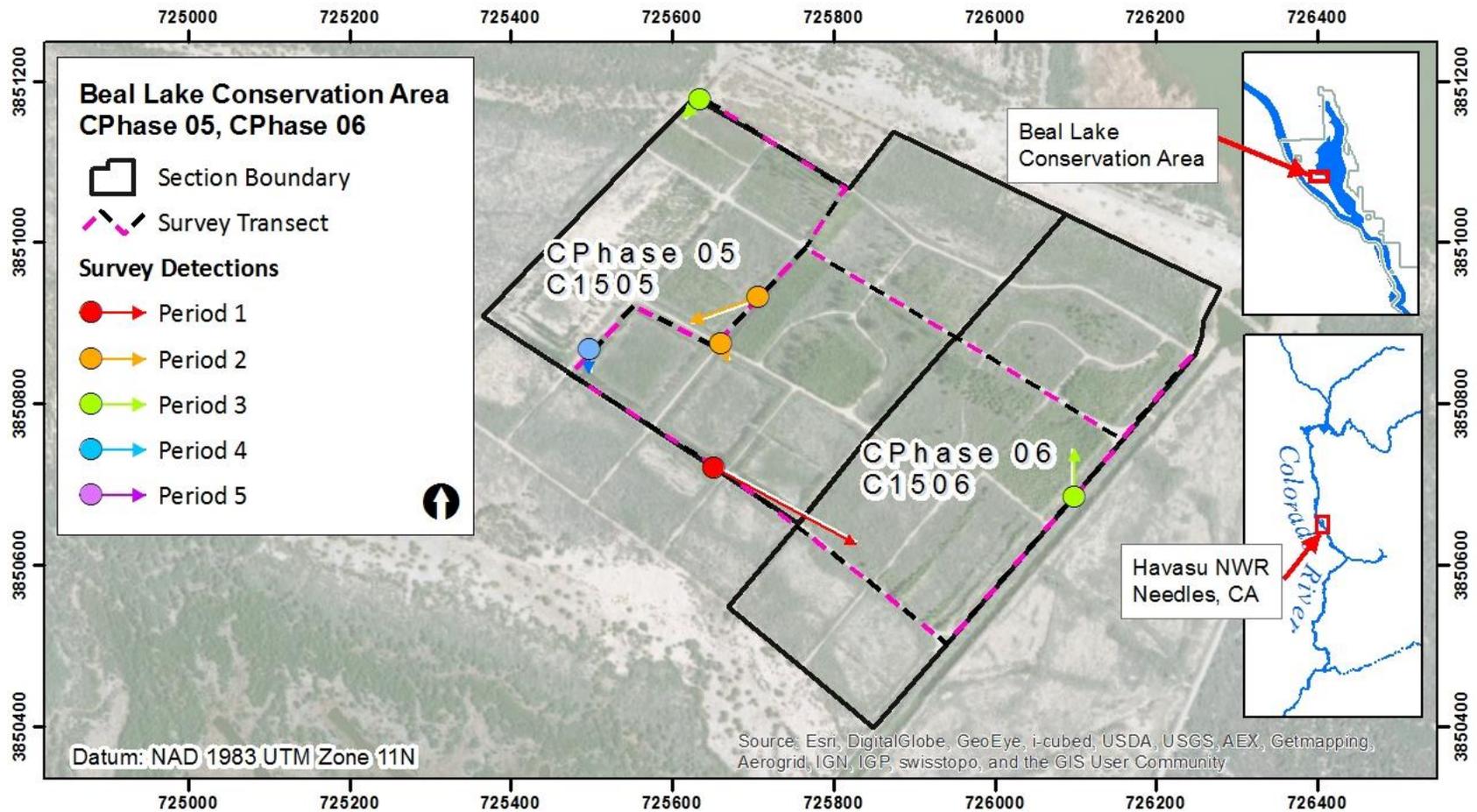


Figure 5.—Beal Lake Conservation Area (Arizona), CPhase 05 and CPhase 06 yellow-billed cuckoo survey sites showing transects and detections, 2014.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

Area: Topock

Mohave County, Arizona (Colorado River drainage)

Two sites in this area were surveyed in 2014: Pintail Slough and Topock Platform.

Site: Pintail Slough

22.4 ha (55.3 ac)

Sections: North Dike (HAVND), 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 (*Prosopis glandulosa*). 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* sp.), 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 2014 (figure 6).

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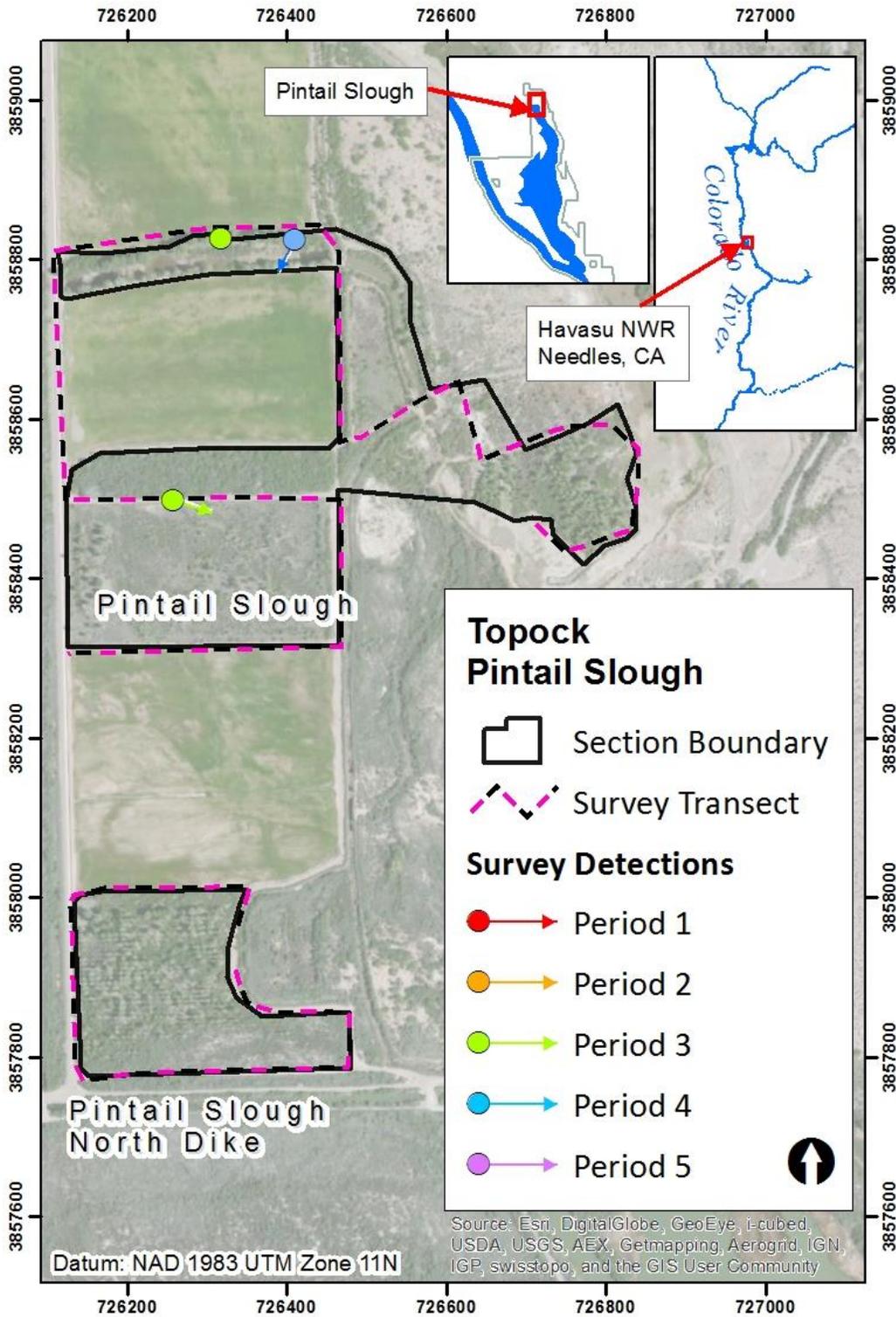


Figure 6.—Topock, Pintail Slough yellow-billed cuckoo survey site showing transects and detections, 2014.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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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 other 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 native habitat located next to fields formerly flooded in the 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 this site and it is in severe decline, with many dead and dying cottonwoods and willows present. During the summer, this habitat patch is dry and supports a healthy cicada population. There was one survey detection at this site in 2014 (figure 7).

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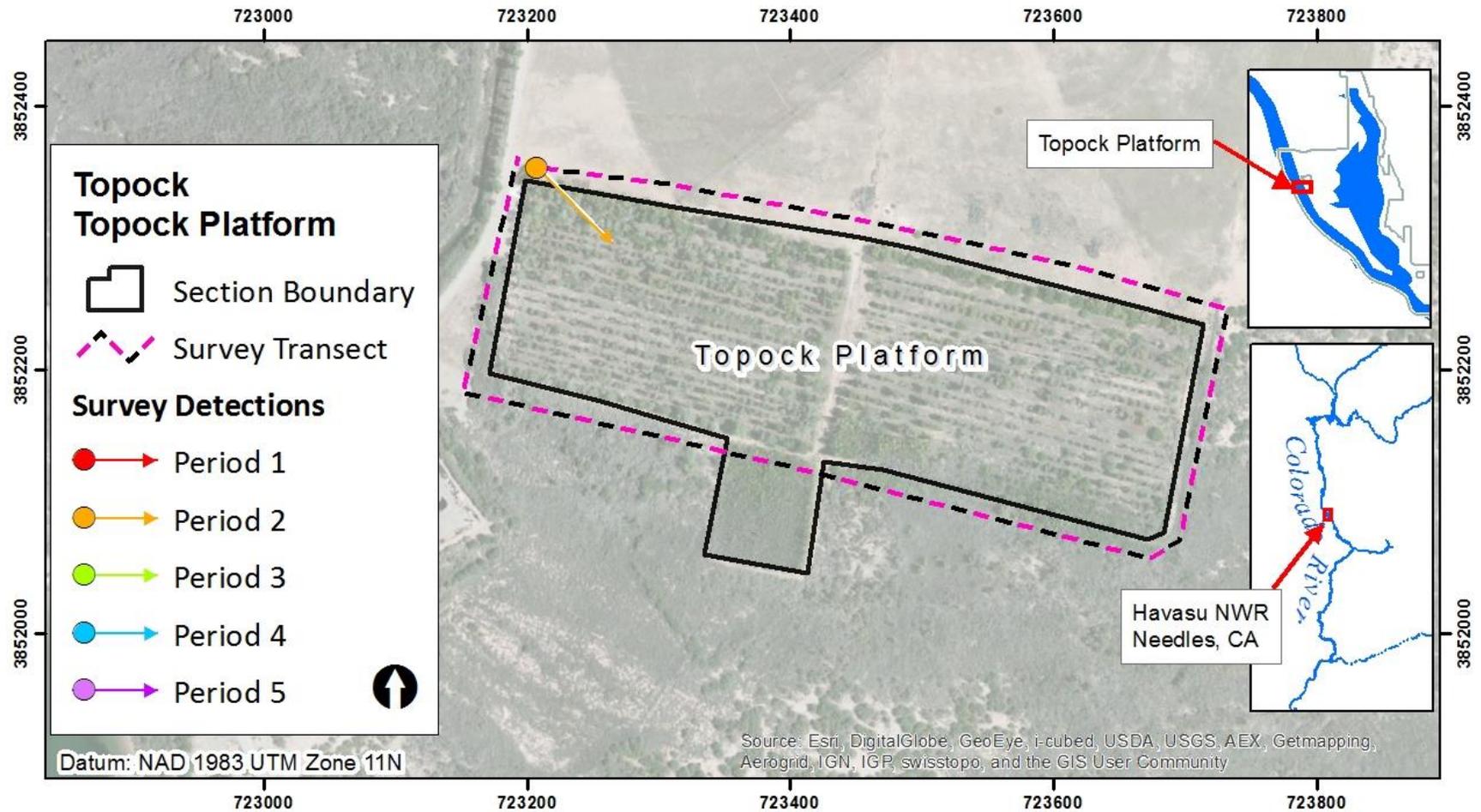


Figure 7.—Topock, Topock Platform yellow-billed cuckoo survey site showing transects and detections, 2014.
Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

Bill Williams River NWR

Area: Bill Williams East and West

Mohave and Yuma Counties, Arizona (Bill Williams River drainage)

The Bill Williams River East and West areas are within the Bill Williams River NWR. The refuge was established in 1993 (formerly part of the Havasu NWR established in 1941) to protect the largest remaining natural riparian habitat in the lower Colorado River Valley. It is located 14.3 km (8.8 miles) 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 16 km (10 miles) 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 riparian habitat regeneration.

The habitat 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 16 sites within Bill Williams River East and Bill Williams River West surveyed in 2014. The Bill Williams River East sites are described from east to west.

Area: Bill Williams River East

Site: Honeycomb Bend (BWHB)

24.8 ha (61 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 multiple 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 seven survey detections and one confirmed breeding territory at this site in 2014 (figure 8).

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Site: Cave Wash (BWCW)

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 historic 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 was one survey detection at this site in 2014 (figure 8).

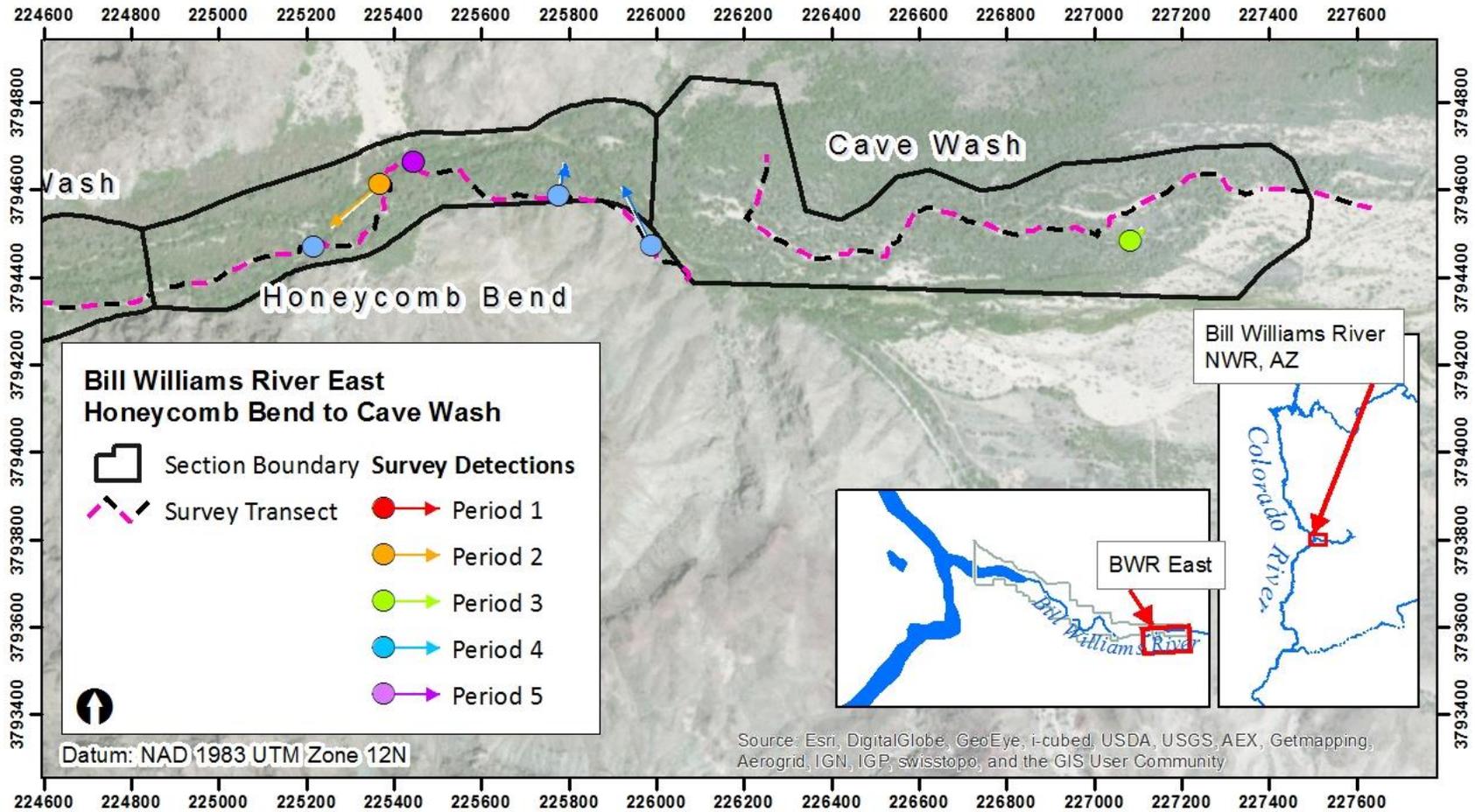


Figure 8.—Bill Williams River East, Honeycomb Bend to Cave Wash yellow-billed cuckoo survey sites showing transects and detections, 2014.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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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 historic Esquerra Ranch house) to the northeast. There were three survey detections at this site in 2014 (figure 9).

Site: Mineral Wash (BWMW)

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 this 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 nine survey detections and three confirmed breeding territories at this site in 2014 (figure 9).

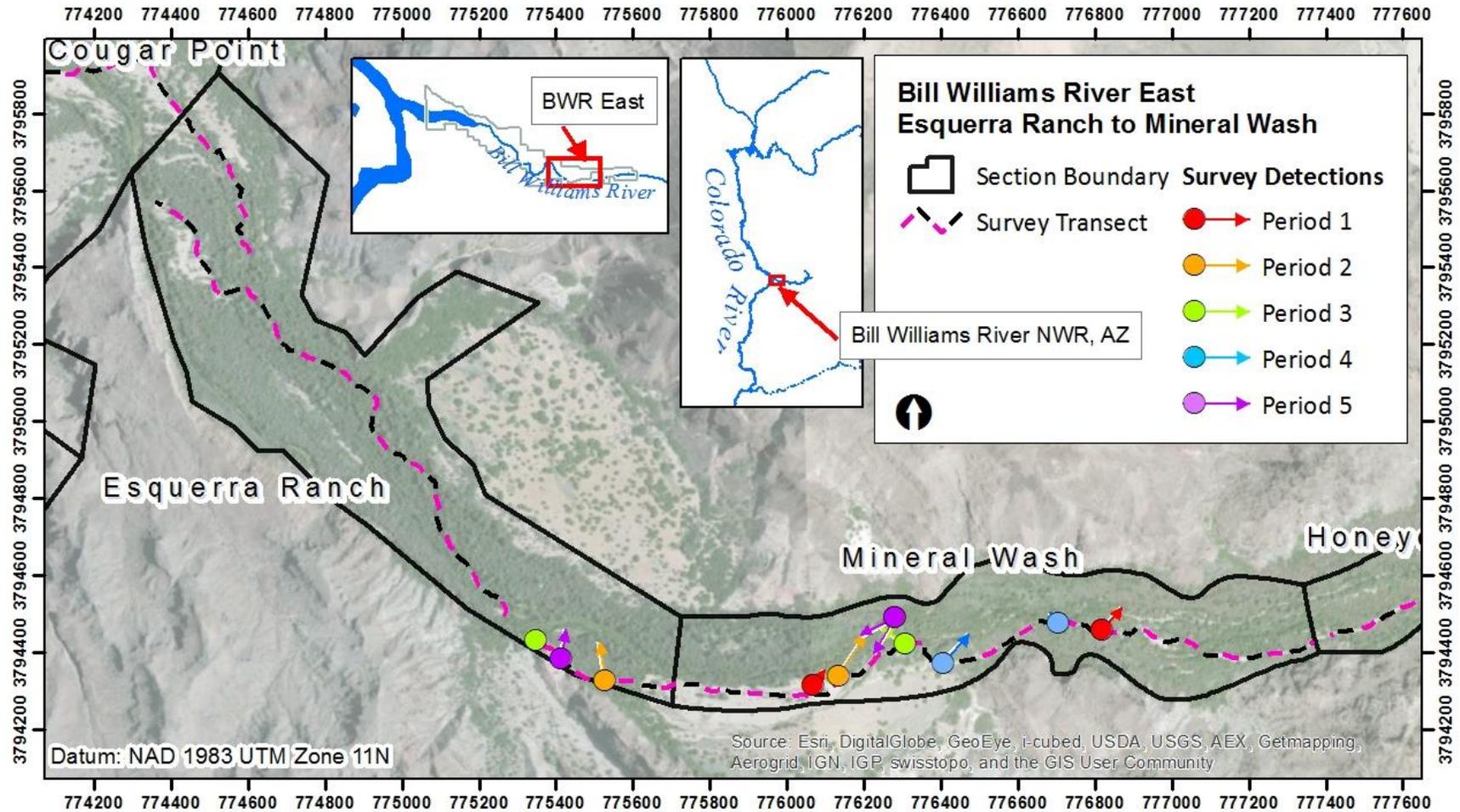


Figure 9.—Bill Williams River East, Esquerra Ranch and Mineral Wash yellow-billed cuckoo survey sites showing transects and detections.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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Site: Kohen Ranch (BWKR)
Section: Kohen Ranch

43.4 ha (107.2 ac)

This site covers areas of natural regeneration that occurred following prolonged flooding during 2005–06. The route begins at the historic Kohen Ranch and heads northeast following the northern edge of the riparian habitat and paralleling 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 two survey detections at this site in 2014 (figure 10).

