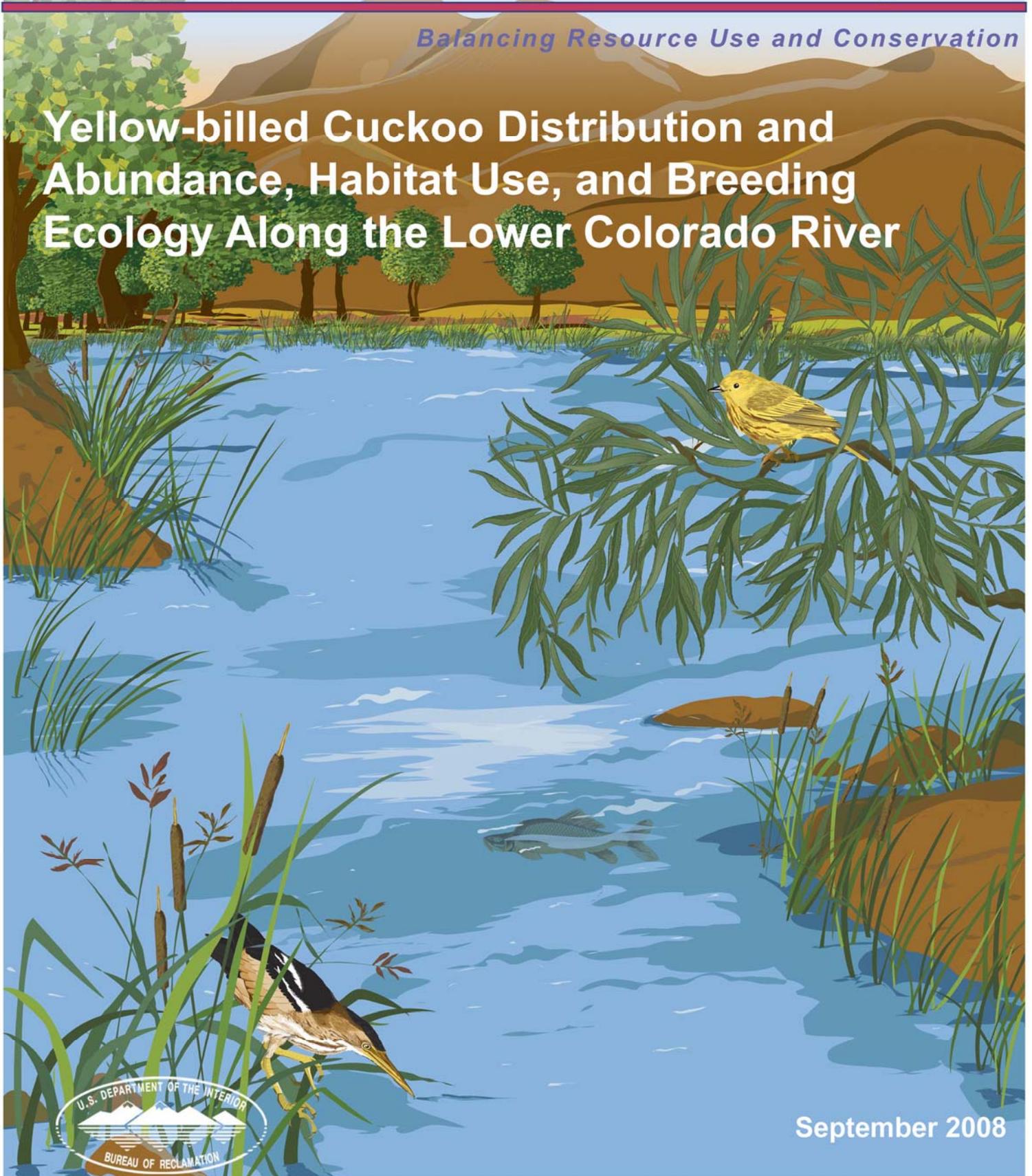




# Lower Colorado River Multi-Species Conservation Program

*Balancing Resource Use and Conservation*

## Yellow-billed Cuckoo Distribution and Abundance, Habitat Use, and Breeding Ecology Along the Lower Colorado River



September 2008

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## **Conservation Participant Group**

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**YELLOW-BILLED CUCKOO DISTRIBUTION AND ABUNDANCE, HABITAT USE, AND BREEDING ECOLOGY ALONG THE LOWER COLORADO RIVER (LIMITROPHE DIVISION AREAS, COCOPAH INDIAN RESERVATION, CIBOLA NWR, IMPERIAL NWR, PICACHO STATE RECREATION AREA, CA, MITTRY LAKE WMA/PRATT RESTORATION AREA, COLORADO/GILA RIVER CONFLUENCE, LOWER GILA RIVER AND QUIGLEY POND WMA, 2005).**

**FINAL REPORT**

25 March 2006

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## SUMMARY

We initiated surveys for Western Yellow-billed Cuckoos (*Coccyzus americanus occidentalis*) in areas managed by the Bureau of Land Management, Bureau of Reclamation, Arizona Game and Fish Department, Cocopah Indian Reservation, Imperial National Wildlife Refuge and Cibola National Wildlife Refuge in 2005. During the 2005 field season, 28 sites were surveyed twice during the migration season between 15 May and 11 June, and 42 sites were surveyed four times during the breeding season between 16 June and 13 August. Across all sites and all visits, we had 33 Yellow-billed Cuckoo detections during the 2005 breeding season. No cuckoos were detected during the migration season surveys, and relatively few were detected on the first breeding-season survey. The greatest number of detections were made during the second breeding-season surveys, when 16 detections were made. The majority of detections occurred during the month of July. At all sites, detections fell off sharply during the fourth breeding-season surveys. Behavioral observations and nest searching was conducted in the sites with cuckoo detections. In 2005, we confirmed only one pair of cuckoos, however, breeding was not confirmed. All other detections were unpaired cuckoos. Cuckoos were detected in only 12 of 42 sites (28.6%) during surveys in 2005. Thirty (71.4%) sites had no detections. The sites with the most detections were located at the Colorado/Gila River Confluence sites and the Limitrophe Division North sites. Yellow-billed Cuckoo detections along the Gila River at the Quigley Pond Wildlife Management Area also yielded a number of detections including the only pair of cuckoos, which is discussed above. The sites with the fewest detections tended to be ones dominated by 51% or greater of exotic vegetation; these six sites along the Gila River produced only one detection all season.

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## INTRODUCTION

### ***YELLOW-BILLED CUCKOO BREEDING BIOLOGY BACKGROUND***

The future of the Western Yellow Billed Cuckoo (*Coccyzus americanus occidentalis*), a neotropical migrant that breeds throughout northern Mexico, the United States, and southern Canada, is uncertain (Hughes 1999). Yellow-billed Cuckoo populations have declined throughout the species' range (Hughes 1999); western populations, in particular, have decreased and suffered catastrophic range reductions in the twentieth century (Laymon and Halterman 1987, Hughes 1999). Consequently, on July 25, 2001, the Western Yellow-billed Cuckoo became a Candidate Species under the Endangered Species Act (USFWS 2002). Candidate Species are those species for which the US Fish and Wildlife Service has sufficient information on biological vulnerability and threats to support proposals to list them as Endangered or Threatened under the ESA, but proposed rules have not been issued because such actions are precluded at present by other listing activity (AGFD 2002). Yet, despite concern over the fate of this species, few aspects of Yellow-billed Cuckoo life history have been adequately studied (Hughes 1999). Probable factors believed to be contributing to population declines are the loss, fragmentation, and alteration of native riparian breeding habitat, the possible loss of wintering habitat, and pesticide use on breeding and wintering grounds (Gaines and Laymon 1984, Franzreb 1987, Laymon and Halterman 1987, Hughes 1999). Populations may also be limited by food availability for young; they may not nest if the local food supply is inadequate on the breeding grounds (Veit and Petersen 1993). Food availability is likely affected by drought conditions. In addition, local extinctions and low colonization rates contribute to the drastic declines (Laymon and Halterman 1989).

Western Yellow-billed Cuckoos require structurally complex riparian habitats with tall trees and a dense woody vegetative understory (Halterman 1991, Hughes 1999). They historically bred in riparian zones from western Washington to northern Mexico including Oregon, southwestern Idaho, California, Nevada, Utah, western Colorado, Arizona, New Mexico and western Texas (American Ornithologists' Union 1983, 1998). Yet, like populations of other riparian obligate species, Western Yellow-billed Cuckoo populations have suffered severe range contractions during the last 80 years, and are extirpated from British Columbia, Washington, Oregon and possibly Nevada (Hughes 1999). Currently, western populations of the Yellow-billed Cuckoo breed in localized areas of California, Arizona, New Mexico, extreme western Texas, Sonora, Chihuahua, and south irregularly to Zacatecas, Mexico (Howell and Webb 1995, Russell and Monson 1998, Hughes 1999). Local breeding is irregular in Utah (J. Parrish pers. comm., Johnson and O'Brien 1998), and western Colorado (Kingery 1998).

In Arizona, the Yellow-billed Cuckoo was once considered a fairly common-to common breeding species within riparian forests dominated by cottonwood, willow and/or mesquite throughout the state (Swarth 1905, 1914, Visher 1910, Phillips et al. 1964, Corman and Magill 2000). Past estimates suggested that less than 200 pairs remained in 1986 (Layman and Halterman 1987), and that less than 50 pairs were present five years later (Ehrlich et al. 1992). The Arizona Game and Fish Department has designated the Yellow-billed Cuckoo as Wildlife of Special Concern in Arizona, and the Regional Forester has designated it as a Sensitive Species on National Forests within Arizona (AGFD 2002). In addition, it is considered likely to become an endangered species, within the foreseeable future, throughout all or a significant portion of its range on the Navajo Nation (NESL 1997).

Prompted by concern regarding severe population declines, habitat loss and the lack of statewide data, the Arizona Game and Fish Department (AGFD) and the U.S. Geological Survey's Colorado Plateau Research Station (CPRS) initiated Yellow-billed Cuckoo surveys in 1998 and 1999. During these surveys, Yellow-billed Cuckoos were documented along 25 drainages: 73 pairs were found in 1998

and 172 pairs were detected in 1999. The major concentrations in the state were along the Agua Fria, San Pedro, and Verde rivers, and Cienega and Sonoita creeks (Corman and Magill 2000).

Results of these surveys show that, as elsewhere in its range, the Yellow-billed Cuckoo depends on riparian habitats. Occupancy rates were highest in cottonwood/willow/ash/mesquite habitat (70.7%), and Cottonwood/willow/ash/mesquite/with less than 75% tamarisk habitat (60.7%). In addition, the Mesquite bosque/hackberry habitat was under sampled in the surveys (only 3.4% of the sites), but had a high occupancy rate of 60.0%. Yellow-billed Cuckoos were much less common in Sycamore/cottonwood habitat (46.2% occupancy), Sycamore/alder/willow/ash/walnut habitat (33.3% occupancy), and habitat comprised of greater than 75% tamarisk cover (33.3% occupancy; Corman and Magill 2000).

In California, prior to the 1930s, Yellow-billed Cuckoos were widely distributed in suitable river bottom habitats and were locally common (Grinnell and Miller 1944, Small 1994). Yet, many modern investigators concluded that there was a catastrophic decline of the cuckoo in California following the start of the major era of development beginning about mid-1800s (Gaines and Laymon 1984, Laymon and Halterman 1987, Launer et al. 1990). In 1971 the state listed the species as threatened in California. It was subsequently listed as endangered in 1987. Based on a 1986-87 statewide survey, only three areas in California support more than about five breeding pairs on a regular basis: the Sacramento River between Colusa and Red Bluff; the South Fork of the Kern River and the lower Colorado River (Laymon and Halterman 1987a, b). The lower Colorado River, on the California-Arizona border, supported an estimated 180-240 pairs in 1976-77, a number that had declined by an estimated 80-90 percent by 1986 (Laymon and Halterman 1987a). Rosenberg et al. (1991) estimated a decline of 93 percent over this period along the lower Colorado River, from an initial 242 pairs in 1976-1977. These declines coincided with habitat loss resulting from high water levels of long duration in 1983-1984 and 1986 (Laymon and Halterman 1987b, Rosenberg et al. 1991). In 1998, no pairs were found in the parts of California, west of the Colorado River that had been occupied in 1976-1977 (M. Halterman, pers. comm., 1999).

Riparian habitats are not just important to the conservation of Yellow-billed Cuckoos. Across the Southwest, riparian landscapes are invaluable. While riparian areas comprise less than 1% of the region's area (Knopf et al. 1988), 75-80% of vertebrate wildlife species depend on riparian areas for food, water, cover, and migration routes (Gillis 1991, Bogan et al. 1998). Riparian zones provide other tangible benefits by improving water quality by filtering sediments and nutrients. Also, accumulated sediments in riparian zones store large amounts of water, which helps to sustain stream flow during drier times.

These valuable habitats are at risk. Noss et al. (1995) ranked riparian forests in Arizona and New Mexico as endangered, with 85%-98% declines in distribution due to destruction, conversion to other uses, or significant degradation in structure, function, or composition, due in part to the invasion of exotic plants, since settlement by Europeans. Overall, a 90% loss of presettlement riparian ecosystems has occurred in Arizona (Arizona State Parks 1988, Bogan et al. 1998). The riparian areas of the lower Colorado River watershed of southern Arizona have experienced major disturbances since presettlement and the area provides a good setting for studying the impacts of human development, and natural impacts such as drought, on riparian habitats and the species dependent upon them, especially the Yellow-billed Cuckoo.

Yellow-billed Cuckoos were once common and now are extremely rare and riparian habitats have been severely impacted demonstrate the clear need to elucidate the linkages between Yellow-billed Cuckoo ecology and riparian ecosystem integrity. Indeed, after conducting surveys for Yellow-billed Cuckoos in 1998 and 1999, AGFD and CPRS concluded that: 1.) The surveys should be expanded to

encompass all major habitat types; 2.) additional presence/absence data was needed from areas within potentially suitable habitat that were not thoroughly surveyed previously (Corman and Magill 2000). Clearly, more needs to be known about this species of concern in order to make informed management decisions regarding its conservation. By learning more about the Yellow-billed Cuckoo's habitat requirements we will be better able to predict the effects of management options.

Information on the status and distribution of cuckoos on the lower Colorado River, provided in this report, has current, timely application. The Yellow-billed Cuckoo is recognized as a covered species under the lower Colorado River (LCR), Multi-species Conservation Program (MSCP) (LCR MSCP 2004). The objective, under the MSCP program, is to conserve, monitor and manage populations and habitat of all covered species. The MSCP goals for the Yellow-billed Cuckoo include: the restoration of 4050 acres of cottonwood-willow habitat (i.e., Yellow-billed Cuckoo breeding habitat) along the lower Colorado River; monitoring these restoration efforts for their effectiveness in providing habitat for cuckoos; and, conducting long-term Yellow-billed Cuckoo ecosystem monitoring along the entire lower Colorado River (LCR MSCP 2004).

## **OBJECTIVES**

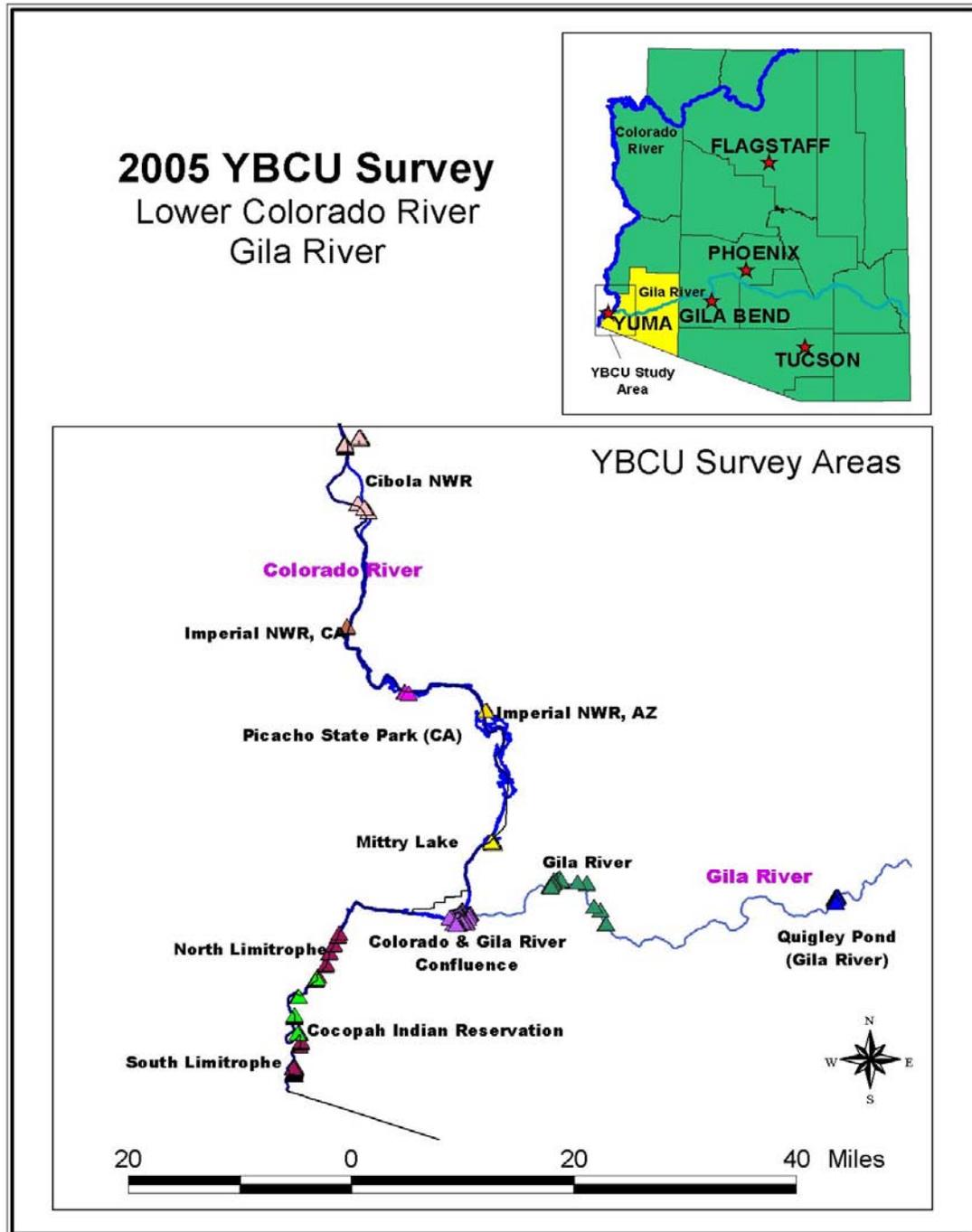
This project was conducted to document the distribution, abundance, and habitat use of Yellow-billed Cuckoos within the riparian areas of concern: the lower Colorado River (primarily Yuma, AZ to the United States/Mexico border), Colorado River/Gila River confluence, lower sections of the Gila River, and the Colorado River at Picacho State Recreation Area, CA. Additionally, the information gathered during the Yellow-billed Cuckoo surveys can be used as baseline data for continued monitoring of Cuckoo populations and riparian vegetation. Specific objectives of the project include:

- a) Conduct comprehensive, repeatable surveys within all potentially suitable habitat types in the areas of concern. This work contributes to baseline information on Yellow-billed Cuckoo populations within these areas. All other avian species encountered within riparian habitats were also recorded.
- b) Determine breeding habitat selection and preference within the areas of concern. The habitat of occupied areas was characterized, and habitat use during migration and breeding were identified using both field surveys and GIS analysis.
- c) Test the effectiveness of the Yellow-billed Cuckoo breeding survey protocol in order to develop a standardized YBCU protocol to use over the Multi Species Conservation period.
- d) Identify core Yellow-billed Cuckoo breeding habitat to use as a basis for future habitat expansion through restoration efforts.

### ***YELLOW-BILLED CUCKOO SURVEY SITES***

The study area included the lower Colorado River between Yuma, AZ and the United States/Mexico Border (including Hunter's Hole and the Limitrophe Division Area), the confluence of the Gila/Colorado River and lower sections of the Gila River, and the Colorado River at Picacho State Recreation Area, CA (Figures 1).

Figure 1. Yellow-billed Cuckoo survey sites along the lower Colorado River and Gila River, AZ, 2005.



## ***SELECTION OF STUDY SITES***

Specific Yellow-billed Cuckoo survey sites were selected prior to the initial survey season, using the “look see” method. This method was employed during previous AGFD/CPRS surveys and, as described by Bibby et al. (1992), calls for identification of suitable habitats prior to conducting surveys. It relies on prior knowledge of possible habitat preferences, expert opinion, and knowledge of the basic biology of the species in question (Halterman et al. 2005). Matthew Johnson selected sites based on considerable experience surveying for cuckoos throughout much of the state. This is a preferred method for surveying rare birds (Dawson 1981) when the goal is detection of all occurrences of a species within constraints such as time. All of the selected study areas are located in Arizona or California.

## ***YELLOW-BILLED CUCKOO SURVEY METHODS***

Surveys for presence/absence of Yellow-billed Cuckoos were conducted following established methodologies (Laymon 1998, Corman and Magill 2000, Halterman et al. 2004, Johnson et al. 2005). These methodologies recommend a minimum of three surveys be conducted between 25 May and 31 August and that surveys at a site be conducted 10 to 14 days apart. The time between surveys ensures surveying throughout the potential breeding season and, therefore, increases the likelihood of detecting nesting cuckoos.

The surveys consisted of using playback of a taped recording of the Yellow-billed Cuckoo’s “kowlp” call. Playback equipment was capable of projecting this call at least 100 m with a minimum of distortion. Surveys were conducted between the hours of 6:00 AM MST (mountain standard time) and 12:00 PM and were terminated if shade temperatures exceeded 100°F (38°C) or during steady rainfall. One transect (i.e., a series of points from which the tape was broadcast) was made through the habitat for every 200 meters of habitat width. The surveyor initially stopped at a survey point and remained quiet for a two-minute period to acclimate to the ambient noise and to listen for spontaneously-calling cuckoos. If no cuckoos were heard in this 2-minute period, the surveyor then played the “kowlp” call once, followed by one minute of silence to listen for a response. If no detections occurred, this playback-listen technique was repeated an additional four times. The surveyor then moved 100 m along the transect (by foot or by boat) and began the listen-playback-listen protocol anew. If a cuckoo was detected at the survey point, UTM coordinates were recorded and given a unique detection label. The distance and compass bearing to the individual was estimated and recorded. The surveyor then moved 300 m before resuming survey playbacks. This was done to reduce the probability of re-detecting and/or attracting the previously detected individual.

During the surveys, the following data were recorded on a field survey form: A) UTM coordinates, using GPS, of all survey points, including point with no detections and those where cuckoos were detected; B) The estimated the number of individual cuckoos detected; C) The estimated distance and the direction (i.e., the compass bearing) from the surveyor to the detected cuckoo; D) UTM coordinates, using GPS, of all survey site boundaries, including start and stop points, regardless of occupation; and, E) provided a site description of each site surveyed.

During these surveys the surveyor attempted to make behavioral observations that included: A) estimate the number of individuals in the habitat patch; B) the appearance of a nesting pair; C) stage of nesting; D) observations of their use of the habitat patch; E) observations on interactions between individuals; and, F) make general observations on Yellow-billed Cuckoo behavior. The interpretation of these behaviors can help to determine breeding status.

Matthew Johnson and three field technicians (Christopher Calvo, Michael Dionne, and Matt Paulson) conducted surveys and behavioral observations during the migration and the breeding seasons (May through August 2005). To assure data comparability within the study and with other Yellow-billed Cuckoo studies, prior to conducting surveys, all surveyors completed training in using standardized survey methodologies and in interpreting cuckoo behavior, provided by Murrelet Halterman (Southern Sierra Research Station), Matthew Johnson, and Jennifer Holmes.

To document migratory Yellow-billed Cuckoos, we conducted a minimum of two surveys at each site between 1 May 2005 -1 June 2005. We began breeding surveys on 5 June to detect breeding cuckoos and conducted four breeding-season surveys at each site.

### ***RIPARIAN HABITAT CLASSIFICATION***

Each survey site's vegetation was categorized, based on the site's vegetation cover, using the habitat classifications listed in Table 1. At each riparian patch inventoried we recorded a site description that included: A) the habitat class, (Table 1); B) an estimate of percent cover of each dominant and/or co-dominant plant species; C) the rank of the canopy/overstory and the understory species based on each species' percent cover; and D) the presence of saturated soil and standing water within the patch. Additionally, each patch was digitally photographed and given a unique name.

**Table 1.** Riparian habitat classifications for Yellow-billed Cuckoo survey sites, lower Colorado River and Gila River, AZ, CA, 2005.

<b>HABITAT CLASS</b>	<b>DEFINITION</b>
Native Habitat	Sites containing > 75% native tree species
Mixed Native Habitat	Sites containing 51-75% native tree species
Mixed Exotic Habitat	Sites containing 51-75% exotic tree species
Exotic Habitat	Sites containing > 75% exotic tree species

### ***YELLOW-BILLED CUCKOO SPATIAL DATA***

Orthorectified color aerial photography was provided by the Bureau of Reclamation and the US Geological Survey produced the Digital Orthophoto Quarter Quads (DOQQs) used to create the maps of study sites. These maps consist of several layers: 1) aerial photography; 2) a point layer of all survey points (i.e., the coordinate point from which a playback survey was conducted) and all cuckoo detections (i.e., the coordinate point at which the surveyor estimated the cuckoo to be located); and, 3) habitat patch boundaries. The maps were created by Pinnacle Mapping Technologies, Inc. The GIS themes are projected in UTM Zone 11 north, the datum is NAD 1983 (horizontal) and NGVD 1929 (vertical), and the Spheroid is GRS 1980. Map units are in meters. The software used to compile the maps was ESRI, Inc. 2002 ArcView GIS Version 3.3.

The imagery available for some sites was fairly old (USGS DOQQs); ground truthing revealed that the vegetation cover had changed considerably. Therefore this imagery was not used to characterize current riparian habitat, but simply used as a georeferenced backdrop. For those patches for which we were able to acquire recent imagery (i.e., BOR 2004), and where cuckoos were detected, we used the imagery to delineate patch boundaries. A riparian patch was defined as an area of contiguous riparian habitat that includes the appropriate riparian tree species and is separated by at least 300 m from the nearest contiguous riparian habitat. These boundaries were digitized, and the area of the patch was calculated using ArcView 3.3 GIS tools. The final GIS database includes shapefiles of YBCU survey and detection points, YBCU patch outlines, and images used as a mapping backdrop.

## RESULTS

### ***2005 YELLOW-BILLED CUCKOO SURVEY EFFORT***

During the 2005 field season, 28 sites were surveyed twice during the migration season, between 15 May and 12 June, and 42 sites were surveyed four times during the breeding season, between 16 June and 13 August. Surveys were initiated and completed later (spanning 13 July to 30 August) at the Imperial North site due to delayed access to the site.

### ***2005 SPATIOTEMPORAL DETECTION PATTERNS AT ALL SITES ALONG THE LOWER COLORADO RIVER IN ARIZONA AND CALIFORNIA, AND THE LOWER GILA RIVER, ARIZONA, 2005.***

Across all sites and all visits, we had 33 Yellow-billed Cuckoo detections (Tables 2, Table 3, and Appendix 1). This represents 0.19 detections per survey-hour. The greatest number of detections was made during the second breeding-season surveys, when 16 detections were made. No cuckoos were detected during the migration season surveys, and relatively few were detected on the first breeding-season survey. The majority of detections occurred during the month of July. At all sites, detections fell off sharply during the fourth breeding-season surveys (from 11 to 1 detections).

Cuckoos were detected in only 12 of 42 sites (28.6%) during surveys in 2005. Thirty (71.4%) sites had no detections. The sites with the most detections were located at the Colorado/Gila River Confluence sites and the Limitrophe Division North sites. The Gila River at the Quigley Wildlife Management Area also yielded a number of detections. The sites with the fewest detections tended to be ones dominated by 51% or greater exotic vegetation (i.e., tamarisk); these six sites (Gila River at 95 sites D,E,F,G,H and I) produced only one detection all season (2.4%, n = 42; Figure 1).

**Table 2.** The total number of detections per survey visit at sites along the lower Colorado River and Gila River, AZ, 2005.

<b>VISIT #</b>	<b>DATE (2005)</b>	<b># YBCU DETECTIONS</b>
Migration #1	5/12 - 5/17	0
Migration #2	6/05 - 6/12	0
Breeding #1	6/16 - 6/25	5
Breeding #2	6/29 - 7/13	16
Breeding #3	7/14 - 7/30	11
Breeding #4	7/31 - 8/13	1
		<b>Total = 33</b>

Of the 42 sites surveyed, 24 sites (57.1%) were classified as either native or mixed native, while 18 sites (42.9%) were classified as exotic or mixed exotic (Table 3). A total of eight sites that were classified as native or mixed native (of 24; 33.3%) had Yellow-billed Cuckoo detections, while only 4 sites that were classified as mixed exotic of exotic (of 18; 22.2%) had Yellow-billed Cuckoo detections.

**Table 3.** Yellow-billed Cuckoo survey sites and habitat type classification along the lower Colorado River and Gila River, AZ, 2005. Sites in italics are where Yellow-billed Cuckoos were detected.

Site Name	Native	Mixed Native	Mixed Exotic	Exotic
Cibola - Horseshoe Plantation	X			
Cibola - Eucalyptus Plantation		X		
<i>Cibola - South Plantation</i>	X			
Cibola - East Side		X		
<i>Cibola - Cross River Site</i>			X	
<i>Colorado Confluence</i>			X	
<i>Gila Confluence Site A</i>			X	
<i>Gila Confluence Site B</i>		X		
Gila Confluence Site C		X		
Gila Confluence Site D		X		
Gila Confluence Site E			X	
Gila Confluence Site F			X	
Gila Confluence Site G			X	
Gila at Highway 95 Site A			X	
Gila at Highway 95 Site B			X	
Gila at Highway 95 Site C			X	
Gila at Highway 95 Site D				X
Gila at Highway 95 Site E				X
<i>Gila at Highway 95 Site F</i>				X
Gila at Highway 95 Site G				X
Gila at Highway 95 Site H				X
Gila at Highway 95 Site I				X
Gila at Highway 95 Site J			X	
<i>Quigley Pond WMA</i>	X			
Limitrophe Division South – Pts.1-16		X		
Limitrophe Division South – Pts.17-18			X	
Limitrophe Division South – Pts.19-22		X		
Limitrophe Division North – Pts.1-2		X		
Limitrophe Division North – Pts.3-4		X		
Limitrophe Division North – Pts.5-8		X		
Limitrophe Division North – Pts.9-10		X		
<i>Limitrophe Division North – Pt.11</i>		X		
Limitrophe Division North – Pts.12-14		X		
Limitrophe Division North – Pts.15-17		X		
Cocopah Reservation – Pts.1-6	X			
Cocopah Reservation – Pts.7-12			X	
Cocopah Reservation – Pts.13-15	X			
Cocopah Reservation – Pts.16-20		X		
<i>Mittry Lake/Pratt Restoration Area</i>	X			
Imperial NWR – North Site		X		
<i>Imperial NWR – South Site</i>	X			
Picacho State Park	X			

**STUDY AREAS DESCRIPTIONS AND SUMMARY OF SURVEY RESULTS PER STUDY AREA**

**CIBOLA NATIONAL WILDLIFE REFUGE**

Cibola NWR is located in the floodplain of the lower Colorado River and is surrounded by a fringe of desert ridges and washes. The refuge encompasses the Colorado River channel as well as a channelized portion constructed in the late 1960's. It has approximately 16,600 acres of riparian habitat. At Cibola NWR, we surveyed for Yellow-billed Cuckoos at five sites that were either considered adequate cuckoo habitat or where historical detections occurred. In 2005, we conducted four cuckoo surveys during the migration period and 20 surveys (four per site) during the breeding period (Table 4).