Site: Gibraltar Rock (BWGR)
Section: Gibraltar Rock

90.1 ha (222.6 ac)

This site is located between Cougar Point and Sandy Wash and south of Kohen Ranch. The eastern portion of the route is generally xeric and open, with patches of large native trees and a dense understory of tamarisk. The western half of the route is drier, with small patches of large native trees and a dense understory of tamarisk, traversing along the old refuge road near the Gibraltar Rock cliff formation. This site may experience winter flooding. Hikers occasionally use this route. There were no survey detections at this site in 2014 (figure 10).

Site: Cougar Point (BWCP)
Section: Cougar Point

49.7 ha (122.8 ac)

This site is 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 2014 (figure 10).

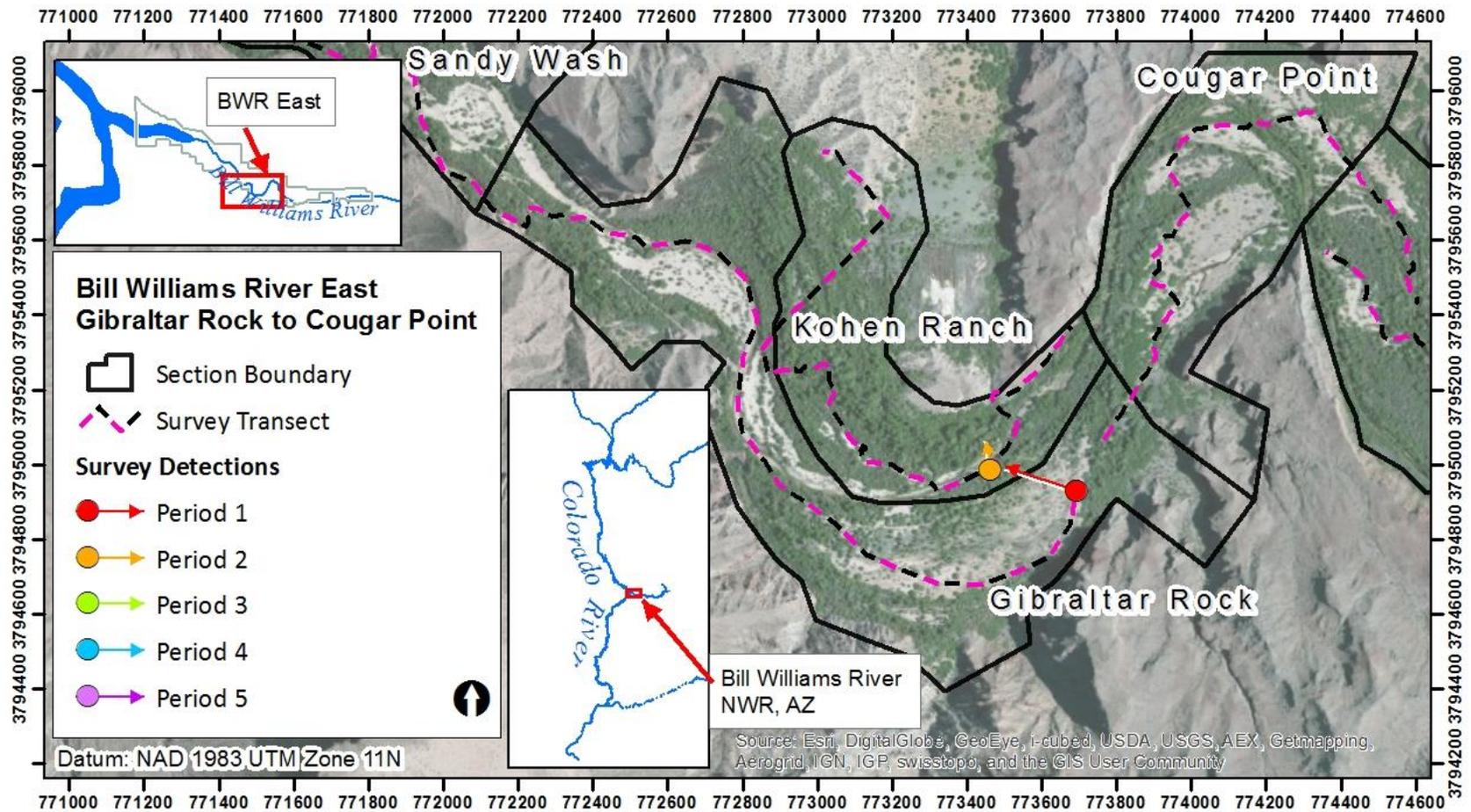


Figure 10.—Bill Williams River East, Gibraltar Rock to Cougar Point yellow-billed cuckoo survey sites showing transects and detections, 2014.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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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 and is reached by the Cross River trail. This site can be reached by kayak or Cross River trail. There were no survey detections at this site in 2014 (figure 11).

Site: Middle Delta (BWMD)

39.2 ha (96.9 ac)

Section: Middle Delta

This site traverses an extensive patch of mature, mixed exotic vegetation extending upstream from the river delta between the BW Marsh and North Burn sites. It also connects to Cross River and North Burn. The eastern (upstream) end has extensive patches of mature cottonwood overstory, with an open understory. To the west, the overstory consists of patches of mature willow, which become sparse closer to Lake Havasu. The understory is dominated by dense tamarisk. The western end of this site is bordered by two forks of the Bill Williams River delta. There was one survey detection at this site in 2014 (figure 11).

Site: BW Marsh (BWMA)

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 activity occur here. There were no survey detections at this site in 2014 (figure 11).

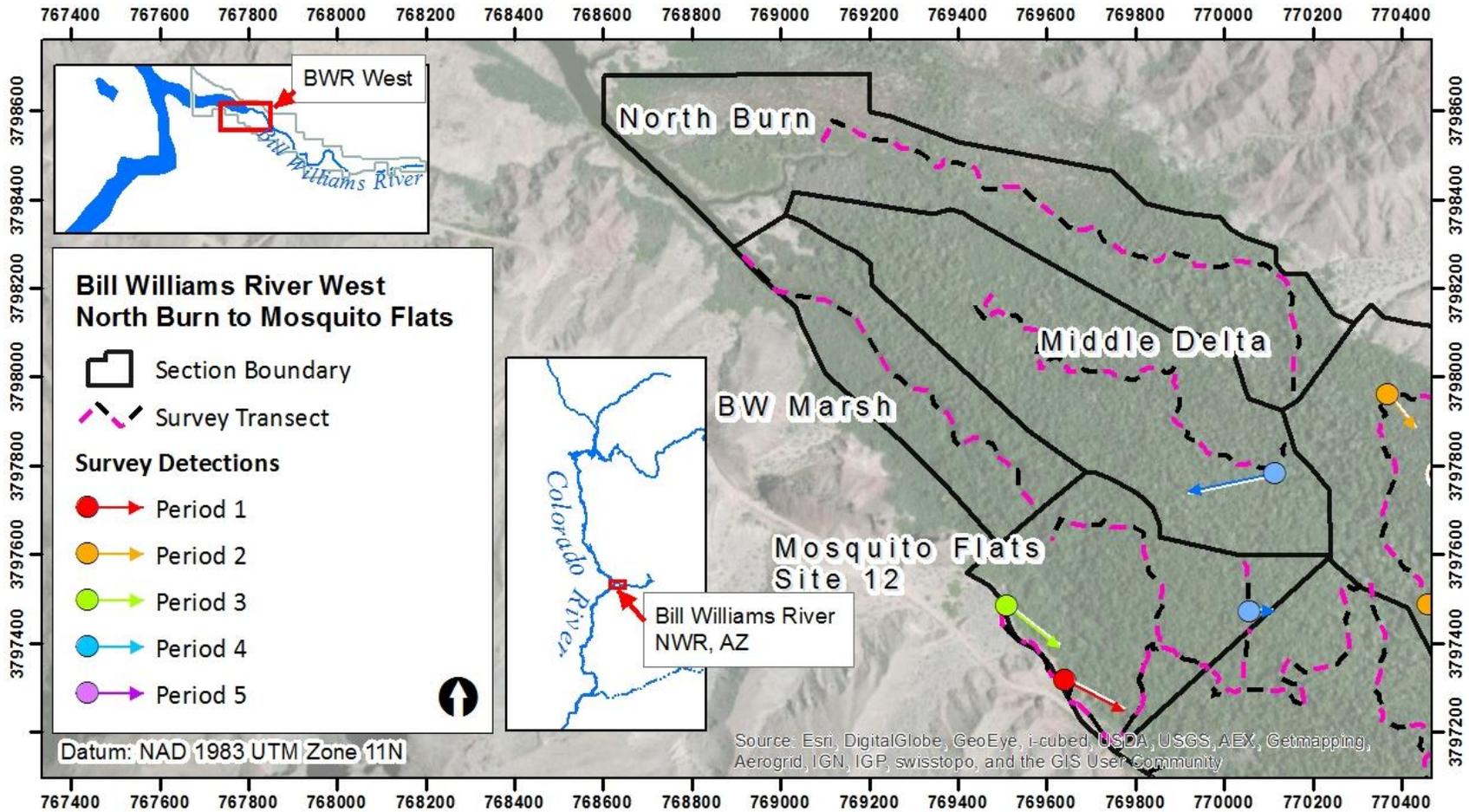


Figure 11.—Bill Williams River West, North Burn to Middle Delta, including Mosquito Flats yellow-billed cuckoo survey sites showing transects and detections, 2014.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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 makes a loop 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 four survey detections at this site in 2014 (figure 12). There were two survey detections at this site in 2014 (figure 12).

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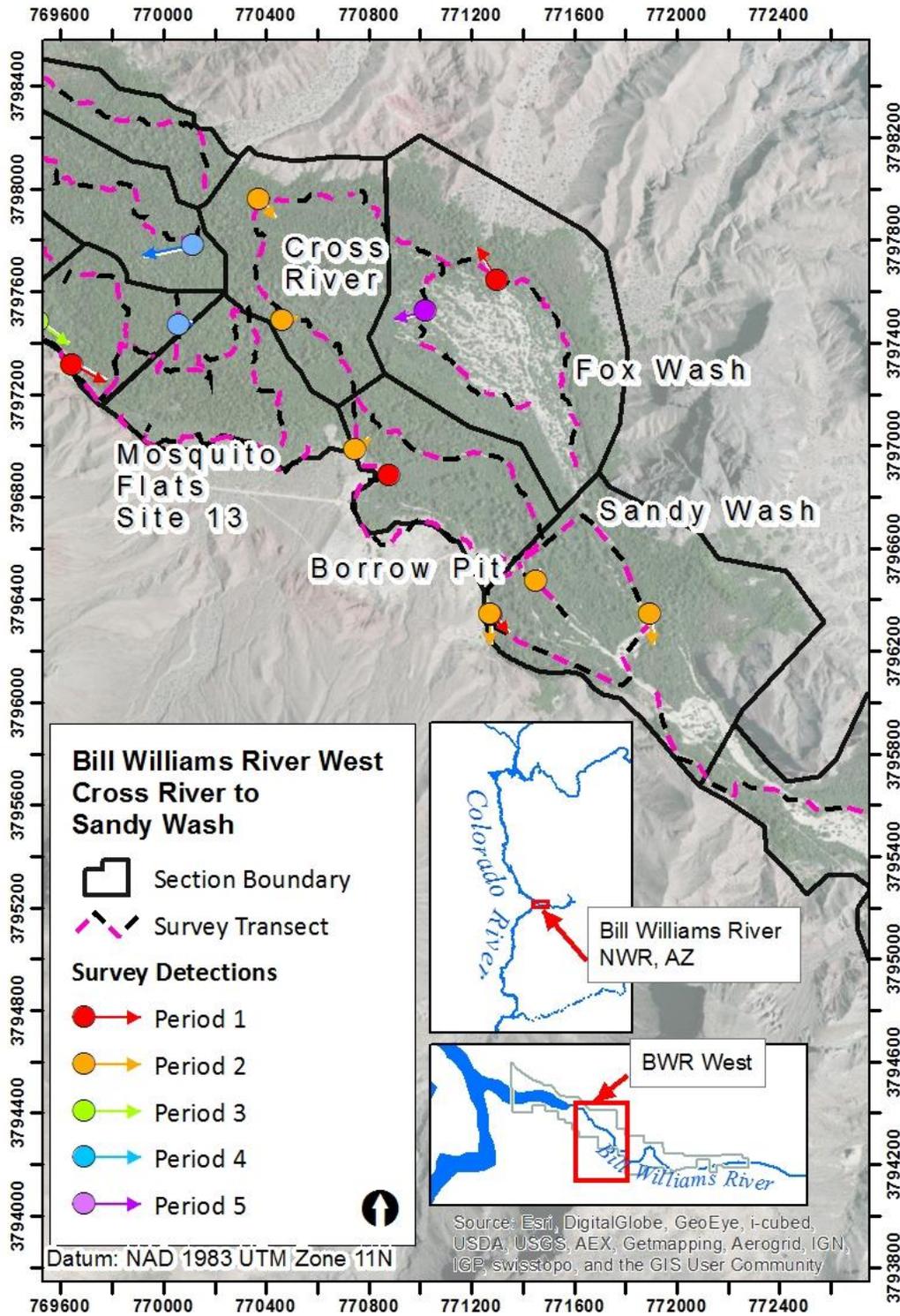


Figure 12.—Bill Williams River West, Mosquito Flats to Sandy Wash yellow-billed cuckoo survey sites showing transects and detections, 2014.
Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

Parker

Area: 'Ahakhav Tribal Preserve

Colorado River Indian Tribal Lands, Arizona

The 'Ahakhav Tribal Preserve lies along the Colorado River approximately 3.5 km (2.1 miles) southwest of Parker, Arizona. This 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: Colorado River Indian Tribe (CRIT 09) (CRIT) 62.5 ha (154.4 ac)
Section: CRIT 09

Over 54 ha (133 ac) of riparian habitat have been restored 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 four survey detections at this site in 2014 (figure 13).

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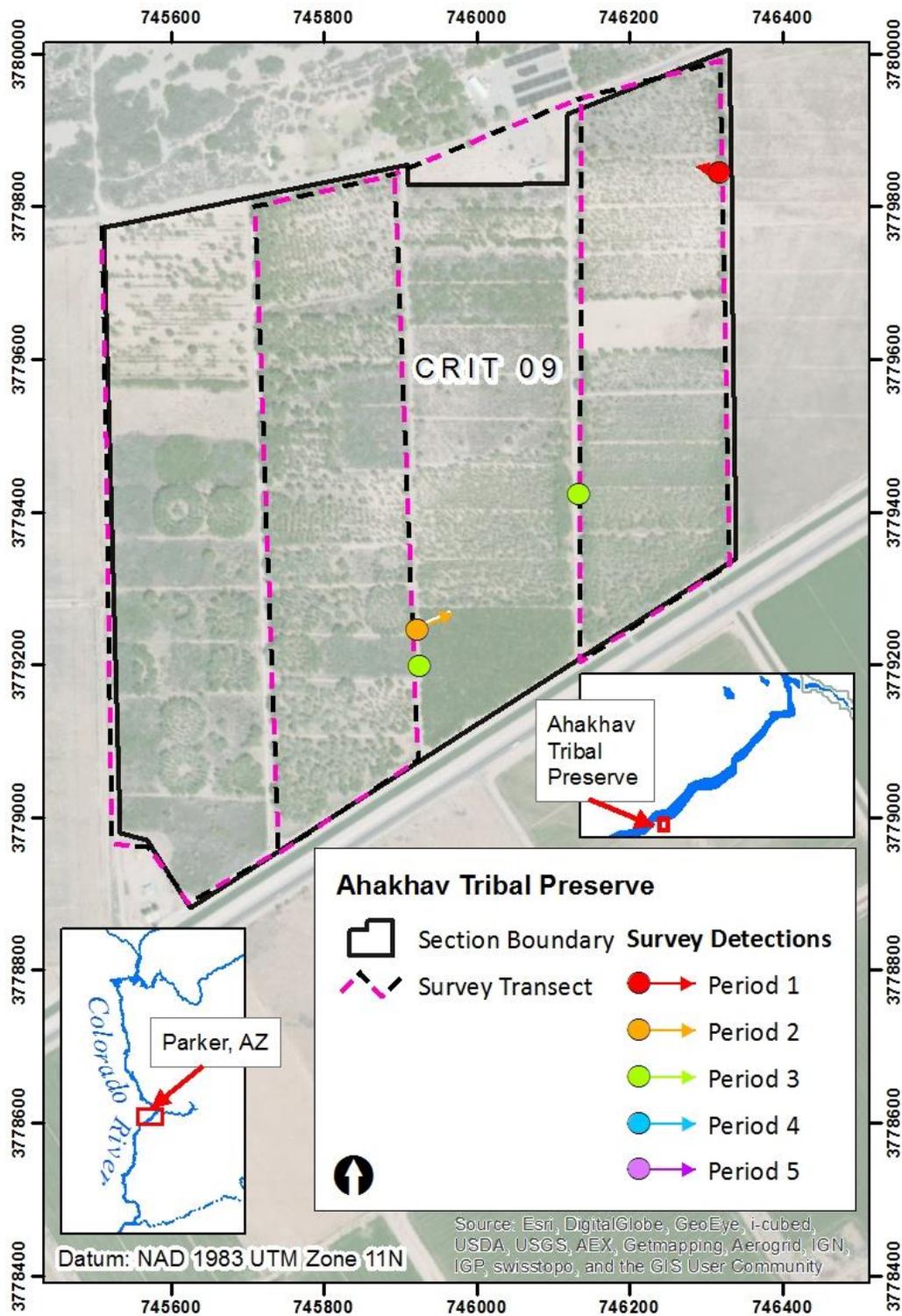


Figure 13.—‘Ahakhav Tribal Preserve yellow-billed cuckoo survey site showing transects and detections, 2014.
 Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

Blythe

Area: PVER

Riverside County, California

The PVER is located 12 km (7.4 miles) 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 2006a), including the specific development plans for each phase (see www.lcrmscp.gov). Phases 01–07 were fully surveyed in 2014, comprising almost 400 contiguous ha (988 ac) of suitable breeding habitat spread over 5 linear km (3.1 miles) bordering the LCR. The phases were surveyed as they became suitable breeding habitat, with Phase 07 first surveyed completely in 2014. All sites experience farming activity, 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 01 to 07 experience hunting-related disturbance on at least two boundaries, including increased human and vehicle traffic, and increased noise from gunshots, humans, and vehicles.

Site: Phase 01 (PVER1)

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. This 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 was one survey detection at this site in 2014 (figure 14).

Site: Phase 02 (PVER2)

31.6 ha (78 ac)

Sections: C2340 and C2339

Phase 02 was planted in 2007. This 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 and coyote willow, considered preferred habitat for the southwestern willow flycatcher (Reclamation 2006b). The eastern half of Section C2340 contains a small field planted with a genetic diversity of cottonwood trees (unlike the other plots, which were planted from nursery pole cuttings). This site is bordered on all sides by dirt access roads and irrigation canals on the west, east, and south. There were seven survey detections at this site in 2014 (figure 14).

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Site: Phase 03 (PVER3)

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 three survey detections at this site in 2014 (figure 14).

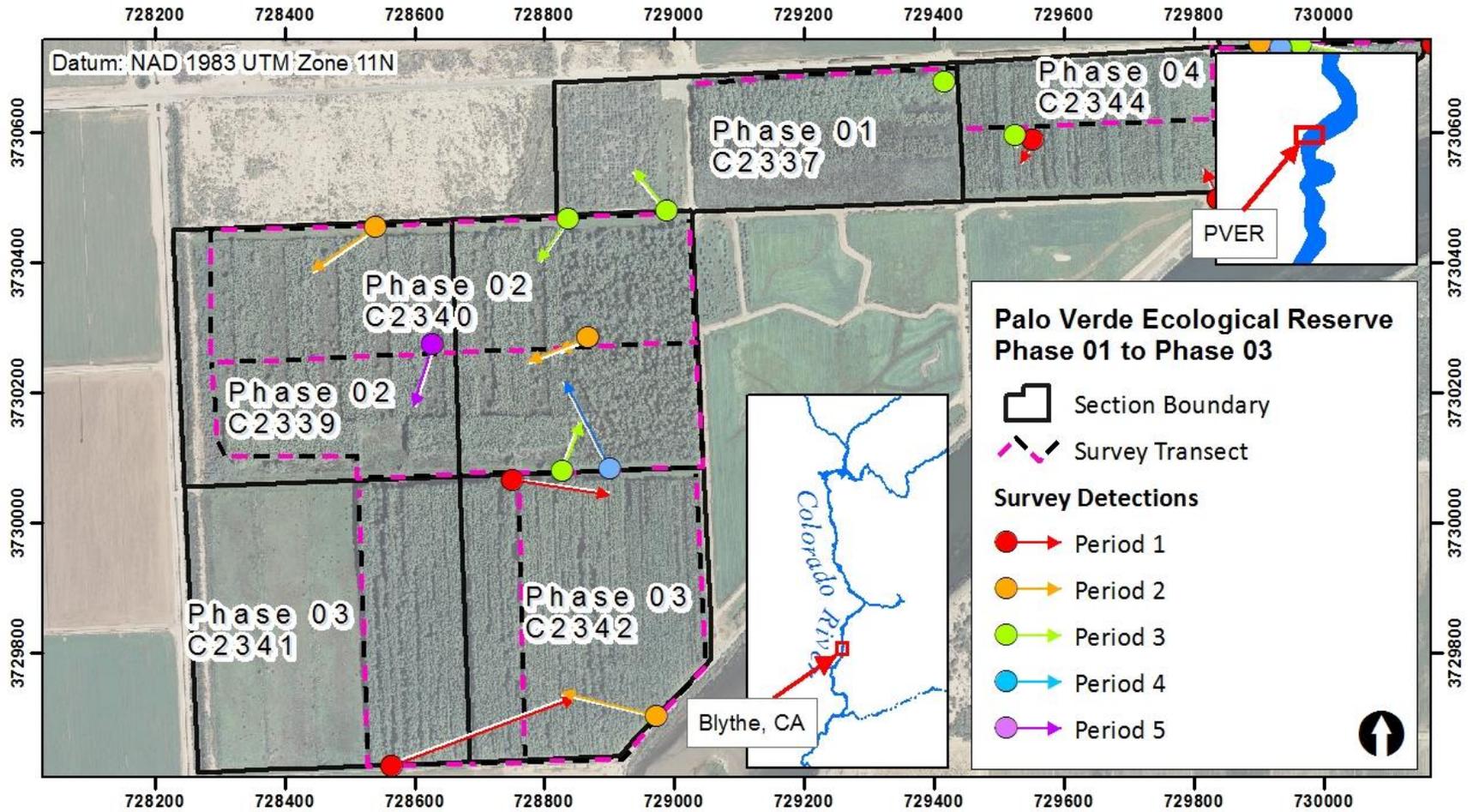


Figure 14.—Palo Verde Ecological Reserve, Phase 01 to 03 yellow-billed cuckoo survey sites showing transects and detections, 2014. Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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Site: Phase 04 (PVER4)

41.2 ha (77 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 on the west and north sides. There were 23 survey detections and four nests found in 2014 (figure 15).