**Table 4.** Dates and sites where Yellow-billed Cuckoo surveys were conducted during two migration visits and four breeding visits at Cibola National Wildlife Refuge along the lower Colorado River, AZ, 2005.

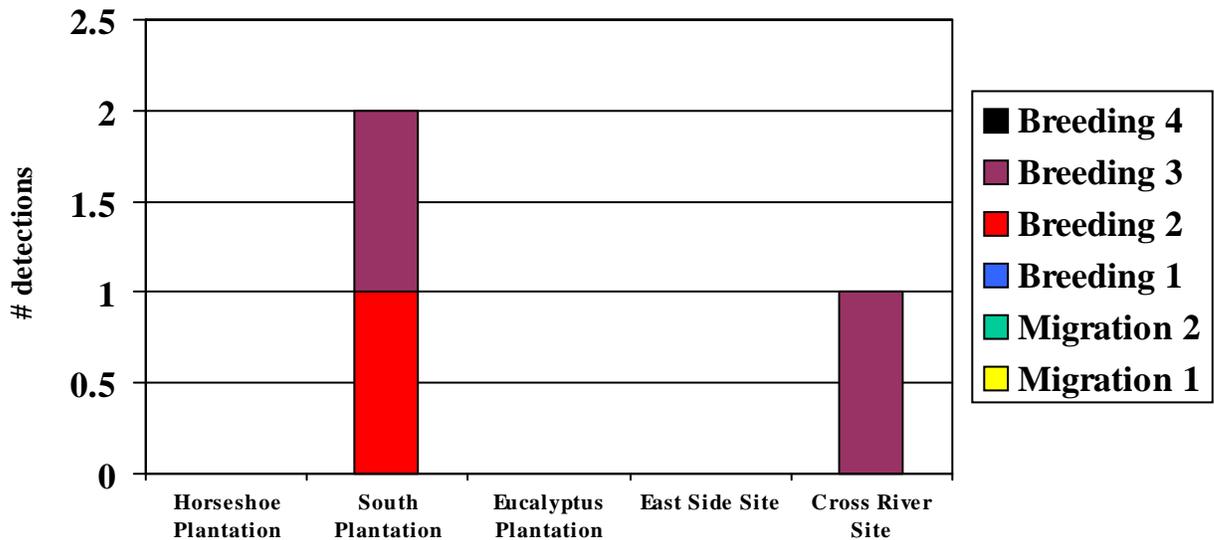
Study Area	Survey Site Names	Migration Visit 1	Migration Visit 2	Breeding Visit 1	Breeding Visit 2	Breeding Visit 3	Breeding Visit 4
Cibola NWR	Horseshoe Plantation	5/16/2005	6/8/2005	6/23/2005	7/12/2005	7/26/2005	8/9/2005
Cibola NWR	Eucalyptus Plantation	5/16/2005	6/8/2005	6/23/2005	7/12/2005	7/26/2005	8/9/2005
Cibola NWR	South Plantation	NA	NA	6/23/2005	7/12/2005	7/26/2005	8/9/2005
Cibola NWR	East Side Site	NA	NA	6/23/2005	7/12/2005	7/26/2005	8/9/2005
Cibola NWR	Cross River Site	NA	NA	6/23/2005	7/12/2005	7/26/2005	8/9/2005

During our 2005 Yellow-billed Cuckoo surveys we had a total of three cuckoo detections, one detection during the second breeding survey and two during the third breeding survey (Table 5). Two of the cuckoo detections occurred at the south plantation site, while one was at the Cross River site (Figure 2).

**Table 5.** The total number of detections per survey visit at Cibola NWR sites along the lower Colorado River, AZ, 2005.

VISIT #	DATE (2005)	# YBCU DETECTIONS
Migration #1	05/16	0
Migration #2	06/18	0
Breeding #1	06/23	0
Breeding #2	07/12	1
Breeding #3	07/26	2
Breeding #4	08/09	0
		<b>3 =Total</b>

## YBCU Detections per site and visit



**Figure 2.** Number of Yellow-billed Cuckoo detections per site per visit within the Cibola National Wildlife Refuge area, Arizona, 2005.

### Summary of Yellow-billed Detections at Cibola NWR

This summary describes the Yellow-billed Cuckoo detections at Cibola NWR including how the bird was detected (e.g., responded to playback recordings); the habitat it was located in and if the bird was wearing any bands. We also recorded behavioral observations including whether the bird displayed courtship behavior; whether the bird was paired; and, if it was apparently paired, whether the pair was nesting? The three detections at Cibola were all solicited through our playback recordings; none of the cuckoos were paired or banded. The two detections at south plantation occurred in native habitat, while the one detection at the Cross River site was in exotic mixed vegetation.

#### *South Plantation*

7/12/2005 – 0827AM – E715789, N3684637 Bearing: 270, Distance: 20m

Yellow-billed Cuckoo responded to playback by flying toward the surveyor who detected it visually; then the cuckoo called after 2 call playbacks. The cuckoo flew northwest into cottonwood then south into another cottonwood, then back again. The cuckoo was not banded and was unpaired; no nest was found.

7/26/2005 – 0719AM – E715571, N3684557 Bearing: 90, Distance: Approx. 30m

The Yellow-billed Cuckoo was detected visually after 3 recordings. The cuckoo flew in silently from the northwest into mixed native habitat. The Observer could not see the bird's legs so banding was not determined. This bird was unpaired and no nest was found.

#### *Cross River Site*

7/26/2005 – 0752AM - E716758, N3684047 Bearing: 230, Distance: Approx. 100m

Yellow-billed Cuckoo responded by calling after 4 recordings. The vocal response came from across the river in mixed exotic habitat. There was no visual detection but the cuckoo was apparently unpaired and no nest was found.

### **Cibola National Wildlife Refuge Site Descriptions**

#### ***Horseshoe Plantation:***

Elevation: 69-76m

UTM: Start - E716170, N3694165

Stop - E715901, N3694380

This site is a restoration site within the refuge that was planted in 1991. It is managed to restore native Fremont cottonwood and willow (Appendix 2A). It consists of Fremont cottonwoods that make up 100% of the overstory and border the site on the north and south of the site, which is approximately 400m long and 40m wide, resulting in a horseshoe-shaped canopy layer at the site. Much of the understory consists of arrowweed (50%), willow (30%), and tamarisk (20%). Cottonwood canopy cover across the site is approximately 50%, and understory vegetation covers approximately 50%. The site is surrounded on all sides by agriculture. The Colorado River is approximately 2 km away. USFWS periodically irrigates the site with 20cm (8in) of standing water.

In 2005, no Yellow-billed Cuckoos were detected at this site. The last detection was June 15<sup>th</sup>, 2004.

#### ***South Plantation:***

Elevation: 60-65m

UTM: Start - E715871, N3684557

Stop - E715645, N3684682

This site is a native restoration site within the refuge (Appendix 2A). The overstory consists of 85% Fremont cottonwood and 15% willow averaging 10-15m in height. The overstory cover is estimated at 26-50%. The understory consists of willow (50%), mesquite (25%), arrowweed (15%) and tamarisk (10%) and averages 1-3m in height. The overall understory cover is estimated at 26-50%, with an open gallery floor of dirt and leaf litter between rows of trees. Monotypic tamarisk stands border this patch on all sides. The site is located 300m west of the Colorado River and has standing water when irrigated by the refuge.

In 2005, we detected Yellow-billed Cuckoos at this site on 12 July and 26 July (Appendix 1 and Appendix 2A).

#### ***Eucalyptus Plantation:***

Elevation: 70-72m

UTM: Start - E713767, N3693808

Stop - E713847, N3693427

This site was managed as a eucalyptus restoration site (Appendix 2A). It is a mixed native site, located west of a gravel road and east of agricultural fields; it is 1km long and dominated (>75% overstory cover) by 10-15m high Fremont cottonwood. Other species in the overstory include 15-20m tall eucalyptus trees (20%) and tamarisk (5%). The total overstory cover is estimated to be between 26 and 50%. The understory consists of a mixture of mesquite (50%), tamarisk (35%), and palo verde (15%) and provides about 25-50% ground cover. The average height of the understory is estimated to be 3-4m. Habitat that borders north and south of the site is mostly made up of desert scrub and monotypic tamarisk stands. Agriculture borders the western side of the plantation. Just east of the surveyed site are scattered 5m tall cottonwoods that provide less than 25% cover of the overall

site. This area is considered to be future Yellow-billed Cuckoo habitat. This site is approximately 100 meters east of the Colorado River, with no standing water within the site. In 2005, no Yellow-billed Cuckoos were detected at this site.

***East Side:***

Elevation: 65-67m

UTM: Start - E717258, N3683328

Stop - E717205, N3683425

This site is comprised of mixed-native habitat (Appendix 2A). It consists of an overstory of Fremont cottonwood (55%) and willow (45%) approximately 10-15m in height. The overstory provides 26-50% of the cover at this site. The understory is dominated by 65% tamarisk, 20% arrowweed, 10% mesquite and 5% willow and averages 2-3m tall. The total understory cover is estimated to be greater than 51%. This site is bordered to the north, south and east by monotypic tamarisk stands. This site located 25m east of the Colorado River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Cross River:***

Elevation: 64-66m

UTM: Start - E716907, N3683832

Stop - E716650, N3683938

This site is comprised of mixed-exotic habitat within the refuge (Appendix 2A). Overall combined canopy cover of the patch is estimated to be 26-50% and consists of willow (75%), cottonwood (10%), and tamarisk (15%). The average height of the overstory is estimated at 10-15m. The understory consists of 70% tamarisk, 20% arrow weed, 5% mesquite and 5% willow and stands about 1-3m in height. The total understory cover is estimated to be greater than 51%. This site is surrounded by monotypic tamarisk stands with a few arrow weed clumps dispersed throughout. This site extends across the Colorado River with no standing water within the site.

In 2005, one Yellow-billed Cuckoo was detected on 26 July (Appendix 1 and Appendix 2A).

**Aerial Photographs of Yellow-billed Cuckoo Survey Points, Detections and Patch Boundary**

Yellow-billed Cuckoo survey points, detections and patch boundaries were mapped onto orthorectified aerial photos of Cibola NWR (Appendix 3A). Patch boundaries were delineated for the areas where Yellow-billed Cuckoos were detected. A riparian patch was defined as an area of contiguous riparian habitat that includes the appropriate riparian tree species and is separated by at least 300 m from the nearest contiguous riparian habitat. At Cibola the patch boundary was established around the south plantation and Cross River sites where cuckoos were detected. The area of cuckoo habitat at Cibola was estimated to be 146.5 ha.

**IMPERIAL NATIONAL WILDLIFE REFUGE**

The Imperial National Wildlife Refuge sites are located in the lower Colorado River floodplain. The sites are surrounded entirely by desert ridges, washes, scrub and the Chocolate Mountains. Within the Imperial National Wildlife Refuge, we surveyed for Yellow-billed Cuckoos at two sites. One of the sites is located near the Imperial NWR headquarters office at their re-vegetation site in Arizona (Appendix 3B). The other site is along the Colorado River, over forty kilometers upstream, in California (Appendix 3C). In 2005, we completed three migration surveys and seven breeding surveys at both of these sites (Table 6).

**Table 6.** Dates and sites where Yellow-billed Cuckoo surveys were conducted during two migration visits and four breeding visits at Imperial National Wildlife Refuge along the lower Colorado River in Arizona and California, 2005.

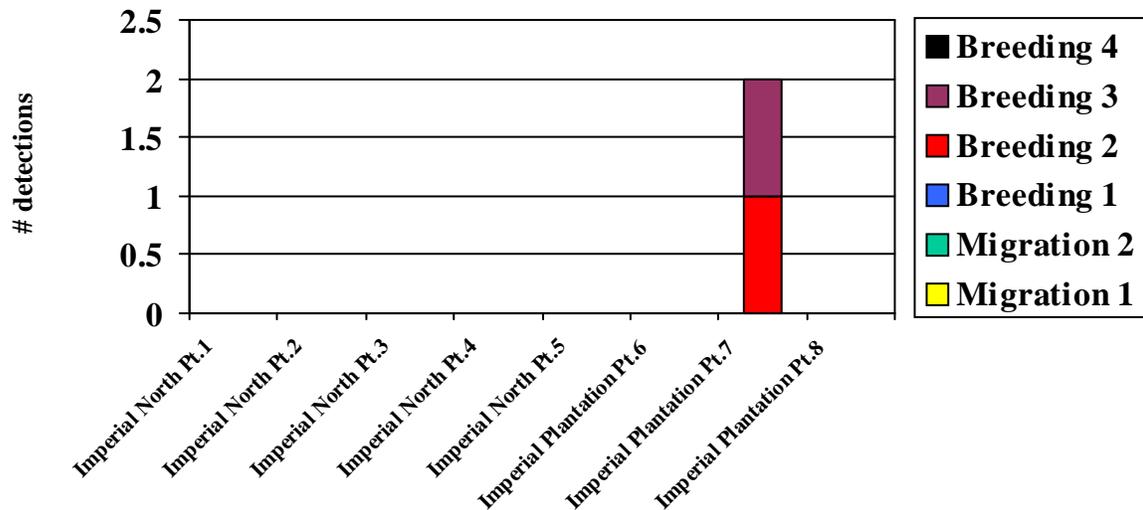
Study Area	Survey Site Names	Migration Visit 1	Migration Visit 2	Breeding Visit 1	Breeding Visit 2	Breeding Visit 3	Breeding Visit 4
Imperial NWR	Imperial NWR Plantation	5/14/2005	NA	06/20/2005	7/16/2005	7/29/2005	08/12/2005
Imperial NWR	Imperial NWR North Site	5/14/2005	6/8/2005	6/21/2005	7/13/2005	7/30/2005	NA

In 2005, we had a total of two Yellow-billed cuckoo detections at the Imperial NWR. One detection was made during the second breeding survey and one during the third breeding survey (Table 7). Both of the cuckoo detections occurred at the Imperial NWR re-vegetation site (Figure 3).

**Table 7.** The total number of detections per survey visit at Imperial National Wildlife Refuge along the lower Colorado River in Arizona and California, 2005.

VISIT #	DATE (2005)	# YBCU DETECTIONS
Migration #1	05/14	0
Migration #2	06/08	0
Breeding #1	06/20-06/21	0
Breeding #2	07/13-07/16	1
Breeding #3	07/29-07/30	1
Breeding #4	08/12	0
		<b>Total = 2</b>

**YBCU Detections per site and visit**



**Figure 3.** Number of Yellow-billed Cuckoo detections per site per visit within the Imperial National Wildlife Refuge area, AZ/CA, 2005.

## **Summary of Yellow-billed Detections at Imperial NWR**

This summary describes the Yellow-billed Cuckoo detections at Imperial NWR including how the bird was detected (e.g., responded to playback recordings); the habitat it was located in and if the bird was wearing any bands. We also recorded behavioral observations including whether the bird displayed courtship behavior; whether the bird was paired; and, if it was apparently paired, was the pair nesting? The two detections at Imperial were all solicited through our playback recordings; none of the cuckoos were paired or banded. The two detections at the Imperial plantation occurred in native habitat.

### ***Imperial South***

7/13/2005 – 0622AM – E734273, N3635865 Bearing: 180, Distance: Approx. 50m

Single Yellow-billed Cuckoo was visually detected after five recordings. The bird flew from the plantation into the marsh area to the north, and then back to same the cottonwood in the plantation. Could not see the birds legs so banding was not determined. This bird was unpaired and no nest was found.

7/30/2005 – 0647AM – E734273, N3635865 Bearing: 160, Distance: Approx. 30m

Single Yellow-billed Cuckoo visual detection after three recordings. Flew in silently from the west. The cuckoo was unbanded. This bird was unpaired and no nest was found.

## **Imperial National Wildlife Site Descriptions**

### ***Imperial South Plantation –***

Elevation: 55-58m

UTM: Start - E734369, N3653881

Stop - E734150, N3653828

This site where Yellow-billed Cuckoos were detected is a native plantation that was established by the USFWS in 1993 (Appendix 2B). The overstory is dominated by a monotypic Fremont cottonwood averaging 15-20m in height. The canopy cover is estimated to be greater than 51%. The understory consists of 60% willow, 30% cottonwood, and 10% mesquite. The average height of the understory is 5m and the estimated cover is 26-51%. Potential habitat exists to the east of this site with 5m tall cottonwoods and 1-2m tall mesquite that lines a channel stretching southeast. Across the road from the channel is a cottonwood plantation with no understory. The cottonwoods in this plantation are all <5m tall. Further southeast, another plantation (20B) consists of cottonwood with no understory averaging 5-8m in height. The Colorado River is 200m to the west of the site, with a marsh of standing water consisting of ravnagrass and cattails just 50m to the south, north and west of the site. These plantations are periodically flooded with 25cm of standing water by USFWS management. No cattle grazing or farming was found to occur near this site.

In 2005, we detected Yellow-billed Cuckoos at the site on 13 July and 30 July (Appendix 1 and Appendix 2B).

**Imperial North**

Elevation: 56-63m

UTM: Start - E714070, N3666062

Stop - E714111, N3666454

This site is comprised of mixed-native vegetation (Appendix 2B). The overstory consists of cottonwood (75%), willow (10%) and tamarisk (15%). It is estimated to be 10-15m in height and to cover greater than 51%. The understory consists mostly of ravnagrass (*Saccharum ravennae*) (40%), cattails (20%), and tamarisk (30%). The average height of the understory is 2-3m and the estimated cover is greater than 51%. West of the site is desert scrub, to north and south is tamarisk and ravnagrass and the Colorado River runs to the east. This site can be temporarily flooded when heavy rains occur.

In 2005, no Yellow-billed Cuckoos were detected at this site.

**Aerial Photographs of Yellow-billed Cuckoo Survey Points, Detections and Patch Boundary**

Yellow-billed Cuckoo survey points, detections and patch boundaries (around occupied patches) were mapped on orthorectified aerial photos of the Imperial NWR sites (Appendix 3B, Appendix 3C). The occupied Imperial south patch boundary area was estimated to be 4.0 ha.

**PICACHO CALIFORNIA STATE PARK**

The Picacho State Park sites are also located in the lower Colorado River floodplain. The sites are entirely surrounded by desert ridges, washes, scrub and the Chocolate Mountains. At Picacho State Park we surveyed for Yellow-billed Cuckoos at one site, where we completed two migration surveys and four breeding surveys (Table 8).

**Table 8.** Dates and sites where Yellow-billed Cuckoo surveys were conducted during two migration visits and four breeding visits at Picacho State Park along the lower Colorado River, CA, 2005.

Study Area	Survey Site Names	Migration Visit 1	Migration Visit 2	Breeding Visit 1	Breeding Visit 2	Breeding Visit 3	Breeding Visit 4
Picacho State Park	Picacho	5/14/2005	06/06/2005	06/20/2005	7/16/2005	7/29/2005	08/12/2005

In 2005, we had no Yellow-billed Cuckoo detections at the Picacho State Park Site along the lower Colorado River (Table 9).

**Table 9.** The total number of detections per survey visit at Picacho State Park along the lower Colorado River, CA, 2005.

VISIT #	DATE (2005)	# YBCU DETECTIONS
Migration #1	05/14	0
Migration #2	06/06	0
Breeding #1	06/20	0
Breeding #2	07/16	0
Breeding #3	07/29	0
Breeding #4	08/12	0
		<b>0 =Total</b>

**Picacho State Park Site Description**

Elevation: 47-58m

UTM: Start - E722418, N3656633  
 Stop - E723003, N3656514

This site is comprised of native habitat (Appendix 2C). The overstory consists of 75% cottonwood and 25% willow. The canopy averages 15m in height and provides greater than 51% cover. The understory consists of arrow weed (45%), willow (30%), mesquite (25%), and less than 5% palo verde. The average height of the understory is 2-3m and provides 26-50% cover. This site is managed by California State Parks and is bordered by desert scrub to the west and south, ravengrass associated with a burn area to the east and the Colorado River to the north. There is no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

**Aerial Photographs of Yellow-billed Cuckoo Survey Points and Detections**

Yellow-billed Cuckoo survey points were placed on aerial photos at the Picacho State Park site along the Colorado River (Appendix 3D).

**MITTRY LAKE STATE WMA/PRATT RESTORATION AREA (Colorado River)**

Mittry Lake State WMA and Pratt Restoration Area are located in the lower Colorado River floodplain in the Laguna Valley. The lake was created in 1904 by Laguna Dam, the first dam built on the lower Colorado River. The Pratt Restoration Area is a re-vegetation site. The site is surrounded by several kilometers of agricultural fields, irrigation canals, desert scrub and the Laguna Mountains. We surveyed for Yellow-billed Cuckoos at the re-vegetation site, including the area surrounding Mittry Lake. In 2005, we conducted 2 migration surveys and 4 breeding surveys (Table 10).

**Table 10.** Dates and sites where Yellow-billed Cuckoo surveys were conducted during two migration visits and four breeding visits at Mittry Lake WMA and Pratt Restoration Area along the lower Colorado River, AZ, 2005.

Study Area	Survey Site Names	Migration Visit 1	Migration Visit 2	Breeding Visit 1	Breeding Visit 2	Breeding Visit 3	Breeding Visit 4
Mittry Lake/Pratt RA	Points 1-15	05/13/2005	06/10/2005	06/18/2005	07/07/2005	07/22/2005	08/04/2005

During our 2005 Yellow-billed Cuckoo surveys at Pratt Restoration Area, we had a single cuckoo detection, during the second breeding survey (Table 11). The cuckoo detection occurred at point 14 at the Pratt Restoration Area re-vegetation site (Figure 4).

**Table 11.** The total number of detections per survey visit at Mittry Lake/Pratt Restoration Area sites along the lower Colorado River, AZ, 2005.

VISIT #	DATE (2005)	# YBCU DETECTIONS
Migration #1	05/16	0
Migration #2	06/18	0
Breeding #1	06/23	0
Breeding #2	07/07	1

Table 11 cont.

VISIT #	DATE (2005)	# YBCU DETECTIONS
Breeding #3	07/26	0
Breeding #4	08/09	0
		1 =Total

YBCU Detections per site and visit

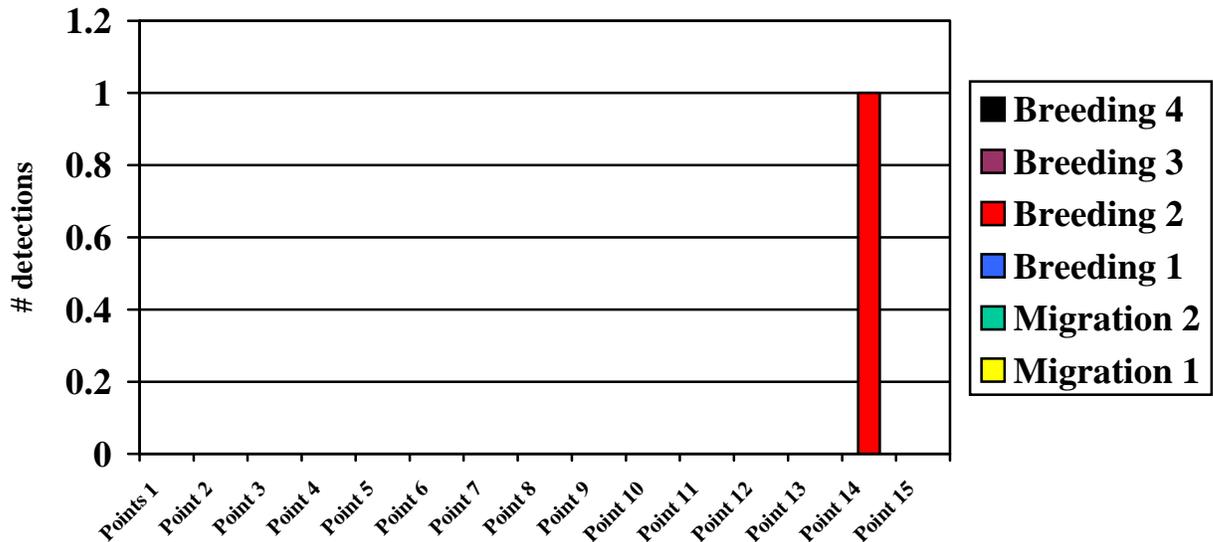


Figure 4. Number of Yellow-billed Cuckoo detections per point per visit at Mittry Lake State WMA/Pratt Restoration Area, AZ, 2005.

**Mittry Lake WMA/Pratt Restoration Area Yellow-billed Cuckoo Detections**

This summary describes the Yellow-billed Cuckoo detections at Mittry Lake State WMA and Pratt Restoration Area including how the bird was detected (e.g., responded to playback recordings); the habitat it was located in and if the bird was wearing any bands. We also recorded behavioral observations including whether the bird displayed courtship behavior; whether the bird was paired; and, if it was apparently paired, was the pair nesting? The single detection at the Pratt Restoration Area was solicited through our playback recordings; the cuckoo was not paired or banded. This detection occurred in native habitat.

**Mittry Lake State WMA/Pratt Restoration Area**

7/07/2005 – 0605AM – E735068, N3634279 Bearing: 80, Distance: 10m

Single Yellow-billed Cuckoo responded by calling and then was seen after an unknown number of recordings. The cuckoo was detected west of the Colorado River in the native plantation. It then flew east into cottonwoods, in native habitat. The cuckoo was not banded and determined to be unpaired; no nest was found.

**Mittry Lake State WMA/Pratt Restoration Area Site Descriptions**

Elevation: 52-57m

UTM: Start - E706510, N3599646  
 Stop - E706361, N3600663

This Pratt Restoration Area site is primarily comprised of a native-vegetation planting project and consists of mixed-native habitat (Appendix 2D). The dominant overstory consists entirely of Fremont cottonwood (100%). The cottonwoods are estimated to be 15m in height and canopy closure is about 80%. The willow portion of the understory is estimated to be around 1-3m tall and make up about 35% of the overall understory. A 40m wide growth of willow (85%) exists on the south side of the site with tamarisk (10%) scattered throughout. Arrow weed (5%) is also found lining the outside portions of the plantation. Near Mittry Lake, which is the remainder of the site, cottonwoods exist with mostly no understory, with an open forest floor of mostly leaf litter. This BLM managed site is bordered by agriculture to the north and west and desert scrub to the east. It is approximately 150 m from Mittry Lake, with regular flooding of 30.5cm (12 inches) within the site.

South of the Pratt Restoration Area, the habitat is comprised of mixed-exotic vegetation (Appendix 2D). It consists of a tamarisk (85%) that average 4-6 m in height and a few cottonwoods (15%) averaging 10-15m in height. The canopy cover is estimated to be about 30%. The understory is made up of about 60% mesquite, 10% arrow weed, and 40% tamarisk that average 1-3m in height. Understory cover is estimated at 80%. This BLM managed site (Betty's Kitchen) has many visitors (campers and fisherman) and constructed trails weave throughout the site. The site is adjacent to Mittry Lake, with no standing water in the site.

In 2005, there was one Yellow-billed Cuckoo detected in the re-vegetation plantation site on 7 July (Appendix 1 and Appendix 2D).

**Aerial Photographs of Yellow-billed Cuckoo Survey Points, Detections and Patch Boundary**

Yellow-billed Cuckoo survey points, detections and patch boundaries were mapped on orthorectified aerial photos at the Mittry Lake site (Appendix 3E). Patch boundaries surround the area where the Yellow-billed Cuckoo was detected. The occupied Mittry Lake patch area was estimated to be 9.3 ha.

**LIMITROPHE DIVISION NORTH AND SOUTH (Colorado River)**

The Limitrophe Division sites (area of the Colorado River south of Morelos Dam and north of the Mexican Border) are located in the lower Colorado River floodplain along the U.S./Mexican border. The south survey sites extend from San Luis to the southern Cocopah Indian Reservation border and the north sites extend from the northern Cocopah Indian Reservation border to Morelos Dam. The sites are surrounded by several kilometers of agricultural fields and irrigation canals on U.S side of the border. Along this section of the Colorado River within the Limitrophe Division Area, we surveyed for Yellow-billed Cuckoos at ten sites (Table 12). In 2005, we conducted 20 cuckoo surveys during the migration period and 40 surveys during the breeding period.

**Table 12.** Dates and sites where Yellow-billed Cuckoo surveys were conducted during two migration visits and four breeding visits at the Limitrophe Division area, along the lower Colorado River, AZ.