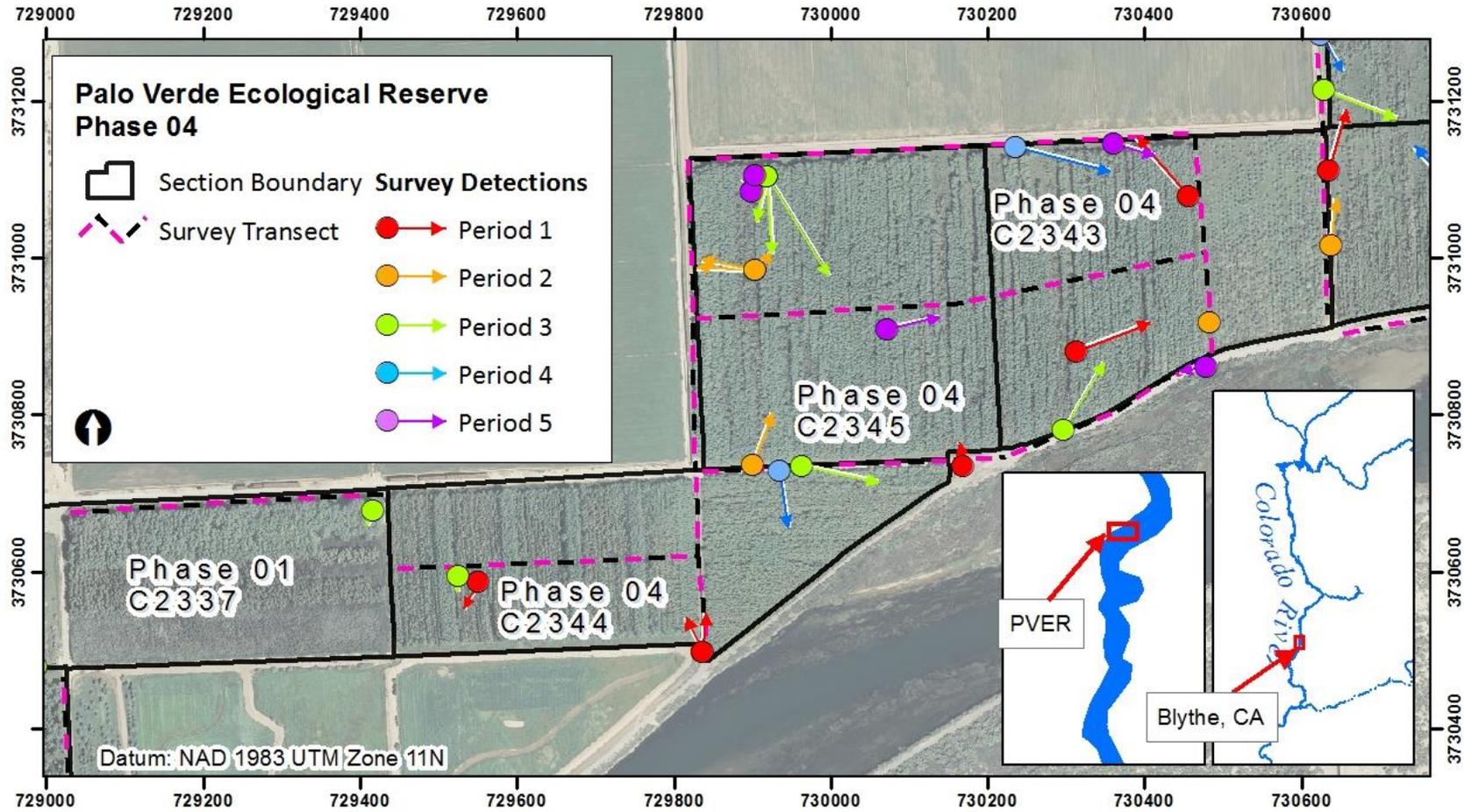


Figure 15.—Palo Verde Ecological Reserve, Phase 04 yellow-billed cuckoo survey site showing transects and detections, 2014. Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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Site: Phase 05 (PVER5)

87.4 ha (216 ac)

Sections: C2346, C2347, C2348, C2349, 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 meadow areas. It is bordered by agriculture fields to the west and the Colorado River to the east. Dirt access roads surround the perimeter, and an irrigation canal is on the western boundary. There were 78 survey detections and ten confirmed breeding territories, including 5 nests, in 2014 (figure 16).

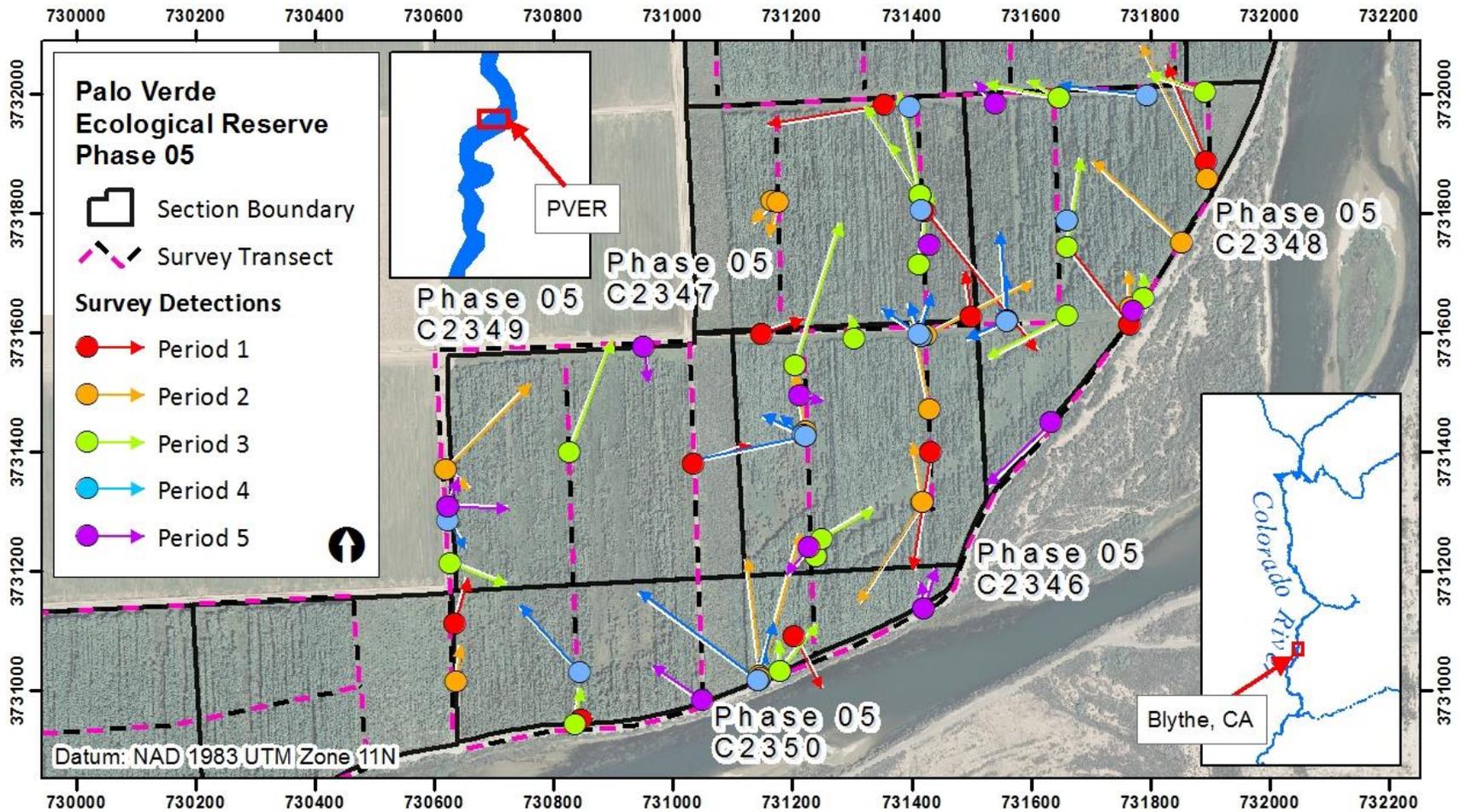


Figure 16.—Palo Verde Ecological Reserve, Phase 05 yellow-billed cuckoo survey site showing transects and detections, 2014. Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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Site: Phase 06 (PVER6)

89 ha (219.9 ac)

Sections: C2351, C2352, C2353, C2354, C2355

Phase 06 was planted with cottonwood, willow, and *Baccharis* species, and open areas of native grasses, quail bush, and mesquite in 2011. This site is bordered by agriculture fields, an irrigation canal to the west, and the Colorado River to the east. Dirt access roads surround the perimeter. There were 86 YBCU survey detections and 25 confirmed breeding territories, including 13 nests, in 2014 (figure 17).

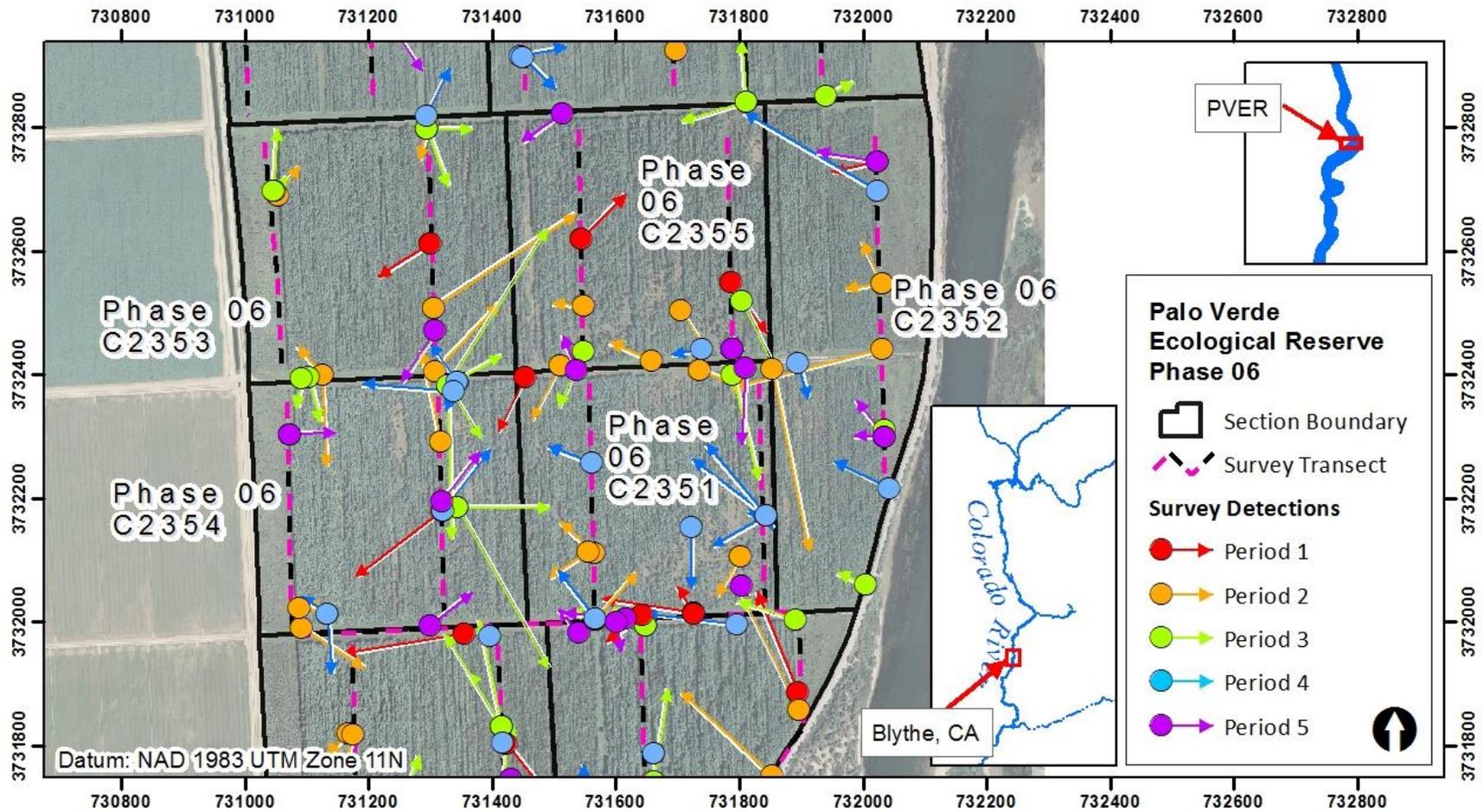


Figure 17.—Palo Verde Ecological Reserve, Phase 06 yellow-billed cuckoo survey site showing transects and detections, 2014. Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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Site: Phase 07 (PVER7)

91.6 ha (226.3 ac)

Sections: C2356, C2357, C2358, C2359, C2360

Phase 07 was planted with cottonwood, Gooddings willow, coyote willow, and *Baccharis* spp., and open areas of native grasses, quail bush, and mesquite in 2012. This site is bordered by agriculture fields to the west and north and the Colorado River to the east. Dirt access roads surround the perimeter. There were 52 survey detections and 10 confirmed breeding territories, including 7 nests, in 2014 (figure 18).

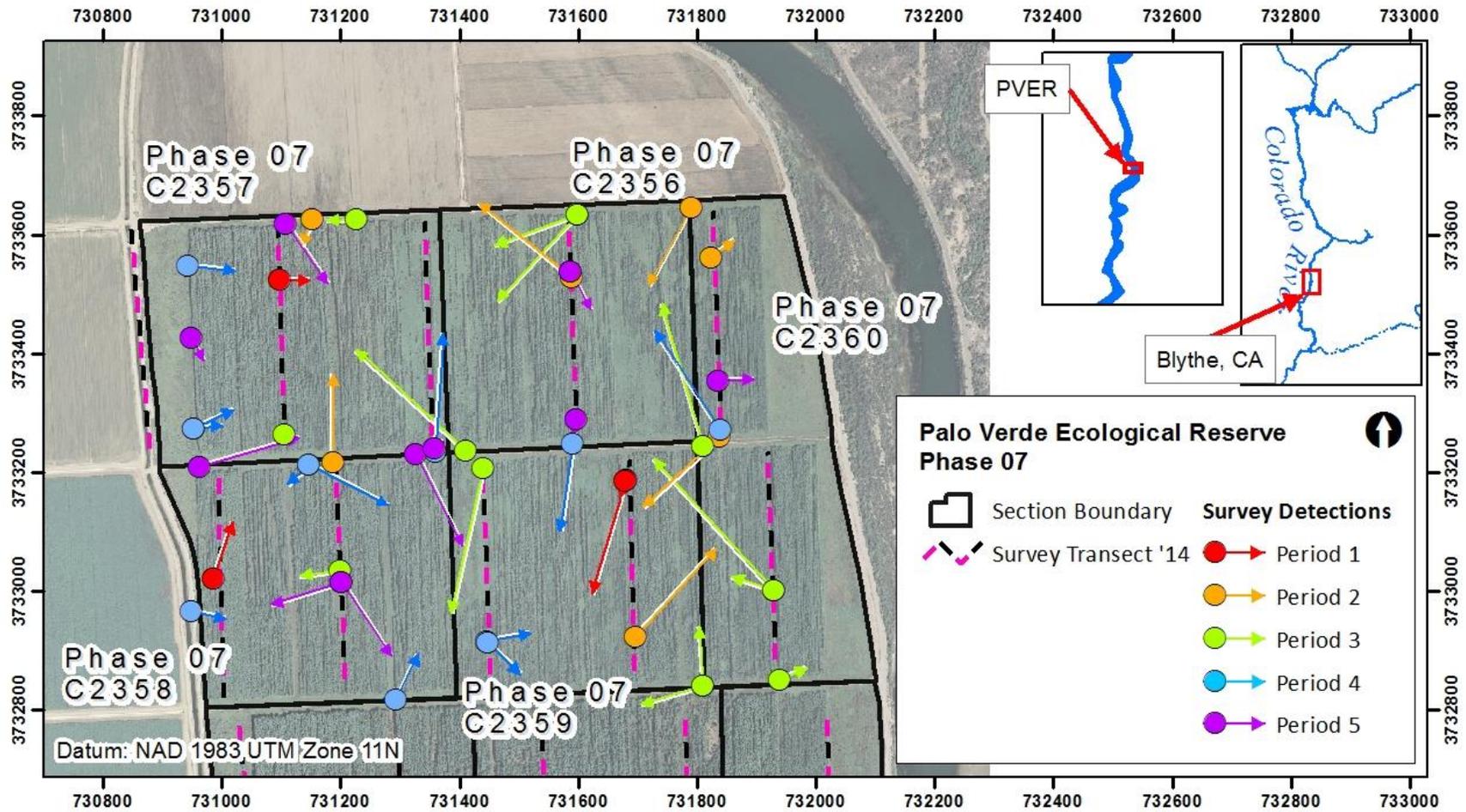


Figure 18.—Palo Verde Ecological Reserve, Phase 07 yellow-billed cuckoo survey site showing transects and detections, 2014. Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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Cibola Valley

Area: CVCA

La Paz County, Arizona

The CVCA is located 24.2 km (15 miles) south of Blythe, California, south and east of the Colorado River and the California/Arizona border. Within Cibola Valley, 407.6 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, 20011). 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. Phases 01 and 02 are located in adjacent fields, and Phase 03 is approximately 2.6 km (1.6 miles) to the west. Agricultural fields dominate the area surrounding the sites. Three sites were fully surveyed in 2014: Phases 01, 02, and 03 (one survey was conducted in Phase 04W, a mesquite site, but it was not continued due to lack of suitability).

Site: Phase 01 (CVCA1)

37.2 ha (91.9 ac)

Sections: C2525, C2526

This site consists of six fields planted in 2006 (Reclamation 2007b). The Colorado River flows approximately 100 m (328 ft) from the northern edge of this site. The dominant tree species are 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 this site. The northern, southern, and western boundaries have cement-lined irrigation canals. There were eight survey detections in 2014 (figure 19).

Site: Phase 02 (CVCA2)

27.5 ha (68 ac)

Sections: C2339, C2340

Phase 02 was planted in 2008 (Reclamation 2007c). This 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. Agriculture fields are located to the east and south, with Highway 78 directly to the east. There were three YBCU detections and one nest confirmed in 2014 (figure 19).