Study Area	Survey Site Names	Migration Visit 1	Migration Visit 1	Breeding Visit 1	Breeding Visit 2	Breeding Visit 3	Breeding Visit 4
Limitrophe Division	North Sites 1-2	5/15/2005	6/09/2005	6/17/2005	6/30/2005	7/15/2005	7/28/2005
Limitrophe Division	North Sites 3-4	5/15/2005	6/09/2005	6/17/2005	6/30/2005	7/15/2005	7/28/2005
Limitrophe Division	North Sites 5-8	5/15/2005	6/09/2005	6/17/2005	6/30/2005	7/15/2005	7/28/2005

**Table 12 cont.**

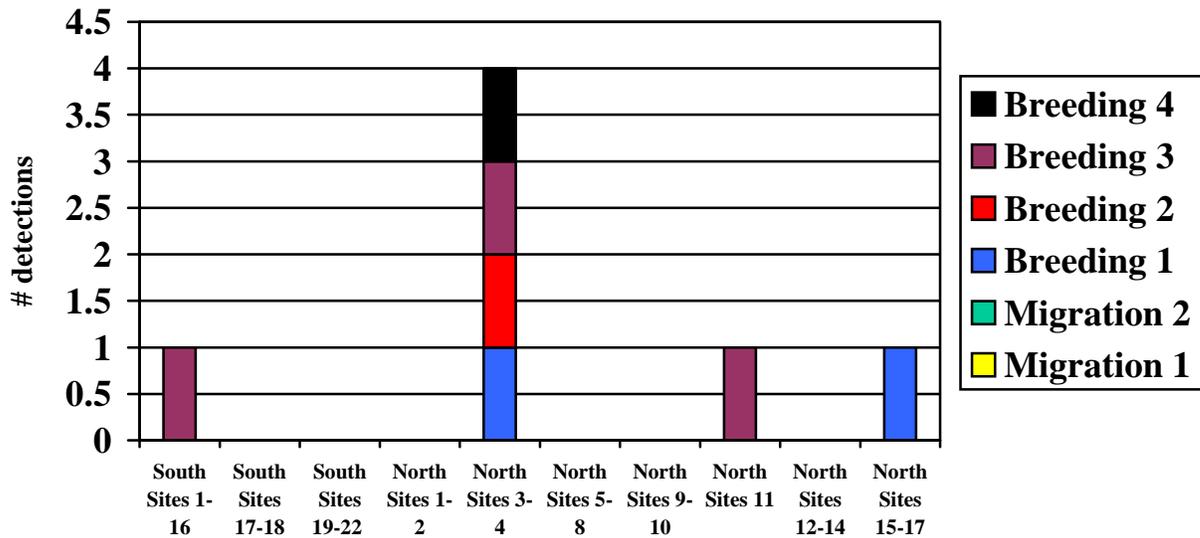
<b>Study Area</b>	<b>Survey Site Names</b>	<b>Migration Visit 1</b>	<b>Migration Visit 1</b>	<b>Breeding Visit 1</b>	<b>Breeding Visit 2</b>	<b>Breeding Visit 3</b>	<b>Breeding Visit 4</b>
Limitrophe Division	North Sites 9-10	5/15/2005	6/09/2005	6/17/2005	6/30/2005	7/15/2005	7/28/2005
Limitrophe Division	North Site 11	5/15/2005	6/09/2005	6/17/2005	6/30/2005	7/15/2005	7/28/2005
Limitrophe Division	North Sites 12-14	5/15/2005	6/09/2005	6/17/2005	6/30/2005	7/15/2005	7/28/2005
Limitrophe Division	North Sites 15-17	5/15/2005	6/09/2005	6/17/2005	6/30/2005	7/15/2005	7/28/2005
Limitrophe Division	South Sites 1-16	5/15/2005	6/05/2005	6/16/2005	6/29/2005	7/14/2005	7/27/2005
Limitrophe Division	South Sites 17-18	5/15/2005	6/05/2005	6/16/2005	6/29/2005	7/14/2005	7/27/2005
Limitrophe Division	South Sites 19-22	5/15/2005	6/05/2005	6/16/2005	6/29/2005	7/14/2005	7/27/2005

During our 2005 Yellow-billed Cuckoo surveys in the Limitrophe Division area we had a total of seven cuckoo detections, two detections during the first breeding survey, one during the second breeding survey, three during the third breeding survey and one during the fourth breeding survey (Table 13). Six of the cuckoo detections occurred in the north section of the Limitrophe Division area, while one detection occurred in the south section of the Limitrophe Division area (Figure 5).

**Table 13.** The total number of detections per survey visit in the Limitrophe Division area sites along the lower Colorado River, AZ, 2005.

<b>VISIT #</b>	<b>DATE SPAN (05)</b>	<b># YBCU DETECTIONS</b>
Migration #1	05/15	0
Migration #2	06/05, 06/09	0
Breeding #1	06/16-06/17, 06/22	2
Breeding #2	06/29-06/30	1
Breeding #3	07/14-7/15	3
Breeding #4	07/27-07/28	1
		<b>7 =Total</b>

### YBCU Detections per site and visit



**Figure 5.** Number of Yellow-billed Cuckoo detections per site per visit at the Limitrophe Division Area sites along the lower Colorado River, AZ, 2005.

### Limitrophe Division North and South Area Yellow-billed Cuckoo Detections

The following are descriptions of Yellow-billed Cuckoo detections in the Limitrophe Division area. Description include how the bird was detected (e.g., solicited calls in response to playback recordings), the habitat the cuckoo was in, whether the bird was banded, and behavioral observations such as courtship behavior, whether the bird was paired, and if a nest was located. Five of the seven detections at the Limitrophe Division area sites were solicited through our playback recordings; none of the cuckoos were paired or banded.

#### ***Limitrophe Division North Pts 15-17***

6/22/2005 – 6:10 to 8:00AM, E712942, N3620713 Bearing: unknown, approximately 35 m. A Yellow-billed Cuckoo called after 1 call broadcast. The cuckoo flew from a cottonwood and alighted on a burned tree. Observers could not see the bird’s legs, and therefore the observers could not determine if it was banded. This bird was unpaired and no nest was found. BLM biologists Fred Wong and Dave Repass detected this cuckoo.

#### ***Limitrophe Division North Pts 3&4***

6/17/2005 – 0527AM – E710732, N3615600 Bearing: 297, Distance: Approx. 70m  
A Yellow-billed Cuckoo responded vocally after 5 call broadcasts. The cuckoo was detected to the west of the site, over the Mexico border, in mixed native habitat. There was no visual detection of this bird.

6/30/2005 – 0526AM – E710637, N3615542 Bearing: 270, Distance: Approx. 10m  
A Yellow-billed Cuckoo was detected visually and then responded vocally after 4 call broadcasts. The cuckoo was detected to the west, over the Mexico border and flew into

mixed native habitat on the U.S. side of the Colorado River. We could not see the bird's legs so we could not determine if it was banded. This bird was unpaired and no nest was found.

7/15/2005 - 0540AM – E710637, N3615542 Bearing: 265, Distance: Approx. 60m

A Yellow-billed Cuckoo called, unsolicited, in mixed native vegetation. There was no visual detection and the individual was apparently unpaired; no nest was found.

7/28/2005 – 0600AM – E710637, N3615542 Bearing: 320, Distance: Approx. 60m

A Yellow-billed Cuckoo called from mixed native habitat after 1 call broadcast. There was no visual detection and it was determined to be unpaired; no nest was found.

#### ***Limitrophe Division North Pt 11***

7/15/2005 – 0702AM – E711802, N3618212 Bearing: 220, Distance: Approx. 30m

A Yellow-billed Cuckoo was observed then called (unsolicited) in mixed native vegetation. We could not see the bird's legs so we could not determine if it was banded. This bird was unpaired and no nest was found.

#### ***Limitrophe Division South Pts 1-16***

07/14/2005 – 0613AM – E706464, N3600002 Bearing: 250, Distance: Approx. 100+m

A Yellow-billed Cuckoo responded by calling, and then was observed, in mixed native vegetation, after 3 call broadcasts. We could not see the bird's legs and could not determine if it was banded. This bird was unpaired and no nest was found.

#### **Limitrophe Division Area Habitat Description**

##### ***Limitrophe Division North Points 1&2***

Elevation: 29-37

UTM: Start - E709923, N3614193

Stop - E709973, N3614282

This section of the Colorado River is comprised of mixed-native habitat and borders the northern territory of the Cocopah Indian Reservation (Appendix 2E). It consists of a canopy of 60% willow and 40% cottonwood. The average height of the overstory is estimated to be 15m and provides a 26-50% cover. The understory is made up of tamarisk (70%), arrow weed (25%), and willow (5%) and averages 4m in height. The understory cover is greater than 51%. This section of the BLM managed Limitrophe Division Area is bordered to the north by tamarisk and arrow weed, to the east by agriculture. It is just northeast of the Colorado River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

##### ***Limitrophe Division North Points 3&4***

Elevation: 33-41m

UTM: Start - E710637, N3615542

Stop - E710727, N3615602

This section is comprised of mixed-native habitat (Appendix 2E). The overstory consists of willow (70%), cottonwood (25%), and tamarisk (5%). The average height of the canopy is 15m and provides 26-50% cover. Mesquite (50%), arrowweed (25%), tamarisk (20%), and willow (5%) make up the understory and average 5m in height. The total cover provided by the understory is greater than 51%. This BLM managed site is bordered to the northeast and southwest by a mixture of tamarisk and

arrow weed, and to the southeast by agriculture. These points are northwest of the Colorado River, with no standing water within the site.

In 2005, Yellow-billed Cuckoos were detected during all four breeding surveys, on 17 and 30 June, 15 & 28 July (Appendix 1 and Appendix 2E).

***Limitrophe Division North Points 5-8***

Elevation: 33-48m

UTM: Start - E7110966, N3615800

Stop - E711143, N3616103

This section is comprised of mixed-native habitat (Appendix 2E). It is dominated by an overstory of cottonwood (90%) with a few willows (10%) dispersed throughout. The average height of the canopy is estimated to be 20m and provides greater than 51% cover. The understory is a mixture of tamarisk (60%) and arrowweed (40%), averages 3m in height, and provides cover for greater than 51% of the patch. This area is bordered by a mixture of tamarisk and arrowweed to the northeast and southwest, and by agriculture to the east and southeast. Limitrophe Division North Points 3&4 are just over 300m to the southwest. The site is northwest of the Colorado River with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Limitrophe Division North Points 9&10***

Elevation: 30-34m

UTM: Start - E711553, N3617675

Stop - E711596, N3617784

This section is comprised of mixed-native habitat (Appendix 2E). The overstory at the site is dominated by 90% cottonwood and 5% willow. The average height of the overstory is estimated to be 15m and provides greater than 51% cover. The understory consists of about 60% arrow weed, 40% tamarisk, 5% willow and 5% mesquite. The height of the understory averages 2-3m and the estimated cover is greater than 51%. This BLM managed site is bordered to the northeast and the south by a tamarisk/arrowweed mix. This site is situated northwest of the Colorado River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Limitrophe Division North Point 11***

Elevation: 37m

UTM: E711802, N3618212

This small section is comprised of mixed-native habitat (Appendix 2E). Its overstory is dominated by 85% willow. Other species found in the overstory are cottonwood (10%) and tamarisk (5%). The average overstory height is estimated at 15-20m and provides greater than 51% cover. The understory consists mostly of tamarisk (75%) with willow (15%) and mesquite (10%) dispersed throughout. The average height of the understory is about 3-4m and is estimated to provide greater than 51% cover. This BLM managed site is bordered to the north and south by a mixture of tamarisk and arrowweed, and to the east by desert scrub. The site is situated northwest of the Colorado River, with no standing water within the site.

In 2005, one Yellow-billed Cuckoo was detected here on 15 July (Appendix 1 and Appendix 1E).

***Limitrophe Division North Points 12-14***

Elevation: 35-36m

UTM: Start - E712119, N3618796  
Stop - E712246, N3619006

This section is comprised of mixed-native habitat (Appendix 2E). Its overstory is dominated by 95% willow with a few tamarisk trees (5%) scattered throughout. The estimated height of the canopy is 10m and provides 26-50% cover. The understory is made up of 80% willow, 10% ravennagrass, 5% mesquite and 5% tamarisk. The understory cover is greater than 51% and reaches an estimated 4m in height. This BLM site is bordered by tamarisk, cottonwood and willow to the south, tamarisk and arrowweed to the north, and agriculture to the east. The site is northwest of the Colorado River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Limitrophe Division North Points 15-17***

Elevation: 32-35m

UTM: Start - E712819, N3620150  
Stop - E712942, N3620713

This section is comprised of mixed-exotic habitat (Appendix 2E). It consists of an overstory of 45% tamarisk, 30% willow, 15% cottonwood and 10% mesquite. The height of the canopy averages 15m and provides greater than 51% cover. The understory consists of 40% arrowweed, 30% willow, 20% tamarisk and 5% mesquite. The average understory height is estimated at 2-3m and provides greater than 51% cover. This area is bordered to the east by agriculture, to the north and south by a mixture of arrow weed, tamarisk and willow. It is just southeast of the Morelos Dam, and northwest of the Colorado River, with no standing water within the site.

In 2005, one YBCU was detected by BLM biologist Fred Wong and David Repass on 22 June (Appendix 1 and Appendix 2E).

***Limitrophe Division South Points 1-16***

Elevation: 24-30m

UTM: Start - E706510, N3599646  
Stop - E706361, N3600663

This patch is the most southern patch within the Limitrophe Division Area. It consists of mixed-native habitat (Appendix 2E). The overstory contains cottonwood (45%), willow (35%), tamarisk (15%) and mesquite (5%). The average height of the canopy is 10m and the cover is estimated at 26-50%. The understory is made up of 60% tamarisk, 15% arrow weed, 10% willow, 5% mesquite, 5% cattail and 5% ravennagrass. The average understory height is 1-3m and provides greater than 51% cover. This BLM managed section is bordered to the north and south by tamarisk, willow and arrow weed, to the east by agriculture, and to the west by desert scrub. This site is northwest of the Colorado River, with no standing water within the site.

In 2005, one YBCU was detected here on 14 July.

***Limitrophe Division South Points 17&18***

Elevation: 33-35m

UTM: Start - E710637, N3615542  
Stop - E710727, N3615602

This section is mixed-exotic habitat (Appendix 2E). The overstory consists of 60% tamarisk and 40% willow. Canopy cover is estimated to be 26-50% and average height is 10m. The understory is dominated by tamarisk (75%) while the other 25% is made up of arrowweed. The average understory height is 1-2m and provides greater than 51% cover. This BLM managed site is bordered by tamarisk and arrowweed to the north and south, and agriculture to the east. It is northwest of the Colorado River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Limitrophe Division South Points 19-22***

Elevation: 34-39m

UTM: Start - E707423, N3604326

Stop - E707526, N3604596

This section comprises mixed- native habitat (Appendix 2E). The overstory consists of 75% willow and 25% cottonwood. The average canopy height is 10m and provides greater than 51% cover. The understory is made up of 40% tamarisk, 30% arrowweed, 25% willow, and 5% mesquite. The average height of the understory is estimated to be 2-3m and provides greater than 51% cover. This site is bordered by agriculture to the east, and tamarisk and arrowweed to the north. It is northwest of the Colorado River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

**Aerial Photographs of Yellow-billed Cuckoo Survey Points, Detections and Patch Boundary**

Yellow-billed Cuckoo survey points, detections and patch boundaries were mapped on orthorectified aerial photos of the north (Appendix 3F) and south (Appendix 3G) portions of the Colorado River Limitrophe Division area. Patch boundaries were delineated for those sites where cuckoos were detected. For the northern sites, the area of the northern-most patch is 14.2 ha; the southern-most patch is 27.5 ha (Appendix 3F). Only one southern site had detections; the area of the occupied patch was estimated as 34.2 ha (Appendix 3G).

**COCOPAH INDIAN RESERVATON (Colorado River)**

The Cocopah Indian Reservation sites are located within the Limitrophe Division area, in the lower Colorado River floodplain along the U.S. Cocopah Reservation/Mexico border. The sites are surrounded by several kilometers of agricultural fields and irrigation canals on the U. S. Cocopah side of the border. On the Cocopah Indian Reservation, we surveyed for Yellow-billed Cuckoos at 4 sites that were considered adequate cuckoo habitat (Table 14). In 2005, we conducted 4 cuckoo surveys during the migration period and 16 surveys during the breeding period.

**Table 14.** Dates and sites where Yellow-billed Cuckoo surveys were conducted during two migration visits and four breeding visits at Cocopah Reservation along the lower Colorado River, AZ, 2005.

Study Area	Survey Site Names	Migration Visit 2	Breeding Visit 1	Breeding Visit 2	Breeding Visit 3	Breeding Visit 4
Cocopah Reservation	Points 1-6	06/06/2005	06/16/2005	06/29/2005	07/14/2005	07/27/2005
Cocopah Reservation	Points 7-12	06/06/2005	06/16/2005	06/29/2005	07/14/2005	07/27/2005

**Table 14 cont.**

Cocopah Reservation	Points 13-15	06/06/2005	06/16/2005	06/29/2005	07/14/2005	07/27/2005
Cocopah Reservation	Points 16-20	06/06/2005	06/16/2005	06/29/2005	07/14/2005	07/27/2005

During our 2005 Yellow-billed Cuckoo surveys we had no cuckoo detections at the Cocopah Indian Reservation sites along the Colorado River (Table 15).

**Table 15.** The total number of detections per survey visit at the Cocopah Indian Reservation along the lower Colorado River, AZ, 2005.

VISIT #	DATE SPAN (05)	# YBCU DETECTIONS
Migration #2	06/06	0
Breeding #1	06/16	0
Breeding #2	06/29	0
Breeding #3	07/14	0
Breeding #4	07/27	0
		<b>0 =Total</b>

**Cocopah Indian Reservation Detections**

There were no Yellow-billed Cuckoo detections within the Cocopah Indian Reservation along the lower Colorado River, AZ 2005.

**Cocopah Indian Reservation Habitat Description**

***Cocopah Points 1-6***

Elevation: 25-28m

UTM: Start - E707322, N3605623

Stop – E706981, N3605781

This section of the Cocopah Indian Reservation consists mainly of native habitat type (Appendix 2F). It is dominated by an overstory of cottonwood (75%) and willow (24%) that provide greater than 51% cover. The average height of the overstory is estimated to be 10-15m. The understory consists of mesquite (40%), willow (30%), and tamarisk (30%) and is an average height of 2-3m. The overall understory cover is greater than 51%. The land adjacent to this site, on the north and east, is used for agriculture. Land to the west is a mixture of tamarisk and arrowweed. It is just north of the Colorado River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Cocopah Points 7-12***

Elevation: 26-37m

UTM: Start - E706535, N3608025

Stop - E706507, N3608579

This section of the Cocopah Indian Reservation consists mainly of a mixed-exotic habitat type (Appendix 2F). It is dominated by tamarisk (90%) with cottonwoods (5%) and willows (5%) dispersed throughout. The estimated canopy height is 10-15m and the cover is greater than 51%. The understory mostly consists of tamarisk (85%) with a few clumps of arrowweed found mostly on the edge of the patch. The average understory height is estimated to be about 2-3m and provides 26-50%

cover. The site is bordered to the east by agriculture, to the north and south by monotypic tamarisk, and to the west by desert scrub and the Colorado River. It is just north of the Colorado River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Cocopah Points 13-15***

Elevation: 21-37m

UTM: Start - E706926, N3611283

Stop - E707174, N3611271

This section of the Cocopah Indian Reservation consists mainly of native habitat type (Appendix 2F). It is comprised mostly of a willow overstory (95%) with a few cottonwoods (5%). The average height of the overstory is approximately 10m and canopy cover is estimated to be 26-50%. The sparse understory is also dominated by willow (55%) and contains arrow weed (40%) and tamarisk (5%) as well. The estimated height of the understory is 1m and provides less than 25% cover. This area is bordered to the south by a burned area and desert scrub, to the east and west by monotypic tamarisk stands. It is just north of the Colorado River with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Cocopah Points 16-20***

Elevation: 30-34m

UTM: Start - E709450, N3613607

Stop - E709767, N3613892

This section is a mixed native site and is the northern border of Cocopah Indian Reservation (Appendix 2F). It consists mostly of an overstory of Fremont cottonwood (85%), willow (10%), and tamarisk (5%). The average canopy height is about 10-15m and the cover is estimated to be greater than 51%. The understory consists of 75% willow, 15% arrow weed and 10% tamarisk. The estimated average height of the understory is 1-2m; provides 26-50% ground cover. This site is bordered to the east by agriculture, to the south and north by tamarisk and arrowweed. It is just north of the Colorado River with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

**Aerial Photographs of Yellow-billed Cuckoo Survey Points**

Yellow-billed Cuckoo survey points were mapped on orthorectified aerial photos of the Cocopah Indian Reservation sites along the Colorado River (Appendix 3H).

**GILA/COLORADO RIVERS CONFLUENCE (Colorado River, Gila River)**

The sites at the Colorado and Gila Rivers' Confluence are located in the lower Colorado River floodplain about 18 km east of Yuma, Arizona. The area is surrounded by agricultural fields and canals for irrigation. At the Gila/Colorado Confluence, and upstream from the confluence, along the Gila River, we surveyed for Yellow-billed Cuckoos in eight sites that were considered adequate cuckoo habitat. In 2005, we conducted 16 cuckoo surveys during the migration period and 32 surveys during the breeding period (Table 16).

**Table 16.** Dates and sites where Yellow-billed Cuckoo surveys were conducted during two migration visits and four breeding visits at the Gila/Colorado Rivers Confluence and Gila River sites upstream of the Gila/Colorado Rivers confluence, AZ.

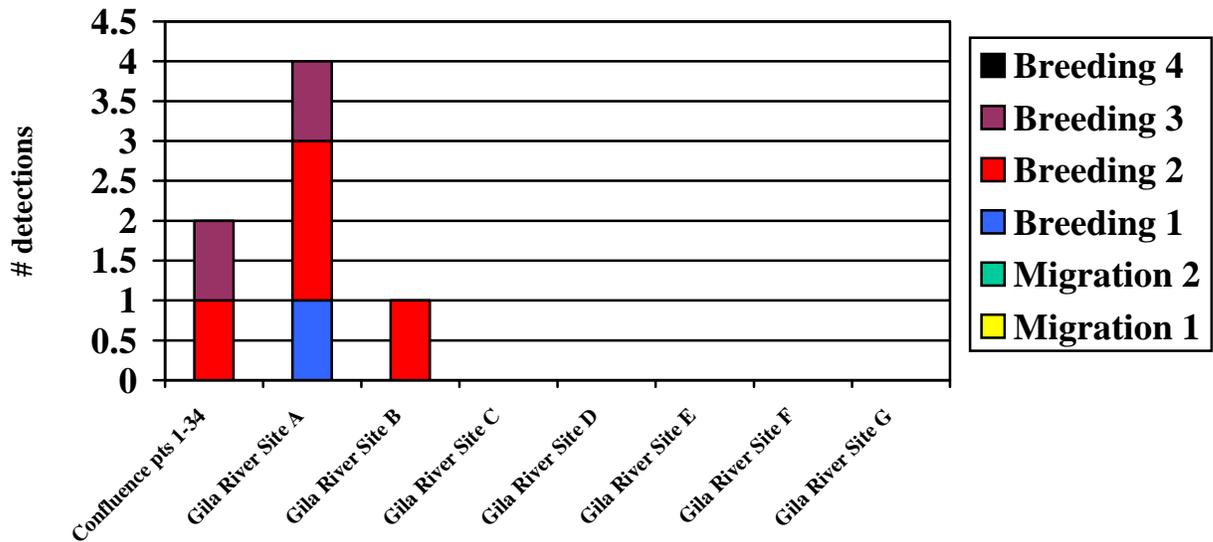
Study Area	Survey Site Names	Migration Visit 1	Migration Visit 1	Breeding Visit 1	Breeding Visit 2	Breeding Visit 3	Breeding Visit 4
Gila/Colorado Rivers Confluence	Gila/Colorado Confluence Points 1-34	05/13/2005	06/11/2005	06/19/2005	07/09/2005	07/22/2005	08/05/2005
Gila/Colorado Rivers Confluence	Gila River Site A	05/13/2005	06/11/2005	06/19/2005	07/09/2005	07/22/2005	08/05/2005
Gila/Colorado Rivers Confluence	Gila River Site B	05/13/2005	06/11/2005	06/19/2005	07/09/2005	07/22/2005	08/05/2005
Gila/Colorado Rivers Confluence	Gila River Site C	05/13/2005	06/11/2005	06/19/2005	07/09/2005	07/22/2005	08/05/2005
Gila/Colorado Rivers Confluence	Gila River Site D	05/13/2005	06/11/2005	06/19/2005	07/09/2005	07/22/2005	08/05/2005
Gila/Colorado Rivers Confluence	Gila River Site E	05/13/2005	06/11/2005	06/19/2005	07/09/2005	07/22/2005	08/05/2005
Gila/Colorado Rivers Confluence	Gila River Site F	05/13/2005	06/11/2005	06/19/2005	07/09/2005	07/22/2005	08/05/2005
Gila/Colorado Rivers Confluence	Gila River Site G	05/13/2005	06/11/2005	06/19/2005	07/09/2005	07/22/2005	08/05/2005

During our 2005 Yellow-billed Cuckoo surveys we had a total of 10 cuckoo detections; one detection was made during the first breeding survey, four detections occurred during the second breeding survey, and two during the third breeding survey (Table 17). Two of the cuckoo detections occurred at the Gila/Colorado Confluence site, while four detections were at the Gila River A site; 1 occurred at the Gila River B site (Figure 6).

**Table 17.** The total number of detections per survey visit sites along the Gila/Colorado Rivers Confluence and along the Gila River upstream of the Gila/Colorado Rivers Confluence, AZ, 2005.

VISIT #	DATE SPAN (05)	# YBCU DETECTIONS
Migration #1	05/13	0
Migration #2	06/11	0
Breeding #1	06/18-06/19	1
Breeding #2	07/8-07/9	6
Breeding #3	07/21-07/22	3
Breeding #4	08/05-08/06	0
		<b>Total = 10</b>

### YBCU Detections per site and visit



**Figure 6.** Number of Yellow-billed Cuckoo detections per site per visit along the Gila/Colorado Rivers Confluence and Colorado and Gila River sites upstream of the Gila/Colorado Rivers confluence, AZ.

#### Gila/Colorado Rivers Confluence and other Gila River sites detections

The following are descriptions of Yellow-billed Cuckoo detections in the Gila/Colorado Rivers Confluence area, including sites upstream of the confluence, along the Gila River. Descriptions include how the bird was detected (e.g., solicited calls in response to playback recordings), the habitat the cuckoo was in, whether the bird was banded, and behavioral observations such as courtship behavior, whether the bird was paired, and if a nest was located. Of the seven detections within the Gila/Colorado Rivers Confluence sites, all but one were solicited through our playback recordings; none of the cuckoos detected were paired or banded. The six detections at Gila/Colorado Rivers Confluence and the Gila Site A occurred in mixed exotic habitat, while the one detection at the Gila Site B site was in mixed native vegetation.

#### *Gila River Site A*

6/19/2005 – 0554AM – E731797, N3623282 Bearing: 270, Distance: Approx. 60m

A Yellow-billed Cuckoo responded by calling and then was observed after 4 call broadcasts. The cuckoo was first seen in a large willow in mixed exotic habitat. It first responded with a series of varied koos, kuks and kwolps and then flew 10m to another willow. The cuckoo was not banded and unpaired; no nest was found.

0613AM – E731520, N3623149 Bearing: 170, Distance: Approx. 20m

A Yellow-billed Cuckoo was observed and then called after 3 call broadcasts. The cuckoo flew in from the south and perched in a cottonwood in mixed exotic habitat. The cuckoo was not banded and unpaired; no nest was found.

7/09/2005 – 0542AM – E731932, N3623624 Bearing: 240, Distance: Approx. 150m

A Yellow-billed Cuckoo responded, with mixture of koos, kuks and kwolps, and then was observed, after 1 call broadcast. The cuckoo flew in from the southwest to a

cottonwood stand in mixed exotic habitat, 40m away. We were unable to determine whether it was banded. It was unpaired and no nest was found.

0615AM – E731653, N3623359 Bearing: 20, Distance: Approx. 300+m  
A Yellow-billed Cuckoo was detected when it called, unsolicited, from a cottonwood stand in mixed exotic habitat across from an agricultural field. The cuckoo was not banded and unpaired; no nest was found.

0624AM – E731520, N3623149 Bearing: 60, Distance: Approx. 20m  
A Yellow-billed Cuckoo responded by calling and was seen after 3 call broadcasts. The cuckoo flew into cottonwoods in mixed exotic habitat, from the northeast. The cuckoo was not banded and unpaired; no nest was found.

7/22/2005 – 0627AM – E731653, N3623359 Bearing: 210, Distance: Approx. 20m  
A Yellow-billed Cuckoo was observed (not calling) after 4 call broadcasts. The cuckoo flew high into cottonwoods in mixed exotic habitat then flew north into an agricultural cotton field. We were unable to determine whether it was banded. It apparently was unpaired and no nest was found.

#### ***Gila River Site B***

7/09/2005 – 0717AM – E731136, N3622586 Bearing: 340, Distance: Approx. 10m  
A Yellow-billed Cuckoo was both seen and heard after 3 call broadcasts. The cuckoo flew into mixed native habitat silently, and then gave a series of kuks. The cuckoo was not banded and unpaired; no nest was found.

#### ***Gila/Colorado Rivers Confluence Site***

7/08/2005 – 0711AM – E729173, N3622954 Bearing: 60, Distance: Approx. 30m  
A Yellow-billed Cuckoo responded after 1 call broadcast from mixed exotic habitat. There was no visual detection and it was apparently unpaired; no nest was found.

0808AM – E729619, N3623118 Bearing: 230, Distance: Approx. 150m  
A Yellow-billed Cuckoo called and then was observed after 2 call broadcasts. The cuckoo flew into willows in mixed exotic habitat about 20 meters away. The cuckoo was not banded and unpaired; no nest was found.

7/21/2005 – 0925AM – E729441, N3623048 Bearing: 37, Distance: Approx. 100m  
A Yellow-billed Cuckoo called after 1 call broadcast, from mixed exotic habitat. The individual was not seen but was apparently unpaired; no nest was found.

#### **Site Descriptions of Gila/Colorado Rivers Confluence Area**

##### ***Gila/Colorado Confluence, point 1-34***

Elevation: 30-58m

UTM: Start - E730721, N3623852

Stop - E729010, N3623003

*The following sections reside along the Colorado River on both the north and south sides of the river. The descriptions of each section start furthest away from the confluence and proceed downstream to the Gila/Colorado Rivers Confluence.*

The upstream section is above the confluence on the north side of the Colorado River and is comprised of mixed-exotic habitat (Appendix 2G). The overstory consists of 50% tamarisk, 30%

willow, and 20% cottonwood. The overall average height of the overstory is 10m and the estimated canopy is 26-50%. The understory consists of 40% tamarisk, 30% arrowweed, 15% willow, 5% ravenagrass, 5% phragmites and 5% cattail. The understory height averages 2m and the cover is greater than 51%. This BLM managed area is bordered to the east, west and north by tamarisk and arrowweed. The Colorado River is 20m to the north of the site with no standing water within the site.

On the south side of the Colorado River, above the confluence, are three areas that were surveyed (Appendix 2G). The northeastern-most area is an exotic monotypic tamarisk stand (100%) that averages 10-15m in height. The estimated canopy cover is greater than 51%. The understory consists of mostly arrowweed (90%) with some tamarisk (10%) dispersed throughout. The average understory height of this area is 1-2m and provides greater than 51% cover. This area is bordered on the east and west by tamarisk and arrowweed, and to the south by agricultural fields. The Colorado River is to the north of this site, with no standing water in the site.

At point four along the Colorado River the habitat is an exotic monotypic tamarisk (100%) stand (Appendix 2G). This area averages 15m in height and provides greater than 51% canopy cover. The understory of this area is made up of 85% tamarisk and 15% arrow weed, averages 1-2m in height and provides less than 25% cover. This area is heavily used by fishermen. It is bordered to the east and west by tamarisk and arrowweed, and to the south by agricultural fields. The Colorado River is to the north, with no standing water within the site.