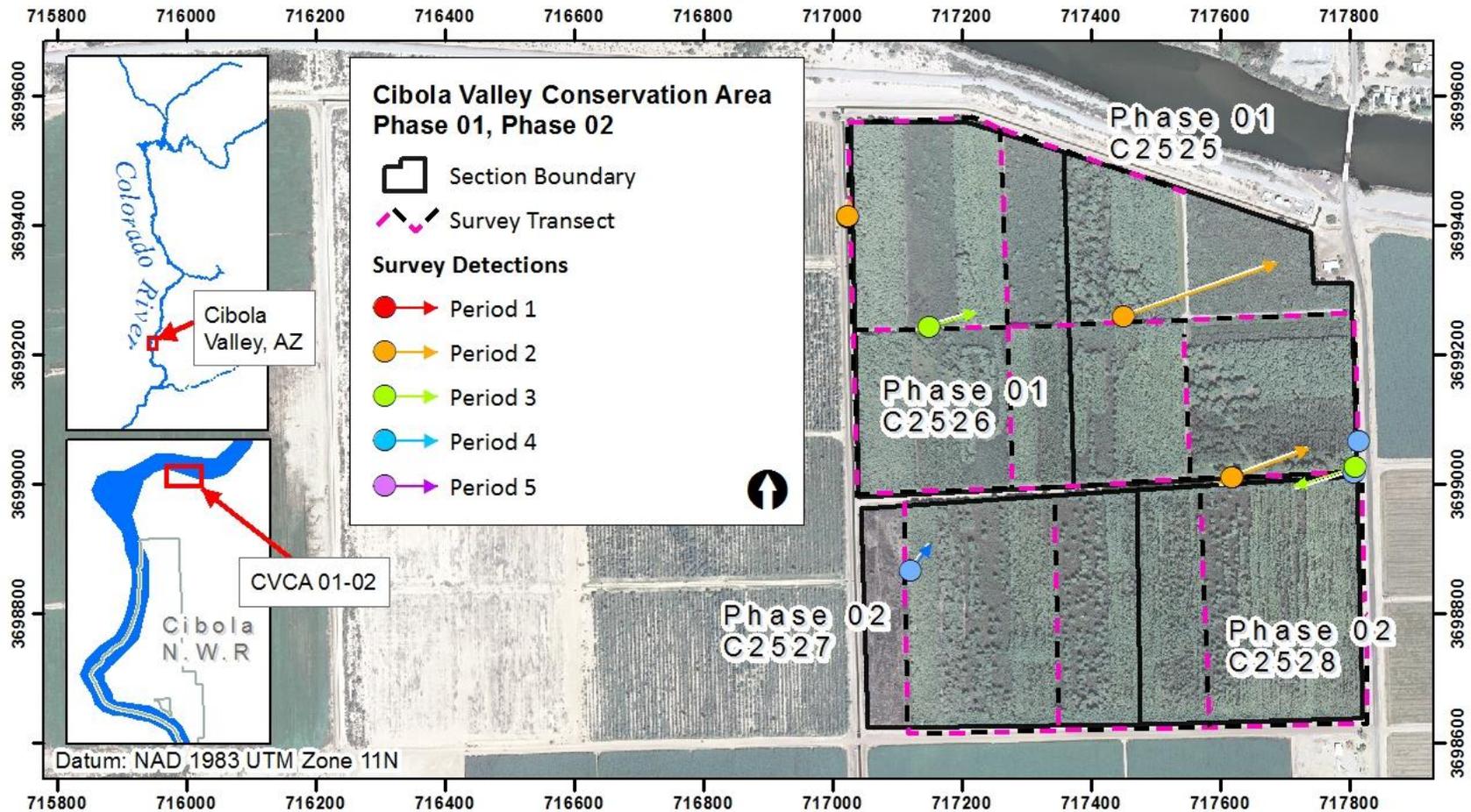


Figure 19.—Cibola Valley Conservation Area, Phases 01 and 02 yellow-billed cuckoo survey sites showing transects and detections, 2014.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

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Site: Phase 03 (CVCA3)
Sections: C2529, C2530

43.9 ha (108.5 ac)

Phase 03 is located 2.6 km (1.6 miles) west of Phases 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 this site, and an agriculture field lies to the west. There were no detections in 2014 (figure 20).

Site: Phase 04W (CVCA4W)
Sections: C2531, C2532

24.4 ha (60.3 ac)

This site is north of CVCA Phase 03 and planted primarily with honey mesquite and quail bush (Reclamation 2008b). One test survey was conducted at this mesquite plot in 2014 after a YBCU was detected at this site in 2013. Though several avian species were recorded in this site (attachment C), the habitat was deemed not yet suitable for breeding YBCUs. Additional mesquite plots were planted at Phase 05 in 2010 and Phase 06 in 2011 (Reclamation 2009, 2011). There were no survey detections in 2014 (figure 20).

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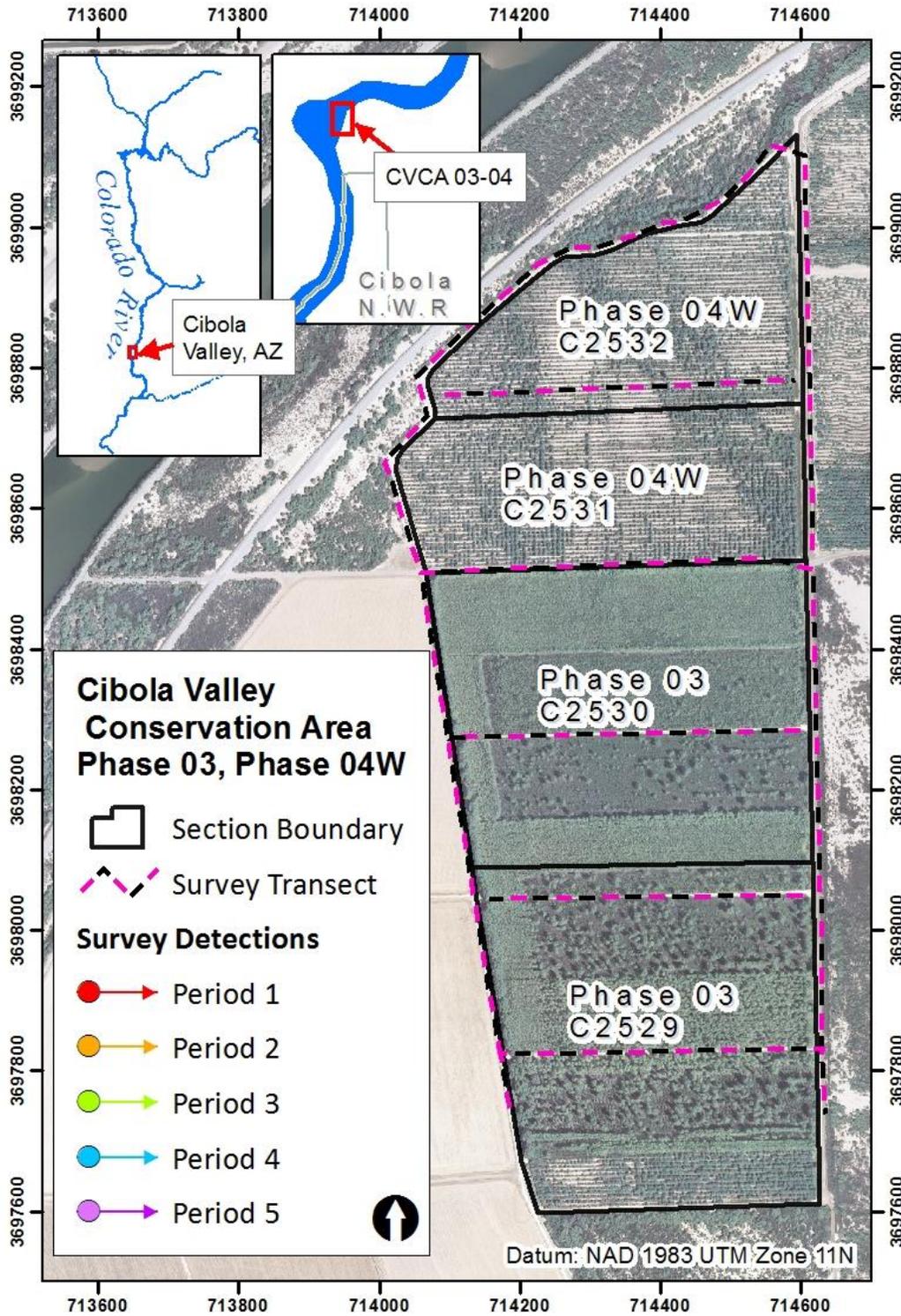


Figure 20.—Cibola Valley Conservation Area, Phases 03 and 04W yellow-billed cuckoo survey sites showing transects, 2014. Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

CNWR

Area: Cibola National Wildlife Refuge Unit 1 (CNU1)

La Paz County, Arizona (Colorado River drainage)

The Cibola NWR is 29.8 km (18.5 miles) south of Blythe, California, within the historical flood plain of the Colorado River. The refuge, greater 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 crops border tamarisk and mesquite-dominated uplands. Most riparian habitats on the refuge are restored sites, with varying degrees of irrigation. Five sites surveyed in 2014 were all in CNU1.

Site: Cottonwood Genetics (CIBGEN)

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 in 2014 (figure 21).

Site: Mass Transplanting (CIBMT)

8.1 ha (20 ac)

Section: Mass Transplanting

This site is west of and adjacent to 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 ac) were planted to inhibit growth of non-native species, though some open areas are now invaded by non-native Johnson grass. There were no survey detections in 2014 (figure 21).

Site: Nature Trail (CIBCNT)

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 this 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 this site to the north and east are seasonally flooded fields for wintering waterfowl. This site is heavily invaded with Johnson grass. There were three survey detections and one confirmed breeding territory in 2014 (figure 21).

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Site: CW-North (CIBNTH)

7.3 ha (18 ac)

Section: CW-North

CW-North is a small, more open, structurally homogeneous site with a cottonwood overstory and ground cover dominated by Bermuda grass. This site is bordered to 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. Nature Trail is 580 m (1,903 ft) to the south, separated by three agricultural fields. There was one survey detection in 2014 (figure 21).

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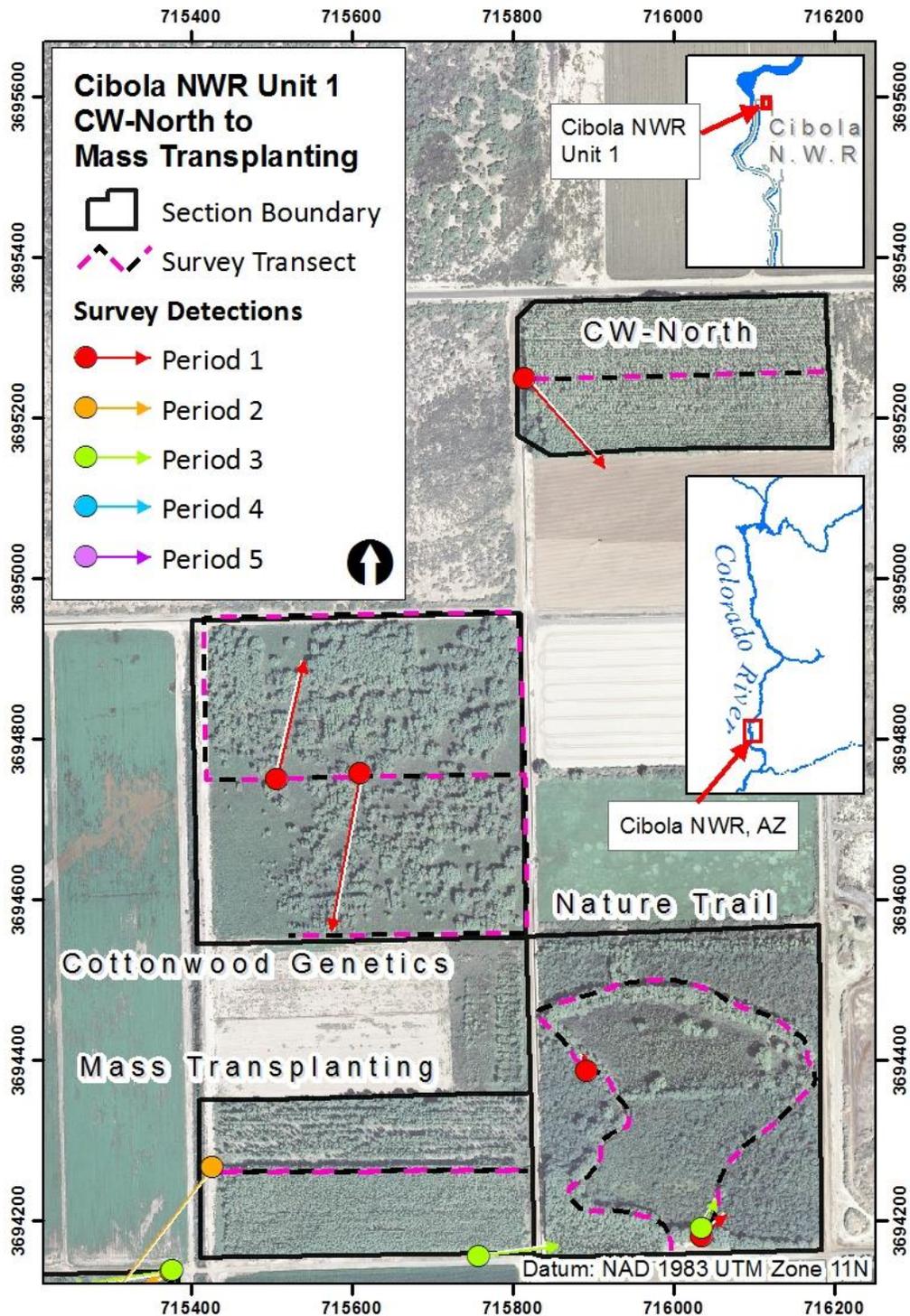


Figure 21.—Cibola National Wildlife Refuge Unit 1 Conservation Area, CW-North to Mass Transplanting yellow-billed cuckoo survey sites showing transects and detections, 2014.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

Site: Crane Roost (CIBCR)
Sections: C2726, C2727

57.3 ha (141.6 ac)

Two sections of this site are similar and encompass an older area. Both sections were planted in 2005 and consist 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 bounded on the north by an access road and an agricultural field. Section C2727 is bounded on the west by an access road and irrigation canal. There were 24 survey detections and three nests found at this site in 2014 (figure 22).

Section: C2728

Dirt access roads surround and dissect the more recently planted (2009) fields of mixed cottonwood and willow just south of Section C2726 and east of Section C2727. This section abuts an agricultural field and a dirt irrigation canal to the east. It contains surface salt deposits, and riparian plantings are shorter and sparser in this section. There were four survey detections at this section in 2014 (figure 22).

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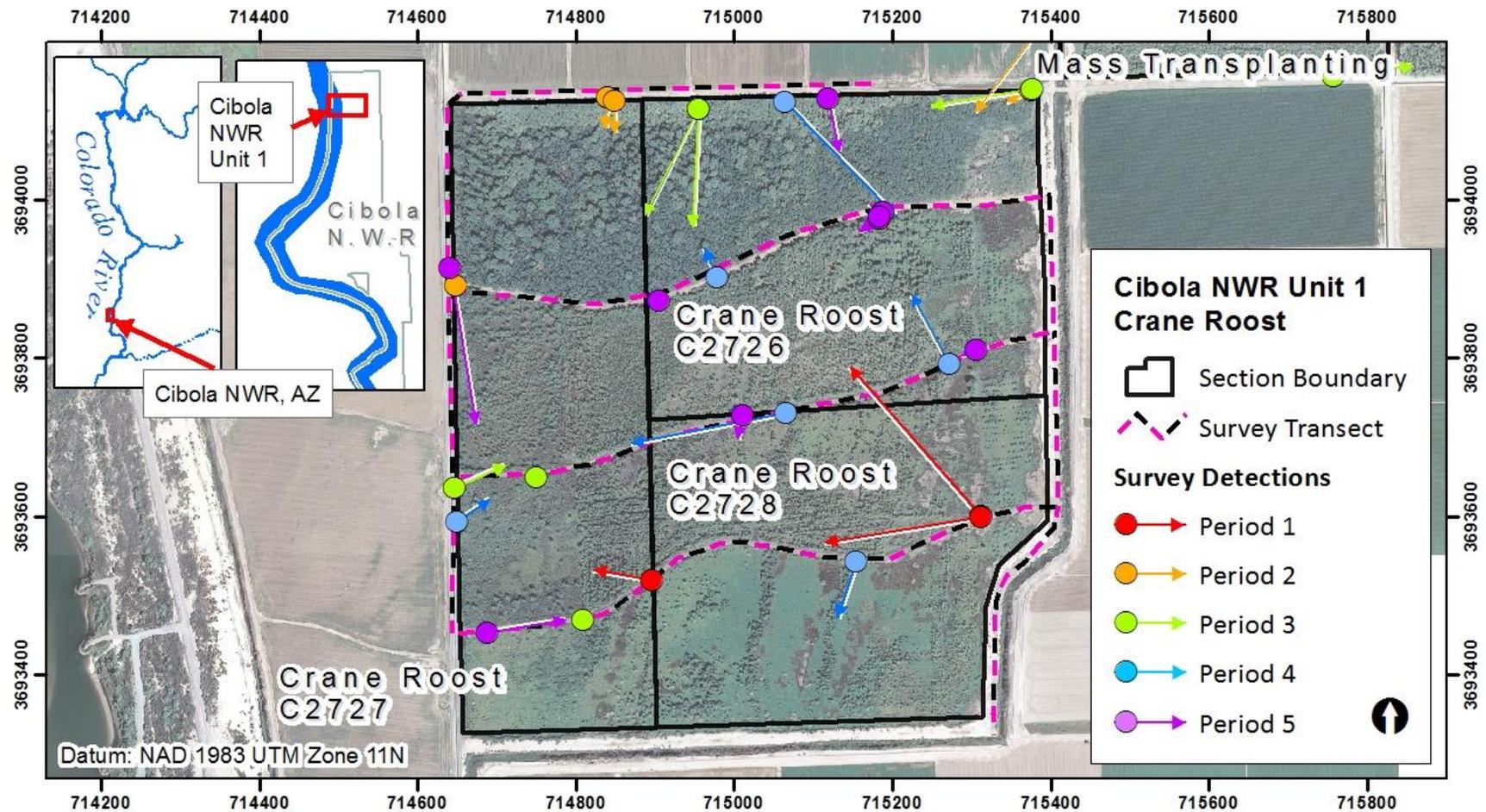


Figure 22.—Cibola National Wildlife Refuge Unit 1 Conservation Area, Crane Roost yellow-billed cuckoo survey site showing transects and detections, 2014.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

Yuma

Area: Laguna

Yuma County, Arizona (Colorado River drainage)

The Laguna area includes the Mittry Lake Wildlife Management Area (Mittry Lake WMA), managed by the Arizona Game and Fish Department for wildlife habitat and outdoor recreation. The Mittry Lake WMA is 24.2 km (15 miles) 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 2014.

Site: Mittry (MLPR)

12.2 ha (30.1 ac)

Section: Pratt Restoration

Pratt Restoration 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 this 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 was one YBCU survey detection in 2014 (figure 23).

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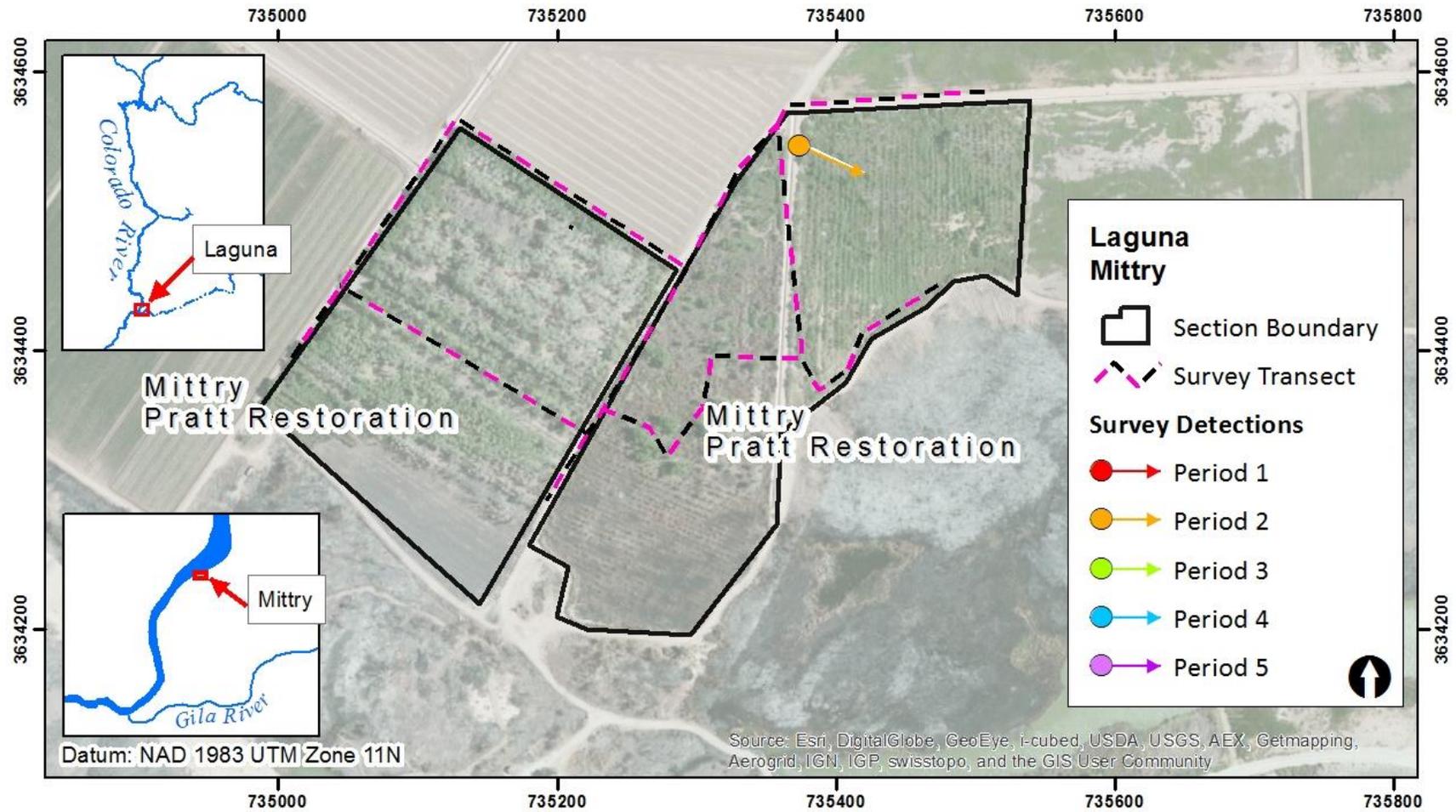


Figure 23.—Laguna, Mittry yellow-billed cuckoo survey site showing transects and detections, 2014.

Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

Area: Yuma East Wetlands

Yuma County, Arizona (Colorado River drainage)

The Yuma East Wetlands are along the banks of the Colorado River in the city of Yuma, Arizona. Until recently, the area was a mix of exotic plants, trash dumps, and squatter camps. Before becoming part of the LCR MSCP, the Yuma East Wetlands was part of the Yuma Crossing Natural Heritage Area, under joint management by the City of Yuma, the Quechan Tribe, the Arizona Game and Fish Department, and private ownership. Planting at Yuma East began in the winter of 2003–2004. The area is promoted as a recreation area with a swimming area, trails, and restrooms. This site is highly managed, with new plantings, clearing, and frequent irrigation. Site workers, hikers, bike riders, as well as homeless are frequently encountered.

Site: *South AC, South C, I (YUEW)*

109.3 ha (270 ac)

Sections: *C4702, C4710, C4711*

These sites are immediately east of the Ocean to Ocean Bridge, approximately 1.2 km (0.7 mile) upstream of Yuma West Wetlands. Only habitat on the southern side of the Colorado River was surveyed in 2014. Section C4702 parallels the river and consists of a mosaic of plantings of Fremont cottonwood, Goodding's willow, and mesquite (*Prosopis* spp.). Further south and east, several rectangular patches of mixed species plantings in Sections C4711 and C4710 were also surveyed. There were no survey detections here in 2014 (figure 24).

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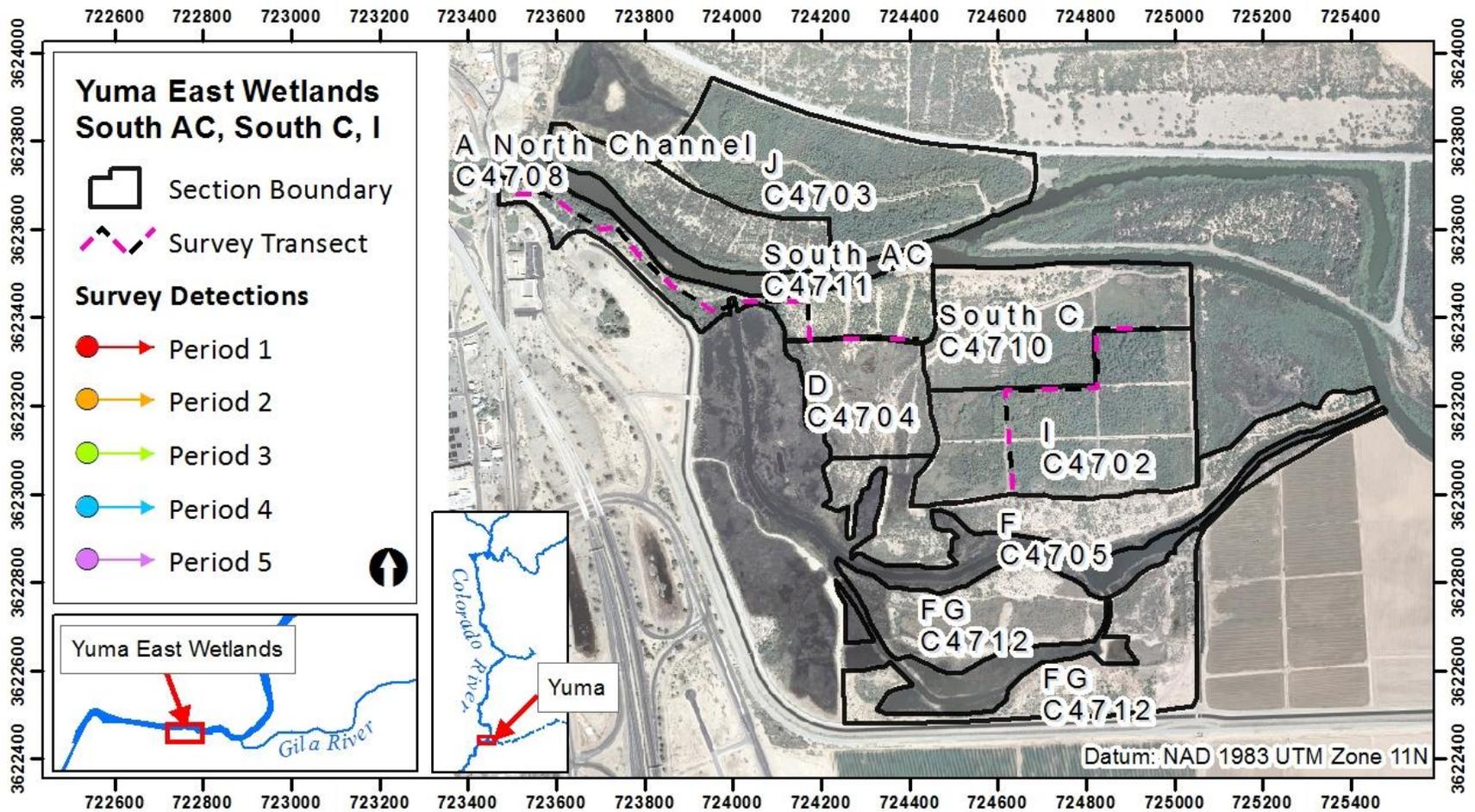


Figure 24.—Yuma East Wetlands yellow-billed cuckoo survey sites showing transects and detections, 2014.
Circles indicate surveyor locations, and arrows indicate estimated distances and bearings from surveyors to detected birds.

Discussion

Over the past several years, detections (figure 25) and breeding territories have increased in LCR MSCP habitat creation areas, generally in line with the continued new availability of LCR MSCP-created habitat planted from 2005 to 2012 (mainly plantings at the CVCA initially, then the PVER in later years). High densities of survey detections and breeding territories have previously been observed in the youngest (2- to 4-year-old) cottonwood-willow plantings (McNeil et al. 2013; McNeil and Tracy 2013). This pattern continued in 2014, with PVER Phases 05 to 07 (aged 2 to 4 years) making up of the majority of all survey detections and confirmed breeding territories, while covering just 16 percent of the surveyed area. At the same time, survey detections and estimated territories have decreased 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 2005–06, a lack of vegetational succession may be reducing YBCU prey biomass, reducing breeding habitat suitability. The regularly irrigated young trees at the PVER may currently be preferred breeding habitat. However, with the planting of cottonwood-willow at the PVER now complete, this area may also experience reduced YBCU activity once the majority of trees in all phases are older than four years, unless some existing habitat is set back to a younger stage through adaptive management. The next preferred area may be the Laguna Division Conservation Area (Reclamation 2012), the next riparian area to be planted under the LCR MSCP.

Since 2008, YBCU have been detected consistently during surveys at Topock Platform, planted during the mid-1990s and no longer irrigated. Although breeding has not been confirmed at this mature site, it would be relatively easy to observe and document the effects on YBCU activity by resuming periodic irrigation there.

A comparison of survey detections by area from 2008 through 2014 (data for previous years from McNeil et al. 2013 and McNeil and Tracy 2013) is shown on figure 25.

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

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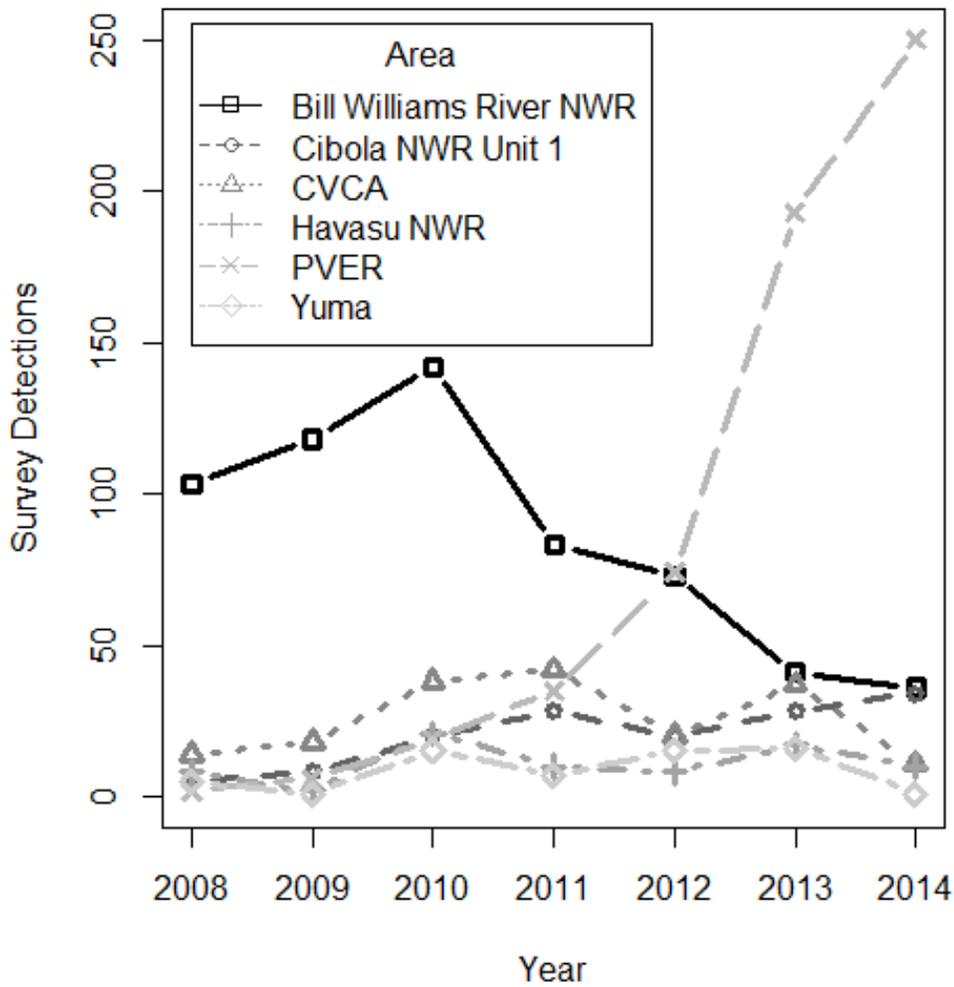


Figure 25.—Lower Colorado River yellow-billed cuckoo survey detections by geographic area and year, 2008–14.
2008–13 data are from McNeil et al. 2013 and McNeil and Tracy 2013.

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 monitoring nests. Population density is estimated from a combination of surveys (“Presence-Absence Surveys and Habitat Occupancy” section) and intensive searches for nests and other breeding evidence. Survival is measured through the analysis of mark-recapture data.

Locating and monitoring a sufficient number of nests will enable 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 always more accurate than apparent nest success, especially for species (such as YBCUs) whose nests are rarely discovered at initiation. Mayfield produces similar estimates for 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 resighting 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 of YBCUs exist. To accurately estimate annual survivorship for most wild bird populations, at least 10 years of continuous mark-resight data are necessary (Amstrup et al. 2005). SSRS has already undertaken 6 years of banding and resighting YBCUs in the study area from 2008 through 2013 (McNeil et al. 2013; McNeil and Tracy 2013), resulting in the banding of 214 western YBCUs (possibly the largest number banded in one watershed). Following the continuation of this work through 2018, estimates for survival, productivity, population growth rate, and dispersal patterns will be calculated using program MARK (White and Burnham 1999).

Before arrival to the breeding grounds and post-breeding, YBCU movements are poorly understood but 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 will be 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 or winter, helping to identify 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 store actual GPS locations (latitude and longitude), averaging 10-m (33-ft) accuracy in open areas, and up to 50 m (164 ft) under dense canopy cover, for pre-designated dates. PinPoint attachments can include transmitters (as chosen for this study), enabling the relocation of returning birds through telemetry and increasing 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. Cuckoos may be subtle in their distress signals and can abandon nests if disturbed (Haltermann 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 1 hour. Given the potential for temperatures to be lethal to bird eggs (40.5–44 °C [104.9–111.2 °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) 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 searched for nests in all accessible suitable vegetation surrounding detection locations. Known nest substrates (within suitable woody riparian habitat) in the study area include cottonwood, Goodding's willow, mesquite, tamarisk, coyote willow, and seep willow. Nesting pairs share incubation duties (Potter 1980; Hughes 1999; Haltermann 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 continuing through 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 appear to have 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 (described below).

YBCU nests can appear similar to nests of mourning doves (*Zenaidura 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 containing YBCU chicks. Recently used YBCU nests were identified by the presence of bluish egg fragments remaining in or directly below the nest.

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After finding a nest, a GPS location was recorded several meters away to reduce further disturbance to nesting birds. A basic description of the nest was taken to aid in relocating the nest for monitoring purposes, including nest substrate species, approximate substrate height, and nest height. Information on the nesting stage and the banded status of adults was also recorded if known. Telescoping mirrors or camera poles were used to monitor the contents of each nest every 2 to 4 days.

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. Nest fate was considered successful if at least one young fledged, determined by an adult or fledgling detected near the nest within 2 days of the estimated fledge date. Young cuckoos leave the nest before they can fly, climbing or hopping onto nearby branches where they may remain for several days and, with patience, can sometimes be located. Nests were considered failed if there was no evidence of fledgling, if nests were damaged or destroyed, if large eggshell fragments or remains were observed, or if the nest was empty before the earliest possible fledge date (approximately 6 days after hatching), with no further activity detected nearby. Nests were determined deserted if intact eggs or live chicks were present, with no further parental activity 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, Mayfield (1975) nest survival was also calculated using the formula

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

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.

Nest productivity was calculated as the average number of young fledged from each nest. For nests with an unknown number fledged, the average of the minimum and maximum possible number of young fledged was calculated (minimum = all known to have fledged, maximum = all young minus any known not to have fledged).

Once nests were inactive, basic nest attributes were measured, including nest substrate height, diameter at breast height of substrate, and nest height. Spherical densimeters were used to measure canopy cover at 10 points: one above the nest, one below the nest, four at 5 m (16.4 ft), and four at 10 m (32.8 ft) from the

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center in all cardinal directions. GPS units were used to measure the nearest forest edge from the nest. Some measurements were not collected at nests that were either destroyed by weather or too high to safely reach by ladder.

Mist Netting, Color Banding, and Resights

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.

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 to capture YBCUs. Two to four stacked (7.8- to 12-m-high) 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 cuckoos. Capture attempts ceased when temperatures reached 40 °C (104 °F).

To increase the number of unique leg band color combinations available, the Federal aluminum bands are color anodized. Different colors have been used in previous years: gold from 2008–2010, blue in 2011, and magenta in 2012–2013 (McNeil et al. 2013; McNeil and Tracy 2013). In 2014, newly captured YBCUs were banded with a red anodized Federal numbered 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, from nests less than 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 400-g Acculab digital scale was used to weigh birds. For adults, molt, feather wear, orbital ring color, cloacal protuberance score, and the brood patch score were recorded following the Monitoring Avian Productivity and Survivorship (MAPS) protocol (DeSante et al. 2014). During all field work, field crews attempted to resight previously banded YBCUs throughout the season by observing with binoculars or photographing the legs of all YBCUs detected.

Sexing of captured birds is required for population demographic measurement, including sex-based survival rates; however, the sexes look alike, and whereas

females are slightly larger than males on average (Pyle 1997), individuals cannot reliably be 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. Genomic DNA was extracted from each blood sample and sexed following a universal avian sexing method (Han et al. 2009).

Radio Telemetry

To increase the number of nests found, a subset of captured adults were fitted with Lotek Biotrack PicoPip Ag 392 radio transmitters weighing 1.1 to 1.2 g (0.04 ounce [oz], < 2.5 percent total body mass). The transmitters were operational for 6 to 10 weeks. Kevlar thread was used to stitch transmitters to the two central rectrices (tail feathers), approximately 1 centimeter (0.39 inch) from each feather base, avoiding the uropygial gland. Kevlar thread knots were secured with a small drop of cyanoacrylate glue (following Pitts 1995; Woolnough et al. 2004). The attachments fall off 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. To confirm breeding status and annual productivity, radioed birds were tracked to nests if possible, and other potential breeding behaviors were observed by tracking the birds throughout the breeding season. 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 two to three bearings approximately 90 degrees apart to estimate the YBCU's location. When a bird's 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 resights, the bird was determined to have left the area, although transmitter failure or depredation was also possible.

PinPoint GPS Units

PinPoint host software (Fowler 2014) was used to program the PinPoint-10 GPS devices to record 10 locations on pre-determined dates outside the peak breeding season (table 11). Each built-in transmitter was tested with the frequency giving the strongest signal recorded.

Seven YBCUs were fitted with PinPoint + transmitter units. Breeding birds or those suspected of breeding were targeted to increase the likelihood of recapture in 2015 (due to the apparent site fidelity of breeding birds). The PinPoint-10 units weighed 1.1 g (0.04 oz), and the transmitters weighed 0.7 g (0.02 oz), totaling 1.8 g (0.06 oz), 2.0 g (0.07 oz) with harness, \leq 3 percent total body mass). The

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Table 11.—GPS-10 PinPoint schedule, 2014–2015

GPS point No.	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

attachment weight limit of 3 percent of total mass required the birds to weigh at least 65.5 g (2.3 oz), which is more likely in females. The transmitters were programmed to activate on June 30, 2015, when most birds should have returned to their breeding grounds and still should have been responsive to playback calls (used to lure birds into mist nets). On activation, the transmitters emit a radio signal for 7 to 14 days. To test functionality of the transmitters (i.e., they transmit a signal during the programmed period), an additional two control transmitter were programmed to activate on the same date as the deployed units.

The PinPoint devices were attached to lower-back, leg-loop harnesses made of 1-millimeter elastic cord, fitted to each YBCU, and secured with Kevlar thread and cyanoacrylate glue on the knots (following Rappole and Tipton 1991). Each attachment 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 an hour to confirm the bird accepted the attachment and resumed normal behavior and flight. Though never necessary, if any bird appeared agitated by the harness or unable to fly, banding crews were instructed to recapture the bird and remove the attachment.

As previously described, recapture is required to retrieve the PinPoint devices and download the GPS data. During subsequent monitoring years, field crews will search previous capture sites and adjacent habitat, using methods described in the “Radio Telemetry” section above to relocate the birds. After a target bird is relocated, mist nets will be used to attempt to recapture the bird. Upon recapture, the PinPoint/harness will be removed, and the area of attachment will be thoroughly examined for any signs of injury or abrasion. The GPS data will be

downloaded and mapped. The GPS locations recorded included pre- and post-breeding stopover sites and one wintering location (see table 11).

Results

Nests

Between July 4 and September 12, 2014, 35 YBCU nests were found in the study area from the Bill Williams River East to CNU1 (table 12). This included 29 nests at the PVER (Phases 04 to 07), three at CNU1 (Crane Roost), two at Bill Williams River East (Mineral Wash), and one at the CVCA (Phase 02). Most nests were located by telemetry ($n = 20$) or by behavioral cues ($n = 11$). Known nesting activity began on June 28 at Crane Roost and ended on September 12 at PVER Phase 07. Nesting activity peaked between July 13 and 19, with 20 active nests (figure 26).

Most nests were found in Fremont cottonwood ($n = 23$), followed by Goodding's willow ($n = 7$), tamarisk ($n = 3$), honey mesquite ($n = 1$), and seep willow ($n = 1$). Nest substrates ranged in height from 2.9 m (9.5 ft) to 22.0 m (72 ft) (mean = 10.0 m [32.8 ft]). Nest heights ranged from 1.49 m (4.9 ft) to 14.5 m (47.6 ft) (mean = 6.8 m [22.3 ft]). Eleven restoration site nests were within 15 m of the forest edge, eight within 50 m, and nine between 50 and 150 m. Canopy cover averaged 90.6 percent above nests and 88.7 percent below nests.

At least two pairs successfully nested into mid-September at the PVER, both fledging at least one young. In addition, while collecting nest attributes at each inactive nest, a series of five contact calls were played to determine if parents or juveniles were still in the area. Between August 26 and September 14, 17 detections were recorded near previous nesting areas.

Overall apparent nest success was 66.7 percent ($n = 33$), and Mayfield success was 55.0 percent ($n = 35$). At the PVER, apparent nest success was 60.7 percent ($n = 28$), and Mayfield success was 48.0 percent ($n = 29$). Depredation was the assumed cause of failure of four nests and was implicated in five other failed nests, though no predators were identified. Weather was implicated in four nest failures; the study area experienced a number of storms during the 2014 season.

Clutch size averaged 2.8 ± 0.85 standard deviation (range 2 to 4, $n = 30$ nests) (table 13). Nest productivity averaged 1.59 young fledged per nest, and 50 to 60 young fledged from the nests monitored in 2014. Successful double brooding was confirmed at PVER Phase 07 when a radio-tracked adult was monitored at two successful nests. Six other birds radio tracked at the PVER re-nested after failures. Of those, four successfully re-nested on the second or third attempt. The number of days between consecutive nests ranged from 3 to 13 (mean = 8 days).