The most southeastern area, along the Colorado River near the confluence of the Gila and Colorado Rivers is comprised of mixed native habitat with an overstory consisting of 40% cottonwood, 40% willow, and 20% tamarisk (Appendix 2G). The canopy averages 10-15m in height and is estimated to provide less than 25% cover. The understory consists of 45% tamarisk, 40% arrowweed, and 15% mesquite; it averages 2-3m in height. The estimated understory cover is greater than 51%. This BLM managed area is bordered to the east and south by tamarisk and arrowweed. To the north is the Colorado River and to the west is the Gila River, with no standing water within the site.

In 2005, unpaired Yellow-billed Cuckoos were detected on 8 July and 21 July (Appendix 1 and Appendix 2G).

*The following sites are along the Gila River, site A is furthest from the confluence while site G is closest to the confluence.*

***Gila River Site A***

Elevation: 44-59m

UTM: E731737, N3623408

This site is comprised of mixed exotic habitat that consists of an overstory of 45% cottonwood, 45% willow, and 10% tamarisk (Appendix 2G). The overall average height is 20m and estimated canopy cover is less than 25%. The understory consists of tamarisk (70%) and arrowweed (30%) and averages 5m in height. The estimated understory cover is greater than 51%. This area is bordered to the north and west by agriculture and to the east and south by tamarisk and willow. This site borders the Gila River, with no standing water within the site.

In 2005, cuckoos were detected here on 19 June, 9 July and 22 July (Appendix 1 and Appendix 1G).

***Gila River Site B***

Elevation: 52-58m

UTM: Start - E731380, N3622458

Stop - E731867, N3622501

This site is comprised of mixed native habitat that is dominated by a cottonwood (100%) overstory that averages 15m in height (Appendix 2G). The estimated total canopy cover is greater than 51%. The understory consists mostly of tamarisk (80%), mesquite (10%) and arrowweed (10%). The average understory height is 2-3m and provides greater than 51% cover. This BLM managed site is bordered by agriculture to the north and scattered tamarisk and cottonwood to the east, south and west. This site borders the Gila River and there is no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River Site C***

Elevation: 56m

UTM: E730128, N3622623

This small section along the Gila River is comprised of mixed native habitat and is dominated by a monotypic (100%) cottonwood overstory (Appendix 2G). The average canopy height is 20m and is estimated to provide less than 25% cover. The understory consists of mostly mesquite (80%) with some tamarisk (15%) and arrowweed (5%). The average height is 2-3m and estimated understory cover is 26-50%. This site is bordered to the north by agriculture and by tamarisk, mesquite and an unknown sp. to the south, east and west. This site borders the Gila River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River Site D***

Area:

Elevation: 39m

UTM: E731614, N3622829

This very small section of the Gila River is comprised of mixed native habitat and is dominated by a willow overstory (100%) averaging 10m in height and providing less than 25% canopy cover (Appendix 2G). The understory consists of 50% tamarisk, 20% mesquite and 30% arrow weed. The understory average height is 3m and the estimated understory cover is greater than 50%. This BLM managed area is bordered by agriculture to the north, east and south. This site borders the Gila River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River Site E***

Elevation: 37m

UTM: Start - E731352, N3622401

Stop - E731305, N3622146

This section of the Gila River is comprised of mixed-exotic habitat with 60% willow, 20% cottonwood, and 20% tamarisk in the overstory (Appendix 2G). The average canopy height is 15m and the estimated cover is less than 25%. The understory consists of 60% tamarisk and 40% arrowweed and averages 4m in height. The estimated understory cover is greater than 51%. This BLM managed site is bordered by agriculture to the north, east and south. This site is adjacent to the Gila River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River Site F***

Elevation: 37m

UTM: Start - E730892, N3622209

Stop - E730768, N3622197

This small section of the Gila River is comprised of mixed-exotic habitat with the overstory consisting of 65% tamarisk and 35% willow (Appendix 2G). Canopy height averages 12m and provides less than 25% cover. The understory is made up of 70% tamarisk, 20% mesquite and 10% ravnagrass. The average height of the understory is 5m and the estimated understory cover is greater than 51%. This site is bordered by agriculture to the north, east and south. The Gila River runs to the west, with no standing water within this site. (Pic.35)

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River Site G***

Elevation: 32-36m

UTM: Start - E730316, N3621992

Stop - E729923, N3621968

This section of the Gila River is comprised of mixed-exotic habitat with an overstory consisting of tamarisk (70%) and 30% willow (Appendix 2G). The average height of the canopy is 20m and estimated canopy cover is less than 25%. The understory consists of 50% tamarisk, 40% arrowweed and 10% mesquite and averages 3m in height. The estimated understory cover is greater than 51%. This site is bordered by agriculture to the north, east and south. The Gila River runs to the west, with no standing water within this site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

**Aerial Photographs of Yellow-billed Cuckoo Survey Points, Detections and Patch Boundary**

Yellow-billed Cuckoo survey points, detections and patch boundaries were mapped on orthorectified aerial photos of the Gila/Colorado Rivers Confluence sites (Appendix 3I). Patch boundaries were delineated for those sites where cuckoos were detected. Along the Colorado River, the northwest patch area is 21.4 ha. Along the Gila River, the southeast patch has an estimated area of 40.9 ha.

**GILA RIVER NEAR HIGHWAY 95**

The sites along the Gila River at the crossing of Highway 95 are located in the Gila River floodplain. These sites are due north of the Gila Mountains and are immediately surrounded by agricultural fields and canals for irrigation. At the Gila River at Highway 95, we surveyed for Yellow-billed Cuckoos at ten sites for a total of 40 cuckoo surveys during the breeding period (Table 18).

**Table 18.** Dates in 2005 of Yellow-billed Cuckoo surveys at each site. Surveys were conducted during four breeding visits per site the Gila River near Highway 95 in Arizona, 2005.

Study Area	Survey Site Names	Breeding Visit 1	Breeding Visit 2	Breeding Visit 3	Breeding Visit 4
Gila River/Hwy 95	Site A	6/25/2005	7/11/2005	7/25/2005	8/8/2005
Gila River/Hwy 95	Site B	6/25/2005	7/11/2005	7/25/2005	8/8/2005

**Table 18 cont.**

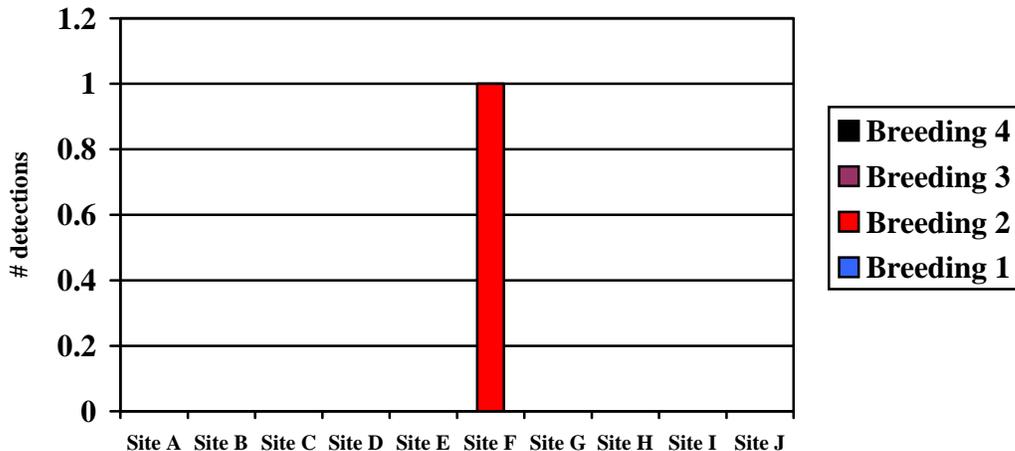
Study Area	Survey Site Names	Breeding Visit 1	Breeding Visit 2	Breeding Visit 3	Breeding Visit 4
Gila River/Hwy 95	Site C	6/25/2005	7/11/2005	7/25/2005	8/8/2005
Gila River/Hwy 95	Site D	6/25/2005	7/11/2005	7/25/2005	8/8/2005
Gila River/Hwy 95	Site E	6/25/2005	7/11/2005	7/25/2005	8/8/2005
Gila River/Hwy 95	Site F	6/25/2005	7/11/2005	7/25/2005	8/8/2005
Gila River/Hwy 95	Site G	6/25/2005	7/11/2005	7/25/2005	8/8/2005
Gila River/Hwy 95	Site H	6/25/2005	7/11/2005	7/25/2005	8/8/2005
Gila River/Hwy 95	Site I	6/25/2005	7/11/2005	7/25/2005	8/8/2005
Gila River/Hwy 95	Site J	6/25/2005	7/11/2005	7/25/2005	8/8/2005

During our 2005 Yellow-billed Cuckoo surveys we had one cuckoo detection during the second breeding survey (Table 19). We only had one cuckoo detection at site F along the Gila River (Figure 7).

**Table 19.** The total number of detections per survey visit along the Gila River near Highway 95, AZ, 2005.

VISIT #	DATE SPAN (05)	# YBCU DETECTIONS
Breeding #1	06/25	0
Breeding #2	07/11	1
Breeding #3	07/25	0
Breeding #4	08/08	0
		<b>1 =Total</b>

**YBCU Detections per site and visit**



**Figure 7.** Number of Yellow-billed Cuckoo detections per site per visit along the Gila River near Highway 95, Arizona, 2005.

## **Gila River at Highway 95 Detections**

The following are descriptions of Yellow-billed Cuckoo detections in the Gila River at Highway 95 area. Descriptions include how the bird was detected (e.g., solicited calls in response to playback recordings), the habitat the cuckoo was in, whether the bird was banded, and behavioral observations such as courtship behavior, whether the bird was paired, and if a nest was located. The only detection at the Gila River at the Highway 95 sites was solicited through our playback recordings; the cuckoo was not paired or banded. The detection occurred at Site F and was in exotic habitat.

### ***Gila River/Highway 95 Site F***

7/11/2005 – 0645AM – E744478, N3628276 Bearing: 160, Distance: Approx. 30m

A Yellow-billed Cuckoo responded to the call broadcast by calling and was then observed, after 2 broadcasts. The cuckoo flew into tamarisk in exotic habitat from the south-southeast. The cuckoo was not banded and was unpaired; no nest was found.

## **Gila River at Highway 95 habitat description**

### ***Gila River/Highway 95 Site A***

Elevation: 54-56m

UTM: Start - E751507, N3622007  
Stop - E751617, N3622012

This section of the Gila River is comprised of mixed-exotic habitat (Appendix 2H). The overstory consists of 40% tamarisk, 30% mesquite, 15% cottonwood and 15% willow and has an average height of 10m (Appendix 2C). Canopy cover is estimated to be between 26 and 50%. The understory consists of 60% tamarisk, 20% arrowweed, 15% mesquite, and 5% willow and averages 3-4m in height. The understory cover is greater than 51%. This BLM managed site is bordered by agriculture to the north and west, and by tamarisk and arrow weed to the south. The Gila River is 20m to the east, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

### ***Gila River/Highway 95 Site B***

Elevation: 56m

UTM: E750692, N3624172

This small section of the Gila River is comprised of mixed-exotic habitat (Appendix 2H). The overstory consists of 85% tamarisk, 10% willow and 5% cottonwood. The average canopy height is 15m and provides 26-50% cover. The understory consists of 60% arrowweed and 40% tamarisk and averages 2-3m in height. The understory cover is estimated to be greater than 51%. This BLM managed site is bordered to the north and northwest by agriculture, and to the east and west by tamarisk and arrowweed. The Gila River is 30m to the southeast of the site, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

### ***Gila River/Highway 95 Site C***

Elevation: 55m

UTM: E749834, N3624598

This section of the Gila River is comprised of mixed-exotic habitat (Appendix 2H). The overstory at this site consists of 75% cottonwood and 25% tamarisk. Average height of the canopy is estimated at 10m and provides 26-50% cover. The understory is dominated by tamarisk (90%) with arrowweed

(10%) dispersed throughout. The understory cover is estimated to be greater than 51%. This BLM managed area is bordered by monotypic tamarisk to the east and west, and by agriculture to the south. The Gila River is 20 m to the north of the site with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River/Highway 95 Site D***

Elevation: 50-51m

UTM: Start - E748736, N3627968

Stop - E748770, N3628103

This section of the Gila River is comprised of exotic habitat (Appendix 2H). The overstory is completely dominated by tamarisk (100%) averaging 15m in height. The canopy cover is estimated to be greater than 51%. The understory is dominated by 90% tamarisk with some arrowweed (10%) scattered throughout. The average height of the understory is 3-4m and provides greater than 51% cover. This site is bordered by agriculture to the north, and tamarisk and arrowweed to the east. The Gila River is 20m to the south of the site, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River/Highway 95 Site E***

Elevation: 51m

UTM: E747404, N3628202

This small section is comprised of exotic habitat (Appendix 2H). The overstory is dominated by tamarisk (100%), which averages 10m in height. The dense, well-developed canopy provides 26-50% cover. The understory consists of 50% tamarisk, 30% mesquite and 20% arrowweed. The understory is estimated to be 3-4m in height and provides 26-50% cover. This BLM area is bordered by tamarisk and arrowweed to the east and west and by agriculture to the north. The Gila River is 30 m to the south, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River/Highway 95 Site F***

Elevation: 48-50m

UTM: Start - E745008, N3628254

Stop - E744478, N3628276

This section of the Gila River is comprised of exotic habitat (Appendix 2H). The overstory is dominated by tamarisk (100%) that averages 10m in height. The canopy cover is estimated at greater than 51%. The understory is also dominated by 75% tamarisk with arrowweed (25%) dispersed throughout. The average understory height is 2-3m and provides 51% cover. This BLM managed area is bordered by monotypic tamarisk to the east and west and to the north by agriculture. The Gila River is 25 m to the south, with intermittent standing within the site.

In 2005, we had one Yellow-billed Cuckoo detection, on 11 July (Appendix 1 and Appendix 2H).

***Gila River/Highway 95 Site G***

Elevation: 50-51m

UTM: Start - E744461, N3628599

Stop - E744992, N3628596

This section of the Gila River is comprised of exotic habitat (Appendix 2H). The overstory consists of monotypic tamarisk and is an average of 10m in height. The estimated overall canopy cover is greater than 51%. The understory is also dominated by 90% tamarisk and contains 10% arrowweed

scattered throughout. The average height of the understory is 3m and provides greater than 51% cover. This BLM managed site is bordered by agricultural fields to the north, east and south. This site is located about 300m from the Gila River and borders a small wetland area to the west; therefore, standing water exists within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River/Highway 95 Site H***

Elevation: 54m UTM: E744049, N3628520

This section of the Gila River is comprised of exotic habitat (Appendix 2H). The overstory is dominated by monotypic tamarisk (100%) averaging 10m in height and provides a canopy cover greater than 51%. The understory contains 60% tamarisk and 40% arrowweed, averages 3m in height, and provides greater than 51% cover. This BLM managed site is bordered by agriculture on all sides. It is located approximately 300 m from the Gila River, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River/Highway 95 Site I***

Elevation: 49m UTM: Start - E743964, N3627176  
Stop – E743655, N3627817

This section of the Gila River is comprised of exotic habitat (Appendix 2H). The overstory is dominated by a monotypic tamarisk overstory (100%). The overall average height of the canopy is 10m and total canopy cover is estimated to be 26-50%. The understory consists of 75% tamarisk and 25% arrowweed and averages 3m in height. The overall understory cover is greater than 51%. This BLM managed site is bordered by tamarisk and arrowweed to the east and west, and agricultural fields to the north. The Gila River is 50 m to the south of the site, with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

***Gila River/Highway 95 Site J***

Elevation: 51-58m UTM: Start - E743398, N3627654  
Stop - E743615, N3627570

This section of the Gila River is comprised of mixed-exotic habitat (Appendix 2H). The overstory is dominated by monotypic tamarisk (100%) that averages 10m in height and provides greater than 51% cover. The understory is mostly made up of tamarisk (60%) but also contains 25% arrowweed, 5% willow, 10% mesquite. The overall average height for the understory is estimated to be 3-4m and it provides greater than 51% total cover. This BLM managed site is bordered by the highway to the north and agriculture to the south and west. The Gila River is 30 m to the east of this site with no standing water within the site.