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Table 12.—Yellow-billed cuckoo nests found in the lower Colorado River study area, 2014

Site	Nest No.	Male ^a	Female ^a	Date found	Search type ^b	Tree species ^c	Tree height (m)	Nest height (m)	1 st egg	No. eggs	No. hatch	No. fledge
Mineral Wash	1	UNB	UNB	4-Jul	BEH	TAMARI	3	2.5	29-Jun	2-2	2-2	2-2
Mineral Wash	2	UNB	UNB	15-Aug	BEH	TAMARI	6.5	5.5	13-Aug	2-2	2-2	0-2
Crane Roost	1	FRK	UNK	9-Jul	SS	BACSAL	3	1.5	2-Jul	3-3	3-3	3-3
Crane Roost	2	UNK	UNK	9-Jul	BEH	PROGLA	8	7	28-Jun	1-3	1-3	1-1
Crane Roost	3	SMA	UNB	11-Jul	TEL	TAMARI	7	5	7-Jul	4-4	3-3	2-3
CVCA 02	1	GWB	DBL	20-Jul	TEL	SALGOO	12	4	18-Jul	2-2	2-2	2-2
PVER 04	1	UNB	UNK	2-Jul	BEH	POPFRE	20	15	2-Jul	4-4	4-4	3-4
PVER 04	2	UNB	UNK	9-Jul	BEH	SALGOO	6	4	5-Jul	4-4	2-3	1-3
PVER 04	3	UNB	UNK	5-Aug	SS	POPFRE	20	10	24-Jul	2-2	2-2	2-2
PVER 04	4	UNB	UNK	22-Aug	BEH	POPFRE	15	10	13-Aug	2-2	1-1	1-1
PVER 05	1	JTK	UNB	8-Jul	SS	SALGOO	12	8	29-Jun	2-2	2-2	2-2
PVER 05	2	UNB	FOX	18-Jul	TEL	POPFRE	9	6	15-Jul	3-3	2-3	0-0
PVER 05	3	HAL	UNB	19-Jul	TEL	POPFRE	12	5	17-Jul	2-2	1-1	0-0
PVER 05	4	UNK	UNK	22-Jul	SS	POPFRE	15	4	21-Jul	2-2	0-1	0-0
PVER 05	5	UNB	FOX	12-Aug	TEL	POPFRE	14	12	11-Aug	2-2	1-1	1-1
PVER 06	1	SER	UNK	4-Jul	TEL	POPFRE	14	7	1-Jul	4-4	0-0	0-0
PVER 06	2	PF	UNK	5-Jul	TEL	SALGOO	12	6.5	1-Jul	3-3	0-0	0-0
PVER 06	3	SPM	B	7-Jul	BEH	POPFRE	10	5	4-Jul	1-2	0-0	0-0
PVER 06	4	UNK	UNK	11-Jul	BEH	SALGOO	5	2	10-Jul	3-3	3-3	2-3
PVER 06	5	SPM	B	14-Jul	TEL	POPFRE	15	4	13-Jul	3-3	0-1	0-0
PVER 06	6	AA	UNK	16-Jul	BEH	SALGOO	12	6	13-Jul	3-3	3-3	3-3

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Table 12.—Yellow-billed cuckoo nests found in the lower Colorado River study area, 2014

Site	Nest No.	Male ^a	Female ^a	Date found	Search type ^b	Tree species ^c	Tree height (m)	Nest height (m)	1 st egg	No. eggs	No. hatch	No. fledge
PVER 06	7	SER	B	17-Jul	TEL	SALGOO	6	4	14-Jul	4-4	4-4	4-4
PVER 06	8	DST	B	18-Jul	TEL	POPFRE	14	7	12-Jul	4-4	4-4	4-4
PVER 06	9	UNK	UNK	18-Jul	BEH	POPFRE	15	7	30-Jun	3-4	3-4	3-4
PVER 06	10	HAL	UNK	7-Aug	TEL	POPFRE	9	6	4-Aug	3-3	0-1	0-0
PVER 06	11	UNK	PHD	12-Aug	TEL	POPFRE	8	6	2-Aug	2-2	2-2	2-2
PVER 06	12	GOD?	B	13-Aug	BEH	POPFRE	13	10	9-Aug	2-2	1-2	0-1
PVER 06	13	HAL	UNB	29-Aug	TEL	POPFRE	11	7	17-Aug	2-2	2-2	2-2
PVER 07	1	CRU	UNK	14-Jul	TEL	POPFRE	10	4	11-Jul	3-3	2-2	2-2
PVER 07	2	IVY	UNK	16-Jul	TEL	POPFRE	10	5	12-Jul	4-4	4-4	3-3
PVER 07	3	UNB	BUL	1-Aug	TEL	POPFRE	12	8	31-Jul	1-2	0-0	0-0
PVER 07	4	UNB	BUL	6-Aug	TEL	POPFRE	11	7	5-Aug	3-3	0-0	0-0
PVER 07	5	DIC	DUS	8-Aug	SS	POPFRE	10	2.5	19-Jul	3-4	3-4	3-4
PVER 07	6	STO	WWW	20-Aug	TEL	POPFRE	10	7.5	17-Aug	2-2	0-0	0-0
PVER 07	7	DIC	UNK	27-Aug	TEL	POPFRE	12	10	24-Aug	2-2	2-2	2-2

^a Sexed by DNA if known. B = banded (partial combination only); UNB = unbanded; UNK = unknown, otherwise initials of known adults banded 2008–14 resighted at nest or feeding fledglings (see table 14); and ? = assumed nesting bird, not confirmed.

^b Search type: BEH = breeding behavior, SS = systematic search, and TEL = telemetry.

^c Tree species: BACSAL = *Baccharis salicifolia*, POPFRE = *Populus fremontii*, PROGLA = *Prosopis glandulosa*, SALGOO = *Salix gooddingii*, and TAMARI = *Tamarix* sp.

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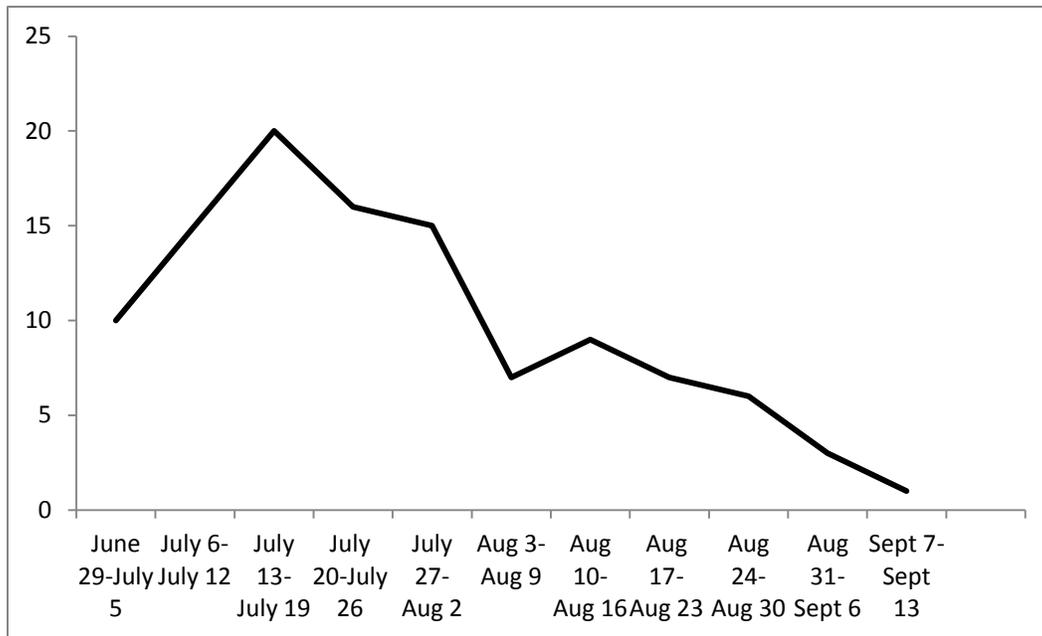


Figure 26.—Number of active nests monitored by week within the Lower Colorado River, 2014.

Color Banding, Recaptures and Resights

Between May 30 and August 22, 2014, a total of 42 adults, including 32 new and 10 previously banded birds, were captured (tables 14, 15, and 16). An additional 38 young were banded from 15 nests (table 17). There were 15 partial or complete resights of birds previously banded between 2009 and 2013 (some which may have been of the same bird), in which just two could be identified to individual. One partially resighted bird was a third-year banded as a chick in either Crane Roost or PVER Phase 04 (all band colors were seen, except one which was either yellow or gold). All between-year recaptures and full resights were of birds previously banded in 2009 (n = 1), 2010 (n = 1), 2012 (n = 3), and 2013 (n = 7). Seven returning adults (five males and two females) returned to their previous breeding areas: six to the PVER and one to CNU1 (table 15). Of six returning birds banded as young (four second-year and two third-year), five returned to their natal area (the PVER); the other bird, whose partially resighted color bands matched two birds banded as young in 2012, at either PVER Phase 04 or Crane Roost, was resighted at the BLCA. The distance from PVER Phase 04 to the BLCA area is 118 km (73 miles); the distance from Crane Roost to the BLCA is 156 km (97 miles).

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Table 13.—Clutch size, productivity, and fates of 35 yellow-billed cuckoo nests found and monitored on the Lower Colorado River, 2014

Site	No. nests	Mean clutch size	Total no. eggs		Total no. hatched		Total no. fledged		Mean productivity	Nest fate		
			Min.	Max.	Min.	Max.	Min.	Max.		Fledged	Failed	Unknown
Mineral Wash	2	2	4	4	4	4	2	4	2	1	0	1
Crane Roost	3	4	9	11	7	9	6	7	2.17	3	0	
CVCA 02	1	2	2	2	2	2	2	2	2	1	0	
PVER 04	4	3	12	12	9	11	7	10	2.13	4	0	
PVER 05	5	2.2	11	11	6	8	3	3	0.6	2	3	
PVER 06	13	3	37	39	22	26	20	23	1.71	7	5	1
PVER 07	7	2.8	18	20	11	12	10	11	1.43	4	3	
All PVER	29	2.8	78	82	48	57	40	47	1.5	17	11	1
All sites	35	2.8	93	99	61	72	50	60	1.59	22	11	2

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Table 14.—Adult yellow-billed cuckoos captured or recaptured on the lower Colorado River, 2014

Band code ^a	C/R No. ^b	Date	Site	LCR MSCP section	Bird ID	Band No.	Color band ^c	Age ^d	Sex ^e	T/P No. ^f
N	1	30-May	PVER 06	C2355	SKE	1713-67933	R/IB-G-IB	AHY	M	NA
N	2	23-Jun	PVER 05	C2346	LEC	1222-90517	R/Bk-W-Bk	AHY	M ^c	NA
N	3	25-Jun	Mass Transplanting	Mass Transplanting	RUM	NA	-/Bk-IB-Bk	AHY	M	NA
N	4	30-Jun	PVER 05	C2347	CRU	1222-90574	R/Bk-Y	AHY	M	T027
N	5	1-Jul	CVCA 01	C2525	DBL	1222-90575	R/R-Bk-R	AHY	F	T008
N	6	3-Jul	CVCA 01	C2526	URS	1222-90576	R/R-mB-R	AHY	F	T006
N	7	4-Jul	PVER 06	C2355	MOR	1222-90513	R/Bk-R-Bk	AHY	M	NA
N	8	7-Jul	PVER 07	C2356	GAR	1222-90518	Y-W-Y/R	AHY	M	T009
N	9	7-Jul	PVER 07	C2359	FOX	1222-90519	R/IB-O	AHY	F	T012
N	10	8-Jul	PVER 07	C2358	VOL	1222-90520	R/Lv-Ag	AHY	M	T019
N	11	15-Jul	PVER 07	C2357	IVY	1222-90585	R/IB-Ag-IB	AHY	M	T028
N	12	16-Jul	PVER 05	C2347	HAL	1222-90586	R/W-G	AHY	M	T036
N	13	17-Jul	PVER 06	C2351	DST	1222-90587	R/R-mB	AHY	M	T032
N	14	18-Jul	PVER 05	C2349	BUL	1222-90588	R/O-G	AHY	F	T035
N	15	21-Jul	Crane Roost	C2727	FRK	1713-67936	R/Ag-W-Ag	AHY	M	T017
N	16	23-Jul	PVER 06	C2353	JBA	1222-90577	R/Lv-Bk-Lv	AHY	F	NA
N	17	24-Jul	Crane Roost	C2726	NIL	1222-90579	R/Ag-G-Ag	AHY	F	T025
N	18	28-Jul	PVER 06	C2354	PUS	1222-90580	R/IB-IB	AHY	F	T007
N	19	29-Jul	PVER 07	C2358	ELE	1222-90581	R/NoB	AHY	F	P30100
N	20	30-Jul	PVER 07	C2357	NAT	1222-90589	R/	AHY	F	P30101
N	21	30-Jul	PVER 07	C2357	BOR	1222-90598	R/Bk-Y-Bk	AHY	M ^s	T002
N	22	1-Aug	PVER 06	C2353	DIC	1222-90599	R/mB-W	AHY	M	T034
N	23	4-Aug	PVER 06	C2355	JWZ	1352-59001	R/	AHY	F	P30102
N	24	4-Aug	CVCA 02	C2527	GWB	1352-59040	R/R-mB	AHY	M	NA
N	25	5-Aug	PVER 06	C2355	SMG	1352-59002	R/O-mB	AHY	F	NA
N	26	6-Aug	PVER 07	C2359	STO	1352-59003	R/IB-Y	AHY	M	T024
N	27	6-Aug	PVER 07	C2357	VDR	1713-67937	R/G-R-G	AHY	M	T013

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Table 14.—Adult yellow-billed cuckoos captured or recaptured on the lower Colorado River, 2014

Band code ^a	C/R No. ^b	Date	Site	LCR MSCP section	Bird ID	Band No.	Color band ^c	Age ^d	Sex ^e	T/P No. ^f
N	28	7-Aug	PVER 07	C2357	DUS	1222-90582	R/	AHY	F	P30103
N	29	11-Aug	PVER 06	C2352	PHD	1222-90583	R/W-Ag-W	AHY	F	T029
N	30	14-Aug	PVER 06	C2355	MSO	1352-59004	R/IB-Bk	AHY	M	T033
N	31	19-Aug	PVER 06	C2355	GOD	1352-59043	R/mB-Ag	AHY	M	NA
N	32	22-Aug	PVER 07	C2359	WWW	1713-67938	R/Ag-IB	AHY	F	NA
R	1	20-Jun	PVER 05	C2348	PF	1212-13730	O W/Ag BI	A6Y ^o	M	T001
R	2	24-Jun	PVER 06	C2351	SER	1713-67901	As/W-Lv	ASY	M	T003
R	3	30-Jun	PVER 05	C2347	SPM	1202-68014	IB-Bk-IB/Mg	SY	M	T014
R	4	1-Jul	Crane Roost	C2726	SMA	1713-67911	Mg/Lv-G	ATY	M	T004
R	5	16-Jul	PVER 05	C2346	JTK	1713-67926	Mg/O-BI	ASY	M	NA
R	6	17-Jul	PVER 07	C2356	JOF	1202-68018	Bk-G-Bk/Mg	SY	M	NA
R	7	18-Jul	PVER 04	C2344	GMF	1202-68021	Mg/W-Bk	ATY	F	NA
R	8	21-Jul	PVER 06	C2351	HAG	1202-68043	Lv-Y/Mg	SY	F	T005
R	9	30-Jul	PVER 06	C2354	AA	1212-13754	BI Ag/R G	A5Y	M	T026
R	10	7-Aug	PVER 06	C2354	CHS	1202-68064	O-G/Mg	SY	F	T015
R*	NoB	14-Aug	PVER 07	C2356	RON	1222-90553	mB-R/R	HY	F	T023
R*	NoB	6-Aug	PVER 07	C2357	HAG	1202-68043	Lv-Y/Mg	SY	F	P30105
R*	NoB	11-Aug	PVER 06	C2355	PUS	1222-90580	R/IB-IB	AHY	F	P30108
R*	NoB	22-Aug	PVER 07	C2359	STO	1352-59003	R/IB-Y	AHY	M	P30104

^a Band code: N = new, R = recapture, and R* = same-year recapture.

^b C/R No. = Capture or recapture number.

^c Color band: Ag = gold, As = silver, Bk = black, G = green, IB = light blue, Lv = lavender, mB = midblue, Mg = magenta, O = orange, R = red, W = white, and Y = yellow.

Hyphen (-) = a split band consisting of two or three colors, and NoB = no band.

^d Age (^o = oldest YBCU record): AHY = > hatching year, ASY = > 2nd year, ATY = > 3rd year, A5Y = > 5th year, HY = hatching year, and SY = second year.

^e Sex (confirmed by DNA sexing unless otherwise stated): F = female, M = male, U = unknown, ^c = sexed by cloacal protuberance, and ^s = sexed by wing size.

^f T/P No. = Transmitter/pinpoint number (NA = not applicable).

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Table 15.—Capture history of yellow-billed cuckoo recaptured or resighted on the lower Colorado River, 2014

Bird ID	Sex ^a	Age ^b	Year banded	Return date	Original capture/nest site	Return/nest site
SPM	M	SY	2013	30-Jun	PVER 05	PVER 05 ^c
JOF	M	SY	2013	17-Jul	PVER 06	PVER 07
HAG	F	SY	2013	21-Jul	PVER 06	PVER 06-07
CHS	F	SY	2013	7-Aug	PVER 06	PVER 06-07 ^c
U3Y	U	TY	2012	7-Jul	PVER 04 or Crane Roost	Beal Lake Conservation Area
BGB	M	TY	2012	17-Jul	PVER 04	PVER 06 ^c
SER	M	ASY	2013	24-Jun	PVER 06	PVER 06 ^c
JTK	M	ASY	2013	16-Jul	PVER 05	PVER 05 ^c
LEA	F	ASY	2013	30-Jul	PVER 06	PVER 06 ^c
SMA	M	ATY	2012	1-Jul	Crane Roost	Crane Roost ^c
GMF	F	ATY	2012	18-Jul	PVER 04	PVER 04
AA	M	A5Y	2010	30-Jul	PVER 03/PVER 02	PVER 06 ^c
PF	M	A6Y ^o	2009	20-Jun	PVER 02	PVER 06 ^c

^a Sex (confirmed by DNA): F = female, M = male, and U = unknown.

^b Age (^o = oldest YBCU record): ASY = > 2nd year, ATY = > 3rd year, A5Y = > 5th year, A6Y = > 6th year, SY = second year, TY = third year.

^c Breeding evidence observed in 2014.

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Table 16.—Summary of yellow-billed cuckoo captures and attachments by site, 2014

Site	Newly banded adults	Recaptures	Banded chicks	Transmitter	GPS PinPoint
Mineral Wash	–	–	2	–	–
Crane Roost	2	1	7	3	–
Mass Transplanting	1	–	–	–	–
CVCA 01	2	–	2	2	–
CVCA 02	1	–	–	–	–
PVER 04	-	1	2	–	–
PVER 05	4	3	2	5	–
PVER 06	11	4	17	9	2
PVER 07	11	1	6	8	5
Total	32	10	38	27	7

GPS PinPoints

GPS PinPoint devices were attached to seven captured YBCUs (six females and one male) (tables 14 and 16). 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

Due to the potentially large effects of small sample sizes on Mayfield (1975) nest survival estimates, a minimum sample size of 20 monitored nests is recommended (Hensler and Nichols 1981). In 2014, well over 20 nests were monitored, though most were in just one area (the PVER), so the less-biased Mayfield estimate for nest success was only able to be calculated individually for this area. The Mayfield rate of 55 percent overall and 47.9 percent at the PVER were similar to previous estimates for this study area: 59 percent overall mean (n = 87) and 52 percent at the PVER (n = 37) from 2008–12 (McNeil et al. 2013). Due to the dearth of nests found in other areas, it remains unclear whether nest success rates differ among areas.

The average productivity estimated in 2014 of 1.58 young per nest is promising; however, data from several years is needed to account for annual, seasonal, site-specific, and stochastic variation in productivity within populations. After the 2018 season, the long-term nest success and productivity of this population will be assessed.

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Table 17.—Yellow-billed cuckoo young banded on the lower Colorado River, 2014

Site	Section	Chick ID	Band date	Band number	Color band ^a
Mineral Wash	Mineral Wash	Nest 1-1	9-Jul	1222-90549	IB-R/R
Mineral Wash	Mineral Wash	Nest 1-2	9-Jul	1222-90550	IB-G/R
Crane Roost	C2726	Nest 2-1	12-Jul	1222-90551	G-Y-G/R
Crane Roost	C2727	Nest 1-1	17-Jul	1222-90554	IB-G-IB/R
Crane Roost	C2727	Nest 1-2	17-Jul	1222-90590	R-G/R
Crane Roost	C2727	Nest 1-3	17-Jul	1222-90591	Ag-G/R
Crane Roost	C2727	Nest 3-1	23-Jul	1222-90594	mB-G/R
Crane Roost	C2727	Nest 3-2	23-Jul	1222-90595	Ag-R-Ag/R
Crane Roost	C2727	Nest 3-3	23-Jul	1222-90596	Lv-W/R
CVCA 02	C2528	Nest 1-1	1-Aug	1352-59032	IB-IB/R
CVCA 02	C2528	Nest 1-2	1-Aug	1352-59033	W-Ag-W/R
PVER 04	C2345	Nest 2-1	21-Jul	1222-90592	Bk-Ag/R
PVER 04	C2345	Nest 2-2	21-Jul	1222-90593	IB-O-IB/R
PVER 05	C2350	Nest 1-1	14-Jul	1222-90552	mB-R-mB/R
PVER 05	C2350	Nest 1-2	14-Jul	1222-90553	mB-R/R
PVER 06	C2351	Nest 4-1	24-Jul	1222-90597	IB-Bk/R
PVER 06	C2351	Nest 4-2	24-Jul	1352-59015	Lv-Bk/R
PVER 06	C2351	Nest 4-3	27-Jul	1352-59016	O-W/R
PVER 06	C2354	Nest 6-1	28-Jul	1352-59017	Y-Lv-Y/R
PVER 06	C2354	Nest 6-2	28-Jul	1352-59018	W-IB-W/R
PVER 06	C2354	Nest6-3	28-Jul	1352-59019	Lv-O-Lv/R
PVER 06	C2351	Nest 8-1	28-Jul	1352-59020	IB-mB-IB/R
PVER 06	C2351	Nest 8-2	28-Jul	1352-59021	Y-Y/R

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Table 17.—Yellow-billed cuckoo young banded on the lower Colorado River, 2014

Site	Section	Chick ID	Band date	Band number	Color band ^a
PVER 06	C2351	Nest 8-3	28-Jul	1352-59022	Ag-Bk-Ag/R
PVER 06	C2351	Nest 8-4	28-Jul	1352-59023	G-Ag-G/R
PVER 06	C2351	Nest 7-1	30-Jul	1352-59028	Bk-Ag-Bk/R
PVER 06	C2351	Nest 7-2	30-Jul	1352-59029	O-O/R
PVER 06	C2351	Nest 7-3	30-Jul	1352-59030	IB-Y-IB/R
PVER 06	C2352	Nest 11-1	15-Aug	1352-59041	IB-R-IB/R
PVER 06	C2352	Nest 11-2	15-Aug	1352-59042	Ag-IB-Ag/R
PVER 06	C2353	Nest 13-1	31-Aug	1222-90585	Ag-W/R
PVER 06	C2353	Nest 13-2	31-Aug	1222-90584	G-Ag/R
PVER 07	C2358	Nest 1-1	28-Jul	1352-59024	Bk-O/R
PVER 07	C2358	Nest 1-2	28-Jul	1352-59025	Ag-G-Ag/R
PVER 07	C2357	Nest 2-1	28-Jul	1352-59026	G-mB-G/R
PVER 07	C2357	Nest 2-2	28-Jul	1352-59027	G-G/R
PVER 07	C2357	Nest 2-3	30-Jul	1352-59031	Bk-Ag/R
PVER 07	C2357	Nest 5-1	8-Aug	1352-59044	Lv-Lv/R

^a Color band: Ag = gold, As = silver, Bk = black, G = green, IB = light blue, Lv = lavender, mB = mid blue, Mg = magenta, O = orange, R = red, W = white, and Y = yellow. Hyphen (-) = a split band consisting of two or three colors.

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Yellow-billed cuckoo nesting at the PVER was confirmed into mid-September in 2014, similar to previous observations in 2012 (McNeil et al. 2013), again overlapping with the annual dove hunting season starting September 1. There is little information on the effects of hunting on riparian breeding birds, although hunting is considered a high-level disturbance, causing disruption of normal behavior (Hockin et al. 1992). The risk of nest abandonment due to disturbance appears to be greatest early in the nest cycle (building and laying) (Gates and Gysel 1978; Hockin et al. 1992), and whereas incubating YBCUs have occasionally abandoned nests following human disturbance, abandonment seems unlikely once an egg has hatched (Laymon 1998); abandonment of chicks has been observed just once from 87 nests monitored in the study area from 2008-12 (McNeil et al. 2013). However, the number of nests in the incubation stage during September may be increasing. Already among the latest-arriving breeding migrants, the end of the YBCU nesting season at the PVER has shifted later by 6 weeks over the past 6 years, from early August in 2009 (McNeil et al. 2013) to mid-September in 2014. The greater likelihood of nests with eggs during hunting season increases the risk of failure due to disturbance. Human disturbance can also cause breeding birds to leave sites prematurely (Klein et al. 1995; Wingfield et al. 1997), and juvenile survival has been found to fall in the days after termination of parental care (Gruebler and Naef-Daenzer 2010). Female YBCUs have been observed leaving active nests before they have fledged, including early in September 2012 during the monitoring of three active nests (McNeil et al. 2013); however, it is generally not possible to determine the causes of early departures, hunting-related or otherwise, or whether they caused reduced productivity or juvenile survival. More research is needed to determine if hunting impacts productivity or survival of YBCUs through reduced parental care.

A highlight in 2014 was the dispersal of a bird banded as a chick in 2012 at either PVER Phase 04 or CNU1 (Crane Roost), located 118 or 156 km (73 or 97 miles) south of Beal Lake, to the BLCA. Either distance is greater than previous dispersal distances observed in the study area to date: median/maximum natal dispersal of 205 m/33.3 km (673 ft/20.7 miles, $n = 5$) and median/maximum breeding (adult) dispersal of 590 m/41.8 km (1,936 ft/26 miles, $n = 18$) from 2009 to 2013 (data from McNeil et al. 2013, McNeil and Tracy 2013).

The recapture in 2014 of an after-sixth-year male is the oldest YBCU recorded (based on data from the U.S. Geological Survey Patuxent Wildlife Research Center 2013). This individual has demonstrated continued site fidelity to the PVER, and has also shown a preference for nesting in young, 2-to-3-year-old cottonwood-willow plantings. First banded as a breeding adult in 2009 in PVER Phase 02, he was then seen in 2012 nesting in Phase 04 (McNeil et al. 2013) and in 2013 nesting in Phase 05 (McNeil and Tracy 2013). In 2014, he nested in Phase 06. Although only one bird, his apparent nesting preference of young habitat mirrors the observed trend in survey detections (see the “Presence-Absence Surveys and Habitat Occupancy” section), lending further support to

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creating and maintaining a mosaic of young cottonwood-willow patches through adaptive management (see the “Presence-Absence Surveys and Habitat Occupancy” section).

Banding in the study area of 32 adult and 38 young YBCUs in 2014 brings the total banded in the study area since 2008 to 284 (134 adults and 150 young, 2008–13 data from McNeil et al. 2013 and McNeil and Tracy 2013). The long-term mark-recapture of the LCR YBCU population will enable survival rates of this population to be estimated. A stable, viable population is indirectly a result of the quality and size of breeding habitat provided under the LCR MSCP. To achieve the goal of obtaining an accurate estimation of survival, productivity, and overall population viability, nest productivity and mark-recapture data will continue to be collected over the next 4 years.

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ATTACHMENT 1

Crosswalk Table

Table 1-1.—Crosswalk table – Location name changes made in 2014 to reflect the standardization of Lower Colorado River Multi-Species Conservation Program (LCR MSCP) location names across all projects

Pre-2014 site code	LCR MSCP location code	LCR MSCP area	LCR MSCP site	LCR MSCP section
BWBP	BWBPBP	Bill Williams River West	Borrow Pit	Borrow Pit
BWCP	PRPRWCP	Planet Ranch	Planet Ranch West	Cottonwood Patch
BWCR	BWCRCR	Bill Williams River West	Cross River	Cross River
BWCW	BECWCW	Bill Williams River East	Cave Wash	Cave Wash
BWER	BEERER	Bill Williams River East	Esquerra Ranch	Esquerra Ranch
BFWW	BWFWFW	Bill Williams River West	Fox Wash	Fox Wash
BWGR	BEGRGR	Bill Williams River East	Gibraltar Rock	Gibraltar Rock
BWHB	BEHBHB	Bill Williams River East	Honeycomb Bend	Honeycomb Bend
BWKR	BEKRKR	Bill Williams River East	Kohen Ranch	Kohen Ranch
BWMA	BWBWMBWM	Bill Williams River West	BW Marsh	BW Marsh
BWMD	BWMDMD	Bill Williams River West	Middle Delta	Middle Delta
BWMFE	BWMFS13	Bill Williams River West	Mosquito Flats	Site 13
BWMFW	BWMFS12	Bill Williams River West	Mosquito Flats	Site 12
BMMW	BEMMMW	Bill Williams River East	Mineral Wash	Mineral Wash
BWNB	BWNBWB	Bill Williams River West	North Burn	North Burn
BWPT	BECPCP	Bill Williams River East	Cougar Point	Cougar Point
BWSW	BWSWSW	Bill Williams River West	Sandy Wash	Sandy Wash
CIBCNT	CNNTNT	Cibola National Wildlife Refuge Unit 1	Nature Trail	Nature Trail
CIBCR	CNCR2728	Cibola National Wildlife Refuge Unit 1	Crane Roost	C2728
CIBCR	CNCR2726	Cibola National Wildlife Refuge Unit 1	Crane Roost	C2726
CIBCR	CNCR2727	Cibola National Wildlife Refuge Unit 1	Crane Roost	C2727
CIBEUC	PSPVCE	Palo Verde Valley South	Palo Verde	Cibola Eucalyptus
CIBGEN	CNCGCG	Cibola National Wildlife Refuge Unit 1	Cottonwood Genetics	Cottonwood Genetics
CIBIPM	PSMWPM	Palo Verde Valley South	Milpitas Wash	Perri Marsh
CIBMT	CNMTMT	Cibola National Wildlife Refuge Unit 1	Mass Transplanting	Mass Transplanting

Table 1-1.—Crosswalk table – Location name changes made in 2014 to reflect the standardization of Lower Colorado River Multi-Species Conservation Program (LCR MSCP) location names across all projects

Pre-2014 site code	LCR MSCP location code	LCR MSCP area	LCR MSCP site	LCR MSCP section
CIBMW	PSMWCIS	Palo Verde Valley South	Milpitas Wash	Cibola Island South
CIBNTH	CNCWNCWN	Cibola National Wildlife Refuge Unit 1	CW-North	CW-North
CRIT09	AKC9C9	'Ahakhav Tribal Preserve	CRIT 09	CRIT 09
CVCA1	CVP1C2525	Cibola Valley Conservation Area	Phase 01	C2525
CVCA1	CVP1C2526	Cibola Valley Conservation Area	Phase 01	C2526
CVCA1	PVP1C2337	Palo Verde Ecological Reserve	Phase 01	C2337
CVCA1	PVP1C2338	Palo Verde Ecological Reserve	Phase 01	C2338
CVCA2	CVP2C2527	Cibola Valley Conservation Area	Phase 02	C2527
CVCA2	CVP2C2528	Cibola Valley Conservation Area	Phase 02	C2528
CVCA3	CVP3C2529	Cibola Valley Conservation Area	Phase 03	C2529
CVCA3	CVP3C2530	Cibola Valley Conservation Area	Phase 03	C2530
CVCA4	CVP4EC2533	Cibola Valley Conservation Area	Phase 04E	C2533
CVCA4	CVP4WC2532	Cibola Valley Conservation Area	Phase 04W	C2532
CVCA4	CVP4WC2531	Cibola Valley Conservation Area	Phase 04W	C2531
CVCA5	CVP5C2536	Cibola Valley Conservation Area	Phase 05	C2536
CVCA5	CVP5C2535	Cibola Valley Conservation Area	Phase 05	C2535
CVCA6	CVP6C2537	Cibola Valley Conservation Area	Phase 06	C2537
CVCA6	CVP6C2538	Cibola Valley Conservation Area	Phase 06	C2538
CVVA4	CVP4EC2534	Cibola Valley Conservation Area	Phase 04E	C2534
DSWA	PKDEWDW	Parker Dam	Eureka Wash	DeSilt Wash
HAVBR	BLCP5C1505	Beal Lake Conservation Area	CPhase 05	C1505
HAVBR	BLCP6C1506	Beal Lake Conservation Area	CPhase 06	C1506
HAVFDR	TKTMFDR	Topock	Topock Marsh	Farm Ditch Road
HAVGH	TKTMGB	Topock	Topock Marsh	Glory Bird
HAVPS	TKPSND	Topock	Pintail Slough	North Dike

Table 1-1.—Crosswalk table – Location name changes made in 2014 to reflect the standardization of Lower Colorado River Multi-Species Conservation Program (LCR MSCP) location names across all projects

Pre-2014 site code	LCR MSCP location code	LCR MSCP area	LCR MSCP site	LCR MSCP section
HAVPS	TKPSPS	Topock	Pintail Slough	Pintail Slough
HAVTPG	TGSCRHNE	Topock Gorge South	Castle Rock	Havasu NE
HAVTPR	TKTPTP	Topock	Topock Platform	Topock Platform
IMP20	ISFLI20A	Imperial South	Fishers Landing	Imperial 20A
IMP50	ISFLI50	Imperial South	Fishers Landing	Imperial #50
IMPML	ISFLME	Imperial South	Fishers Landing	Martinez East
IMPNW	ISFLINW	Imperial South	Fishers Landing	Imperial NW
IMPSTH	ISFLIN	Imperial South	Fishers Landing	Imperial Nursery
KEYPIT	ALKPKP1	Alamo	Key Pittman WMA	Key Pittman WMA 1
LAG2	LGLWLW	Laguna	Laguna West	Laguna West
LAG3	LGLWL3	Laguna	Laguna West	Laguna 03
LAGMW	LGLWMW	Laguna	Laguna West	Mittry West
LHWP	LHNKWP	Lake Havasu North	Kiowa	Willow Patch
LITBR	LFLBLB	Littlefield	Littlefield Bridge	Littlefield Bridge
MLEA	LGMLKERd	Laguna	Mittry	Mittry Lake East Rd
MLPR	LGMPR	Laguna	Mittry	Pratt Restoration
MOME	MMVRSVRS	Mormon Mesa	Virgin River South	Virgin River South
OVRW	MROWOW	Muddy River	Overton Wildlife	Overton Wildlife
OVRWP	MROHWMOP	Muddy River	Overton Above High-Water Mark	Overton WMA Pond
PAHNTH	ALPPN	Alamo	Pahrnagat NWR	Pahrnagat North
PAHSTH	ALPPS	Alamo	Pahrnagat NWR	Pahrnagat South
PAHWST	ALPPW	Alamo	Pahrnagat NWR	Pahrnagat West
PICSRA	POLTPSRA	Picacho	Lago Tres	Picacho SRA
PVER2	PVP2C2340	Palo Verde Ecological Reserve	Phase 02	C2340
PVER2	PVP2C2339	Palo Verde Ecological Reserve	Phase 02	C2339

Table 1-1.—Crosswalk table – Location name changes made in 2014 to reflect the standardization of Lower Colorado River Multi-Species Conservation Program (LCR MSCP) location names across all projects

Pre-2014 site code	LCR MSCP location code	LCR MSCP area	LCR MSCP site	LCR MSCP section
PVER3	PVP3C2341	Palo Verde Ecological Reserve	Phase 03	C2341
PVER3	PVP3C2342	Palo Verde Ecological Reserve	Phase 03	C2342
PVER4	PVP4C2345	Palo Verde Ecological Reserve	Phase 04	C2345
PVER4	PVP4C2344	Palo Verde Ecological Reserve	Phase 04	C2344
PVER4	PVP4C2343	Palo Verde Ecological Reserve	Phase 04	C2343
PVER5	PVP5C2347	Palo Verde Ecological Reserve	Phase 05	C2347
PVER5	PVP5C2350	Palo Verde Ecological Reserve	Phase 05	C2350
PVER5	PVP5C2346	Palo Verde Ecological Reserve	Phase 05	C2346
PVER5	PVP5C2348	Palo Verde Ecological Reserve	Phase 05	C2348
PVER5	PVP5C2349	Palo Verde Ecological Reserve	Phase 05	C2349
PVER6	PVP6C2355	Palo Verde Ecological Reserve	Phase 06	C2355
PVER6	PVP6C2351	Palo Verde Ecological Reserve	Phase 06	C2351
PVER6	PVP6C2352	Palo Verde Ecological Reserve	Phase 06	C2352
PVER6	PVP6C2353	Palo Verde Ecological Reserve	Phase 06	C2353
PVER6	PVP6C2354	Palo Verde Ecological Reserve	Phase 06	C2354
PVER7	PVP7C2357	Palo Verde Ecological Reserve	Phase 07	C2357
PVER7	PVP7C2358	Palo Verde Ecological Reserve	Phase 07	C2358
PVER7	PVP7C2359	Palo Verde Ecological Reserve	Phase 07	C2359
PVER7	PVP7C2360	Palo Verde Ecological Reserve	Phase 07	C2360
PVER7	PVP7C2356	Palo Verde Ecological Reserve	Phase 07	C2356
PVER8	PVP8P8	Palo Verde Ecological Reserve	Phase 08	Phase 08
YUEW	YWANCC4708	Yuma East Wetlands	A North Channel	C4708
YUEW	YWDC4704	Yuma East Wetlands	D	C4704
YUEW	YWFC4705	Yuma East Wetlands	F	C4705
YUEW	YWFGC4712	Yuma East Wetlands	FG	C4712

Table 1-1.—Crosswalk table – Location name changes made in 2014 to reflect the standardization of Lower Colorado River Multi-Species Conservation Program (LCR MSCP) location names across all projects

Pre-2014 site code	LCR MSCP location code	LCR MSCP area	LCR MSCP site	LCR MSCP section
YUEW	YWIC4702	Yuma East Wetlands	I	C4702
YUEW	YWJC4703	Yuma East Wetlands	J	C4703
YUEW	YWSACC4711	Yuma East Wetlands	South AC	C4711
YUEW	YWSCC4710	Yuma East Wetlands	South C	C4710
YUHH	HHCL1CL1	Hunters Hole Conservation Area	Cell 01	Cell 01
YUHH	HHCL2CL2	Hunters Hole Conservation Area	Cell 02	Cell 02
YUHH	HHCL3CL3	Hunters Hole Conservation Area	Cell 03	Cell 03
YUHH	HHCL4CL4	Hunters Hole Conservation Area	Cell 04	Cell 04
YUHH	HHCL5CL5	Hunters Hole Conservation Area	Cell 05	Cell 05

ATTACHMENT 2

2014 Survey Form

ATTACHMENT 3

Birds Encountered During Yellow-billed Cuckoo Surveys,
2014

Table 3-1.—Birds encountered during yellow-billed cuckoo surveys, Reach 1 (Muddy River) and Reach 3 (Beal Lake Conservation Area, Topock), 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Overton Wildlife	CPhase 05, CPhase 06	Topock (North Dike)	Topock (Pintail Slough)	Topock Platform
Abert's towhee	5	4	4	5	4
American coot		4			
American kestrel		1		2	2
Anna's hummingbird		1			1
Ash-throated flycatcher	1	5	3	4	4
Bell's vireo	5	4	4	5	
Bewick's wren	5	2	2	4	
Black phoebe		3	1	4	2
Black-chinned hummingbird	2	3		2	
Black-headed grosbeak	1	1		2	
Black-tailed gnatcatcher	3	4	3	5	4
Blue grosbeak	5	3	2	5	4
Brown-crested flycatcher	1	3	2	5	2
Brown-headed cowbird	4	4	4		4
Bullock's oriole	2	4	1	5	2
California gull		1			
Canada goose	2				
Cattle egret		1			
Cassin's tern		1			
Chipping sparrow					1
Clapper rail		1			
Cliff swallow	1	3	2	2	2
Common moorhen		4			
Common raven	4	2		2	2
Common yellowthroat	5	5	2	5	
Cooper's hawk		1			
Crissal thrasher	5	5	3	4	4
Double-crested cormorant		1			
Eurasian collared-dove		1			
Gambel's quail	4	5	4	5	3
Gila woodpecker		2	1	5	

Table 3-1.—Birds encountered during yellow-billed cuckoo surveys, Reach 1 (Muddy River) and Reach 3 (Beal Lake Conservation Area, Topock), 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Overton Wildlife	CPhase 05, CPhase 06	Topock (North Dike)	Topock (Pintail Slough)	Topock Platform
Great blue heron	1	4		1	
Great egret		3			
Great horned owl	1			1	1
Greater roadrunner	5	5	1	4	1
Greater yellowlegs		1			1
Great-tailed grackle	2	5	3	5	3
Green heron		3			
Hooded oriole				1	
Horned lark				1	
House finch	2	1	2	3	1
Indigo bunting				2	
Killdeer		3			1
Ladder-backed woodpecker		5	2	4	4
Lark sparrow				1	1
Lazuli bunting		1		1	1
Least bittern		2			
Lesser goldfinch	4	1	1	2	2
Lesser nighthawk	1	3	1	3	2
Loggerhead shrike	5	4		4	
Long-billed curlew					1
Lucy's warbler	2	4	1	3	1
Macgillivray's warbler		1			
Mallard	1				
Mourning dove	5	5	4	5	5
Northern mockingbird	1			1	
Northern rough-winged swallow	1	3	2	2	2
Pacific-slope flycatcher	1		1	1	2
Pied-billed grebe	2	4			1
Phainopepla				1	
Red-breasted nuthatch	1				
Red-tailed hawk				1	

Table 3-1.—Birds encountered during yellow-billed cuckoo surveys, Reach 1 (Muddy River) and Reach 3 (Beal Lake Conservation Area, Topock), 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Overton Wildlife	CPhase 05, CPhase 06	Topock (North Dike)	Topock (Pintail Slough)	Topock Platform
Red-winged blackbird	4	4		2	1
Say's phoebe	1	1			
Snowy egret		1			
Song sparrow	3	4	1	1	1
Spotted sandpiper					1
Summer tanager		5	2	1	1
Swainson's hawk		1			
Townsend's warbler				1	
Tree swallow	1	1			
Tropical kingbird				4	
Turkey vulture		2		1	
Verdin	4	5	3	5	4
Warbling vireo		1		1	1
Western flycatcher		1			
Western grebe		2			
Western kingbird	1	3		5	1
Western meadowlark	5				
Western tanager		1		1	1
Western wood-pewee				1	
White-faced ibis	1	5		1	1
White-winged dove	4	5	4	5	5
Wild turkey	1				
Willow flycatcher	1				1
Wilson's warbler				1	1
Yellow warbler	5	4		2	
Yellow-billed cuckoo	2	4		2	1
Yellow-breasted chat	5	5	4	5	2
Yellow-headed blackbird	1	5	1		

Table 3-2.—Birds encountered during yellow-billed cuckoo surveys, Reach 3 (Bill Williams River East and West), 2014
 (The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Borrow Pit	Cross River	Cave Wash	Esquerria Ranch	Fox Wash	Gibraltar Rock	Honeycomb Bend	Kohen Ranch	BW Marsh	Middle Delta	Mosquito Flats Site 13	Mosquito Flats Site 12	North Burn	Mineral Wash	Cougar Point	Sandy Wash
Abert's towhee	5	5	5	4	4	5	5	5	2	4	4	4	4	5	4	5
American coot			1				3		3							
American kestrel								2	1							
American redstart							1									
Anna's hummingbird	1											1				
Ash-throated flycatcher	3	4	3	3	4	5	4	5	3	2	4	4	3	5	4	5
Barn owl														1		
Bell's vireo	4	4	5	4	3	4	5	5		2	4	5	3	5	4	5
Bewick's wren	4	4	5	4	4	5	5	5	3	4	4	4	4	3	2	5
Black phoebe	1			2	1		4	2	4			1	2	1		
Black-chinned hummingbird					1					1						1
Black-crowned night heron																
Black-headed grosbeak	1	2	2	1	2	3	5	3		1		1		4	1	3
Black-tailed gnatcatcher	5	2	5	4	4	5		4			4	4	2		1	5
Black-throated gray warbler																1
Black-throated sparrow	1			1							2	1		4	5	

Table 3-2.—Birds encountered during yellow-billed cuckoo surveys, Reach 3 (Bill Williams River East and West), 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Borrow Pit	Cross River	Cave Wash	Esquerria Ranch	Fox Wash	Gibraltar Rock	Honeycomb Bend	Kohen Ranch	BW Marsh	Middle Delta	Mosquito Flats Site 13	Mosquito Flats Site 12	North Burn	Mineral Wash	Cougar Point	Sandy Wash
Blue grosbeak	5	4	5	4	4	4		5	3	1		3	3	4	4	5
Bronzed cowbird																
Brown-crested flycatcher	5	5	5	4	4	4	5	5	4	3	4	5	3	5	4	4
Brown-headed cowbird	5	3	2	3	3	2	3	3	3	2	4	5	4	2	1	3
Bullock's oriole	3	3	3	4	1	2	3	5		1	3		3	2	1	3
Cactus wren						5		1	1		3			3	1	
Canyon wren	5	5	4	4	4		5	5	4	4		5	4	2	2	5
Cliff swallow					2	1			2				2	1	1	
Common blackhawk								3								
Common ground-dove			1											1		
Common moorhen			4				5		3				1			
Common raven	4				1	3	1						1	2	2	2
Common yellowthroat	4	5	5	4	3	1	5	3	4	4	4	5	4	5	3	3
Cooper's hawk	1	1	2	1	1	1	2	1	2	1			2	3		1
Crissal thrasher	5	4	4	3	4	4	5	5			4	5	3	3	4	5
Elf owl						1										

Table 3-2.—Birds encountered during yellow-billed cuckoo surveys, Reach 3 (Bill Williams River East and West), 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Borrow Pit	Cross River	Cave Wash	Esquerria Ranch	Fox Wash	Gibraltar Rock	Honeycomb Bend	Kohen Ranch	BW Marsh	Middle Delta	Mosquito Flats Site 13	Mosquito Flats Site 12	North Burn	Mineral Wash	Cougar Point	Sandy Wash
Eurasian collared-dove	1		1				1									
Gambel's quail	3		4	4	4	5	4	5				2		5	4	2
Gila woodpecker	5	5	5	4	4	5	5	5	4	4	4	5	4	5	4	5
Gilded flicker			2											1		1
Great blue heron	1		1	2			1							4	1	
Great horned owl	1	2	3			3	3	1	3	2		3		1		1
Greater roadrunner	5	2	4	2	4	5	3	5			1	3	3	5	4	4
Great-tailed grackle	1						2		3				3			
Green heron			1				5		3					4		
Hooded oriole		1				2	1	1						1		
House finch	1		1	2		1	1		1		1	1	1	4	2	
Hutton's vireo		1					1			1			1			
Indigo bunting								1						1		
Ladder-backed woodpecker	5	5	5	4	4	5	5	5	4	4	4	5	4	5	4	5
Lazuli bunting							1	1								1

Table 3-2.—Birds encountered during yellow-billed cuckoo surveys, Reach 3 (Bill Williams River East and West), 2014
 (The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Borrow Pit	Cross River	Cave Wash	Esquerria Ranch	Fox Wash	Gibraltar Rock	Honeycomb Bend	Kohen Ranch	BW Marsh	Middle Delta	Mosquito Flats Site 13	Mosquito Flats Site 12	North Burn	Mineral Wash	Cougar Point	Sandy Wash
Least bittern									2							
Lesser goldfinch	2	3	2		2	2	1	1	1	1	2	3	1	1		1
Lesser nighthawk	4	1	1	3	2	4	3	4		1	4	2	1	2	2	3
Loggerhead shrike	3	3		1	4	4	2	2	3	2	3	2	3	2	1	3
Louisiana waterthrush																
Lucy's warbler	2	5	3	4	2	1	3	3	3		3	5	3	2		1
Macgillivray's warbler							1		1							
Mourning dove	5	5	5	4	4	5	5	4	4	3	4	5	3	5	4	5
Northern cardinal						3	1	4							2	
Northern mockingbird								2	1							1
Northern rough-winged swallow	3			2	2	2	3	3	3		1		1		3	
Nutting's flycatcher													3	1		
Pacific-slope flycatcher	2	1	1	1	1		2	3		1	1	1		4	1	3
Peregrine falcon							2									
Phainopepla			1			1										
Pied-billed grebe							1									

Table 3-2.—Birds encountered during yellow-billed cuckoo surveys, Reach 3 (Bill Williams River East and West), 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Borrow Pit	Cross River	Cave Wash	Esquerria Ranch	Fox Wash	Gibraltar Rock	Honeycomb Bend	Kohen Ranch	BW Marsh	Middle Delta	Mosquito Flats Site 13	Mosquito Flats Site 12	North Burn	Mineral Wash	Cougar Point	Sandy Wash
Red-tailed hawk						2	1									
Red-winged blackbird				1					1				1			
Say's phoebe	1					1			1			1				
Scissor-tailed flycatcher								1								
Snowy egret														1		
Song sparrow	5	5	5	4	4	3	5	4	4	4	4	5	4	3	3	4
Summer tanager	4	4	5	3	3	3	5	5	4	3	4	4	2	4	3	5
Tree swallow			1				1									
Turkey vulture	1		2	2	1	2	1	3						4	2	1
Verdin	5	5	5	3	4	5	4	5	2	5	4	5	4	4	3	4
Vermilion flycatcher				1												
Violet-green swallow	1					1			2						1	
Warbling vireo	1						3	1	2			1		1		
Western flycatcher		1									1					
Western kingbird	1		2		2	1	1	2	1			1		2		2
Western screech owl				2		3	2	1		1	1			2	1	1

Table 3-2.—Birds encountered during yellow-billed cuckoo surveys, Reach 3 (Bill Williams River East and West), 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Borrow Pit	Cross River	Cave Wash	Esquerra Ranch	Fox Wash	Gibraltar Rock	Honeycomb Bend	Kohen Ranch	BW Marsh	Middle Delta	Mosquito Flats Site 13	Mosquito Flats Site 12	North Burn	Mineral Wash	Cougar Point	Sandy Wash
Western tanager	2	1	3	1	1	1	1	1	1			2		1	1	2
Western wood-pewee							1									
White-faced ibis	2	1	1	2								1	1	1	1	1
White-throated swift	1		1	1	1	2		2						1	1	
White-winged dove	5	5	5	3	4	4	4	5	3	4	4	5	4	5	4	3
Willow flycatcher							1							1		
Wilson's warbler							1					1			1	3
Yellow warbler	1	5	2	4	1	1	5	3	4	4	4	5	4	4		
Yellow-billed cuckoo	2	1	1		2	1	3	1		1		3		5		2
Yellow-breasted chat	5	5	5	4	4	5	5	5	4	4	4	5	4	5	4	5
Yellow-headed blackbird	1												1	1		1

Table 3-3.—Birds encountered during yellow-billed cuckoo surveys in Reach 4 ('Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1) Conservation Area, 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Nature Trail	Crane Roost	Cottonwood Genetics	Mass Transplanting	CW-North	CRIT 09	CVCA Phase 01	CVCA Phase 02	CVCA Phase 03	CVCA Phase 04W	PVER Phase 01	PVER Phase 02	PVER Phase 03	PVER Phase 04	PVER Phase 05	PVER Phase 06	PVER Phase 07
Abert's towhee	4	4	2	2	2	5	5	4	5	1	4	5	5	5	5	5	5
American kestrel	2	1			1	4	1	1							4	2	1
Anna's hummingbird						5											
Ash-throated flycatcher	3	4	3	2	2	5	5	3	5		1	4	2	2	5	5	5
Barn owl												2		1	1	1	1
Bell's vireo	3	1				2						2			1	1	
Bewick's wren																1	
Black phoebe		3		1		5	2	2	1			3	2	4	4	3	4
Black-chinned hummingbird	4	5	2	1		1	5	3		1	4	3	4	3	3	2	4
Black-headed grosbeak						1							1	1	2		2
Black-tailed gnatcatcher	3	1		1		5	3	1	2	1			1	2	4		
Blue-gray gnatcatcher															1		

Table 3-3.—Birds encountered during yellow-billed cuckoo surveys in Reach 4 ('Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1) Conservation Area, 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Nature Trail	Crane Roost	Cottonwood Genetics	Mass Transplanting	CW-North	CRIT 09	CVCA Phase 01	CVCA Phase 02	CVCA Phase 03	CVCA Phase 04W	PVER Phase 01	PVER Phase 02	PVER Phase 03	PVER Phase 04	PVER Phase 05	PVER Phase 06	PVER Phase 07
Black-throated gray warbler															1		
Black-throated sparrow						1											
Blue grosbeak	4	5	4	3	2	5	5	5	3	1	5	5	5	5	5	5	5
Brown-crested flycatcher	2	2		3	1	4	1	2	2			2		1	5	1	2
Brown-headed cowbird	4	4	3	1	1	5	4	5	4	1	3	4	3	5	5	5	5
Bullock's oriole	2	3			1	5	4	1	4	1	1	1	1	4	5	3	5
California gull																	1
Cattle egret						1			1								
Cassin's tern													1				
Cassin's vireo						1											
Cliff swallow	2	4	1	1		3	1	1	1	1				1	1	1	4
Common ground-dove						3	2		1			3	3	2	4	4	5

Table 3-3.—Birds encountered during yellow-billed cuckoo surveys in Reach 4 (‘Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1) Conservation Area, 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Nature Trail	Crane Roost	Cottonwood Genetics	Mass Transplanting	CW-North	CRIT 09	CVCA Phase 01	CVCA Phase 02	CVCA Phase 03	CVCA Phase 04W	PVER Phase 01	PVER Phase 02	PVER Phase 03	PVER Phase 04	PVER Phase 05	PVER Phase 06	PVER Phase 07
Common moorhen						1											
Common raven	1	1				2			1		1	3	2		4	2	1
Common yellowthroat	1	4	3	2	1	4	1	1			3	5	3	5	5	5	5
Cooper’s hawk				1	1	2		1					1	1	2		1
Crissal thrasher	2	1	2		1	4	2		1	1	1	1		2	4	1	
Double-crested cormorant						1											
Eurasian collared-dove	1	1	1	2	1	3	2	4			1		1	1	1	2	1
European starling						2		1									
Gambel's quail	3	4	4	4	2	5	4	2	3	1	4	5	2	3	4	3	4
Great blue heron		2		1		2	1					2		2	1	1	1
Great egret						2	2	1					1			1	2
Great horned owl	3	3		1	2	4	4	3	2		1	4	4		5	5	5

Table 3-3.—Birds encountered during yellow-billed cuckoo surveys in Reach 4 (‘Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1) Conservation Area, 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Nature Trail	Crane Roost	Cottonwood Genetics	Mass Transplanting	CW-North	CRIT 09	CVCA Phase 01	CVCA Phase 02	CVCA Phase 03	CVCA Phase 04W	PVER Phase 01	PVER Phase 02	PVER Phase 03	PVER Phase 04	PVER Phase 05	PVER Phase 06	PVER Phase 07
Greater roadrunner		3	3			3	2				1	2	3	5	5	1	1
Great-tailed grackle	1	2	3	2		5	2	3	1			2		1	5	3	5
Green heron		1				1										1	
Hooded oriole						1											
Horned lark						3											
House finch	1	2	2	2		5	4	1			3	5	4	4	5	3	5
House wren																	1
Inca dove							4	4	2		1	1		4	1	1	
Indigo bunting	1			1			1					1	2	4	5	5	5
Killdeer	3	3				2	2	2	1			2	4	2	2	2	1
Ladder-backed woodpecker	4	2		2		4	4		2	1	1	4	3	5	5	3	3
Lazuli bunting						3							1				

Table 3-3.—Birds encountered during yellow-billed cuckoo surveys in Reach 4 ('Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1) Conservation Area, 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Nature Trail	Crane Roost	Cottonwood Genetics	Mass Transplanting	CW-North	CRIT 09	CVCA Phase 01	CVCA Phase 02	CVCA Phase 03	CVCA Phase 04W	PVER Phase 01	PVER Phase 02	PVER Phase 03	PVER Phase 04	PVER Phase 05	PVER Phase 06	PVER Phase 07
Lesser goldfinch						5		3					1	1		4	4
Lesser nighthawk	3	4	1	1	1	3	1					2	1	1	5	2	1
Loggerhead shrike	3	2	4	3	3	5	4	1	3	1	2	2	2		5	3	4
Long-billed curlew		1															1
Lucy's warbler	2	2				5	2	2	1	1	1	3	1	4	4	3	4
Macgillivray's warbler						1											
Mallard															1		
Mourning dove	5	5	4	5	5	5	5	5	5		4	5	4	5	5	5	5
Northern harrier		1	1														
Northern mockingbird		5	3			3	1		1	1		1	2	1	1	1	2
Northern rough-winged swallow		1				2		1					2	1	2	2	
Orange-crowned warbler						1									1		1

Table 3-3.—Birds encountered during yellow-billed cuckoo surveys in Reach 4 ('Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1) Conservation Area, 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Nature Trail	Crane Roost	Cottonwood Genetics	Mass Transplanting	CW-North	CRIT 09	CVCA Phase 01	CVCA Phase 02	CVCA Phase 03	CVCA Phase 04W	PVER Phase 01	PVER Phase 02	PVER Phase 03	PVER Phase 04	PVER Phase 05	PVER Phase 06	PVER Phase 07
Osprey							1										
Pacific-slope flycatcher						2	1							1		1	
Peregrine falcon						4	1									1	
Purple martin																1	
Red-shouldered hawk															1	1	2
Red-tailed hawk							2				1	1	1		1	1	1
Red-winged blackbird	4	5	4	4			4	3	5	1	3	5	4	5	5	5	5
Rock pigeon						1											
Rose-breasted grosbeak														1			
Say's phoebe	1	1		1									1	2	1	1	
Snowy egret																1	
Song sparrow		3		1	1			1			2	3	2	4	5	5	5

Table 3-3.—Birds encountered during yellow-billed cuckoo surveys in Reach 4 (‘Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1) Conservation Area, 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Nature Trail	Crane Roost	Cottonwood Genetics	Mass Transplanting	CW-North	CRIT 09	CVCA Phase 01	CVCA Phase 02	CVCA Phase 03	CVCA Phase 04W	PVER Phase 01	PVER Phase 02	PVER Phase 03	PVER Phase 04	PVER Phase 05	PVER Phase 06	PVER Phase 07
Spotted sandpiper						1											1
Summer tanager		2	1			4			1			1	2			1	
Swainson's hawk		1					1		1				1			1	
Tree swallow						3			1							1	
Tropical kingbird						5											
Turkey vulture	1	1		1	1	5	4	2	3	1		1	1	2	3	3	2
Unknown flicker		1															
Unknown flycatcher									1								
Unknown gull					1												
Unknown hummingbird								1							1		
Verdin	1	1				5	2		3	1		2		3	5	2	1
Vermilion flycatcher			1			5		1									

Table 3-3.—Birds encountered during yellow-billed cuckoo surveys in Reach 4 (‘Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1) Conservation Area, 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Nature Trail	Crane Roost	Cottonwood Genetics	Mass Transplanting	CW-North	CRIT 09	CVCA Phase 01	CVCA Phase 02	CVCA Phase 03	CVCA Phase 04W	PVER Phase 01	PVER Phase 02	PVER Phase 03	PVER Phase 04	PVER Phase 05	PVER Phase 06	PVER Phase 07
Warbling vireo						2							1		2	1	1
Western flycatcher															1	1	1
Western kingbird	5	5	3	5	3	5	5	5	3	1	2	5	4	5	5	5	5
Western tanager		1					2							3	3	2	3
Western wood-pewee							1	1							1	1	
Whimbrel																	1
White-faced ibis	1	5	3	2		3	2	1	4			3	4	3	1	3	2
White-tailed kite			1													1	
White-throated swift																	1
White-winged dove	5	5	5	5	3	4	5	5	5	1	5	5	4	5	5	5	5
Willow flycatcher						1									1		1
Wilson's warbler		1				1								1			

Table 3-3.—Birds encountered during yellow-billed cuckoo surveys in Reach 4 (‘Ahakhav Tribal Preserve to Cibola National Wildlife Refuge Unit 1) Conservation Area, 2014

(The number of survey periods each species was detected in is displayed for each site. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Nature Trail	Crane Roost	Cottonwood Genetics	Mass Transplanting	CW-North	CRIT 09	CVCA Phase 01	CVCA Phase 02	CVCA Phase 03	CVCA Phase 04W	PVER Phase 01	PVER Phase 02	PVER Phase 03	PVER Phase 04	PVER Phase 05	PVER Phase 06	PVER Phase 07
Yellow warbler		3				1	1					1		5	2	5	1
Yellow-billed cuckoo	1	5	1			3	3	1			1	3	2	5	5	5	5
Yellow-breasted chat	3	5	2	2			4	1	2		1	5	3	5	5	5	5
Yellow-headed blackbird	3	2	1	2		2	2	1	1			2	1		2	3	1
Zone-tailed hawk													1				

Table 3-4.—Birds encountered during yellow-billed cuckoo surveys in Reaches 5–6 (Laguna and Yuma East Wetlands), 2014
(The number of survey periods each species was detected in is displayed for each area. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Mittry	South AC, C, I
Abert's towhee	3	3
American coot	1	2
American kestrel	1	2
Anna's hummingbird		2
Ash-throated flycatcher	3	3
Barn owl	1	
Black phoebe	3	2
Black-chinned hummingbird	2	3
Black-tailed gnatcatcher	1	2
Blue grosbeak	4	4
Brown-headed cowbird	1	3
Bullock's oriole	1	1
Cattle egret	1	
Cliff swallow	1	
Common yellowthroat	3	4
Crissal thrasher		1
Eurasian collared-dove		3
Gambel's quail	2	1
Gila woodpecker	1	4
Great blue heron	1	1
Great egret	2	3
Great horned owl	1	2
Greater roadrunner		2
Great-tailed grackle	3	4
Green heron		1
House finch	1	2
Indigo bunting	1	
Killdeer	1	1
Ladder-backed woodpecker	1	3
Lesser nighthawk	1	3
Loggerhead shrike	3	2

Table 3-4.—Birds encountered during yellow-billed cuckoo surveys in Reaches 5–6 (Laguna and Yuma East Wetlands), 2014
 (The number of survey periods each species was detected in is displayed for each area. Lower Colorado River Multi-Species Conservation Program covered species are in **bold**.)

Species name	Mittry	South AC, C, I
Lucy's warbler	1	2
Mallard	1	1
Mourning dove	4	4
Northern mockingbird		3
Pied-billed grebe	3	3
Red-winged blackbird	3	2
Rock pigeon		3
Say's phoebe	1	1
Tree swallow	1	
Verdin	3	3
Vermilion flycatcher		1
Warbling vireo		2
Western kingbird	3	2
Western tanager	1	
White-faced ibis	1	
White-winged dove	3	4
Willow flycatcher		2
Yellow warbler	1	2
Yellow-billed cuckoo	1	
Yellow-breasted chat	3	1
Yellow-headed blackbird	2	