In 2005, no Yellow-billed Cuckoos were detected at this site.

**Aerial Photographs of Yellow-billed Cuckoo Survey Points and Detections**

Yellow-billed Cuckoo survey points and detections were mapped on orthorectified aerial photos of the Gila/Colorado Rivers Confluence sites (Appendix 3J). Patch boundaries were delineated for the

area where the one Yellow-billed Cuckoo was detected since this photo was taken in 1996 and does not reflect the vegetation that exists there today.

### QUIGLEY STATE WILDLIFE MANAGEMENT AREA

The sites at the Quigley WMA are located in the Gila River floodplain. The area is approximately four miles south of US Highway 8 Tacna exit. Although immediately surrounded by agricultural fields and canals for irrigation, the area beyond the fields is comprised of desert scrub habitat. At the Quigley WMA, we surveyed for Yellow-billed Cuckoos at the native re-vegetation site and the surrounding Gila River mixed-native riparian habitat. In 2005, we conducted two cuckoo surveys during the migration period and four surveys during the breeding period (Table 20).

**Table 20.** Dates and sites where Yellow-billed Cuckoo surveys were conducted during two migration visits and four breeding visits at the Quigley State Wildlife Management Area along the Gila River, AZ.

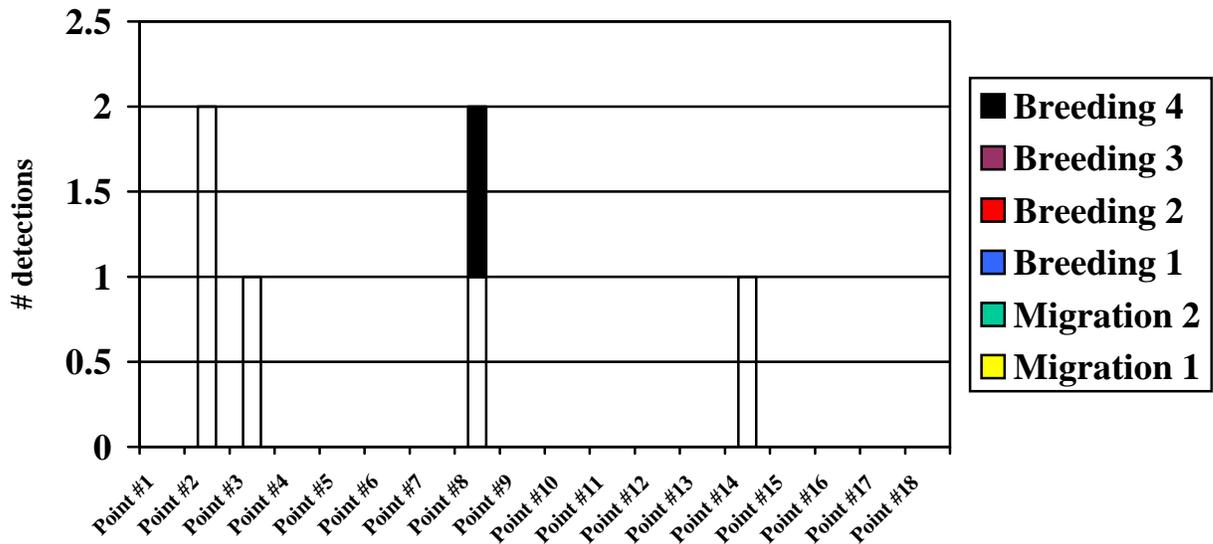
Study Area	Survey Site Name	Migration Visit 1	Migration Visit 2	Breeding Visit 1	Breeding Visit 2	Breeding Visit 3	Breeding Visit 4
Quigley WMA	Quigley WMA	5/17/2005	6/11/2005	6/22/2005	7/10/2005	7/23/2005	8/7/2005

During the 2005 Yellow-billed Cuckoo surveys there was a total of eight cuckoo detections; one detection during the first breeding survey, four detections during the second breeding-season survey, two during the third breeding survey and one during the fourth breeding survey (Table 21). Three of the cuckoo detections occurred at points two and three in the re-vegetation site, while three detections were at points eight and fourteen along the Gila River next to the re-vegetation site (Figure 8).

**Table 21.** The total number of detections per survey visit at Quigley State Wildlife Management Area along the Gila River, AZ, 2005.

VISIT #	DATE (2005)	# YBCU DETECTIONS
Migration #1	05/17	0
Migration #2	06/11	0
Breeding #1	06/22	1
Breeding #2	07/10	5
Breeding #3	07/23	2
Breeding #4	08/10	1
		<b>9 =Total</b>

### YBCU Detections per site and visit



**Figure 8.** Number of Yellow-billed Cuckoo detections per point per visit at Quigley State Wildlife Management Area along the Gila River, AZ, 2005.

#### Quigley Pond WMA Detections

The following are descriptions of Yellow-billed Cuckoo detections in the Quigley Pond WMA. Descriptions include how the bird was detected (e.g., solicited calls in response to playback recordings), the habitat the cuckoo was in, whether the bird was banded, and behavioral observations such as courtship behavior, whether the bird was paired, and if a nest was located. One cuckoo detection at the Quigley WMA site was solicited through our playback recordings, while five were not; none of the cuckoos were banded. On 10 July we observed two Yellow-billed Cuckoos, one following the other with a stick in its bill. However, no nest was found. The cuckoo detections at Quigley WMA all occurred in mixed-native habitat.

6/22/2005 – 0536AM - E222488, N3625644 Bearing: 150, Distance: Approx. 80m

A Yellow-billed Cuckoo called and then was seen after 3 recordings. The cuckoo flew into a willow in native habitat, from the southeast. The cuckoo was not banded and was unpaired; no nest was found.

7/10/2005 – The surveyor waited two hours before starting survey to try and observe undisturbed breeding behavior.

0545AM – E222385, N3625433 Bearing: 175, Distance: Approx. 40m

Two Yellow-billed Cuckoos were seen without broadcasting calls. The cuckoos, one following the other with a stick, flew, in native vegetation, from cottonwoods eastward into a willow. The cuckoos were unbanded and no nest was found.

0654AM – E222385, N3625433 Bearing: 190, Distance: Approx. 40m

A Yellow-billed Cuckoo was detected visually with no broadcasts. The cuckoo flew in native vegetation from a cottonwood north into mesquite. We could not see the bird's

legs so we could not determine if it was banded. This bird was determined to be possibly paired, but no nest was found.

0707AM – E222385, N3625433 Bearing: 150, Distance: Approx. 125m

A Yellow-billed Cuckoo was detected (without broadcasting) calling in native vegetation. The bird was not observed, but was estimated to be possibly paired; but no nest was found.

0854AM – E222385, N3625433 Bearing: 150, Distance: Approx. 150m

A Yellow-billed Cuckoo was detected calling in native habitat (no recordings were broadcast). The bird was not observed, but was estimated to be possibly paired; but no nest was found.

7/23/2005 – We waited one hour before starting survey to try and observe breeding behavior.

0629AM – E222385, N3625433 Bearing: 225, Distance: Approx. 30m

A Yellow-billed Cuckoo was detected visually with no recordings broadcast. The cuckoo flew in native habitat from a cottonwood north into mesquite. The exact same pattern of flight and perches were detected on 10 July. We could not see the bird's legs so we could not determine if it was banded. This bird was determined to be possibly paired but no nest was found.

0645AM – E222620, N3625532 Bearing: 240, Distance: 8m

A Yellow-billed Cuckoo was detected vocally and visually in native habitat (without use of recordings). We could not see the bird's legs so we could not determine if it was banded. This bird was determined possibly paired but no nest was found.

8/07/2005 – 0637AM – E222385, N3625433 Bearing: 130, Distance 70m

A Yellow-billed Cuckoo was detected calling in native habitat (with no calls broadcast). This bird was not seen but was estimated to be possibly paired; no nest was found.

### **Quigley Pond WMA Site Descriptions**

Elevation: 56-80m

UTM: Start - E222784, N3625629

Stop - E222401, N3624724

This AZG&F wildlife management area contains a cottonwood plantation along the Gila River (Appendix 2I). The overstory of the plantation is cottonwood (100%) with an estimated height of 10-15 m. The understory consists of a cottonwood/willow mix (80%) and 20% bare ground. To the east of the plantation there are willow and tamarisk stands interspersed within a large bulldozed area. 240m to the south of this area is a willow stand that was included in the survey and has a tamarisk and willow understory. This is a mixed native site with an overstory consisting of 60% cottonwood, 25% willow and 15% tamarisk. The average overstory height is 10m and canopy cover is estimated at 26-50%. The understory consists of 75% arrowweed, 15% tamarisk, 5% willow, less than 5% mesquite, and less than 5% unknown species. The average height of the understory is 3m and provides greater than 51% cover. This site is bordered by agriculture to the north, west and south, and by tamarisk and arrowweed to the southwest. The Gila River is to the west. There is no standing water within the site; however, this site is irrigated as part of the AZG&F management plan.

In 2005, we detected Yellow-billed Cuckoos during all 4 breeding-season surveys; on 22 June, 10 July, 23 July and 7 August (Appendix 1 and Appendix 2I).

### **Aerial Photographs of Yellow-billed Cuckoo Survey Points and Detections**

Yellow-billed Cuckoo survey points and detections were mapped on orthorectified aerial photos of the Quigley Pond WMA site (Appendix 3K). Patch boundaries were delineated for the area where Yellow-billed Cuckoos were detected since this photo was taken in 1996 and does not reflect the vegetation that exists there today.

### ***BIRD SPECIES LIST***

During our Yellow-billed Cuckoo surveys in 2005, we documented all other species we detected (Appendix 4). For each species we noted the site they were detected in and any breeding behavior worth noting. Species are listed according to what survey they were detected and what survey area.

## **DISCUSSION**

Historically, in Arizona, Yellow-billed Cuckoos were listed as a common breeding species within extensive riparian forests throughout the state (Swarth 1905, Visher 1910, Phillips et al. 1964, Corman and Wise-Gervais 2005). Along the Gila and lower Colorado Rivers, Yellow-billed Cuckoos were common to abundant in cottonwood-willow forests in bottomland floodplains (Grinnell 1914, Swarth 1914). In 1976, estimates of breeding cuckoo pairs were 846 for the lower Colorado River and its five tributaries (Goschupf 1987). Later studies along the lower Colorado River found a 93% decline between 1976 and 1986. Also, on the Bill Williams River Delta, which abuts the lower Colorado River, a 71 to 75% decline was detected during this time period (Rosenburg et al. 1991). The decline on the Bill Williams River can possibly be attributed to the high water levels of 1983-1984, which flooded and killed many of the cottonwood trees in the area. Habitat has since recovered on the Bill Williams River delta, but cuckoo numbers remain low (M. Halterman, pers. comm., 1999).

These declines are widely attributed to habitat loss. As habitat has declined along riparian ecosystems, cuckoo numbers have also declined, as has been documented for the lower Colorado River, including many sections in California. Losses of riparian habitats from historic levels have been substantial in Arizona (Rosenberg et al. 1991, Ohmart 1995, Noss et al 1995). These losses have been greatest at lower elevations (<914m/3000ft) along the lower Colorado River and its major tributaries (i.e., Gila River, Bill Williams River), which have been greatly affected by upstream dams, flow alterations, channel modifications and clearing of land for agriculture (Groschupf 1987).

### ***YELLOW-BILLED CUCKOO PRESENCE DURING MIGRATION AND BREEDING SURVEYS***

During our six survey periods (two during spring migration, four during breeding and one in September at sites where cuckoos had been detected), we had 21 Yellow-billed Cuckoo detections. Of those 21 detections we concluded that there was only one possible pair at Quigley Pond. We observed courtship behavior (carrying sticks) between one pair at this site; however, no nests were ever located. The other 19 detections were determined to be single unpaired birds.

Detections occurred only during the breeding-season surveys, while no detections occurred during spring migration surveys. In order to detect a species during spring migration, one has to survey during that very short window of time when the birds are migrating through. Our two surveys during

migration occurred in mid-May and early June with no results. There are sites in the lower Colorado River basin that may be used as stop-over habitat during migration, and may provide key resources for individuals to continue their migration. In order to increase the probability of detecting cuckoos during spring migration, additional surveys would be needed. Different survey techniques may also be required (e.g., passive mist-netting). Many bird species use the lower Colorado River riparian habitat during migration (Rosenberg et al. 1991), but most do not sing during migration and therefore are difficult to detect. Thus, studies have used mist netting to determine migrant presence and abundance of migrating birds. Our migration-season surveys consisted of using standardized playback recordings to survey. Cuckoos have been documented responding to playback recordings/broadcasts during migration, but the probability a cuckoo will respond during migration is unknown.

### ***YELLOW-BILLED CUCKOO HABITAT NEEDS***

The areas surveyed during this study were sites where cuckoos had been historically detected or were considered adequate Yellow-billed Cuckoo habitat. Our surveys in 2005 along the lower Colorado and Gila Rivers included a large proportion of the areas covered historically along the lower Colorado River basin. Since this study only covered a sub-sample of the lower Colorado River region, many historic sites were not surveyed during this study. Therefore, it is difficult to compare our findings to previous studies. However, it is apparent that the number of breeding pairs is substantially less than estimated from studies conducted in the 1970s and 1980s (e.g., estimates of 846 breeding cuckoo pairs for the lower Colorado River and its five tributaries by Goschupf (1987) and estimates by Rosenberg et al. (1991).

These declines are likely due to the loss of riparian habitat. It's been estimated that 85-98% of Arizona's native riparian habitat has been destroyed or severely degraded since Euro-American settlement (Noss et al. 1995, Bogan et al. 1998). By the early 1900s agriculture activities were booming around Yuma and the Imperial Valley, California (Rosenburg et al. 1991). However, annual flooding continued to devastate these farming efforts. In order to control the river for human use the U.S Bureau of Reclamation began to develop the river for power generation, water storage and flood control. This began with the construction of a series of dams (Laguna Dam in 1907, Hoover Dam in 1936, Parker Dam, and Imperial Dam in 1938 and Davis Dam in 1954), which changed the natural flows of the lower Colorado River by ending the cycle of annual flooding. With floods controlled and irrigation water readily available, large strands of natural flood plain vegetation were converted to agricultural uses. In the 1940s and 1950s wide portions of the floodplain near Yuma, Blythe, Parker and Needles were cleared for agriculture. Extensive farm tracts, "clean" farming practices, and shifts to crops such as cotton and lettuce have resulted in the removal of large tracts of cottonwood/willow forests and mesquite bosques and greatly reduced the extent of wildlife habitat, including habitat required by the Yellow-billed Cuckoo. The only large tracts of natural riparian vegetation that remained through the 1970s were on the five Indian reservations and the three national wildlife refuges (Cibola, Imperial, and Havasu). Also, with the construction of the dams, floods were essentially stopped, except when heavy runoff from local rains produced floods from the larger tributaries (e.g., Bill Williams River). Without these floods, new rich alluvial seedbeds were no longer formed and the life history cycle of cottonwoods, willows and mesquite were irreversibly changed (Rosenberg et al. 1991).

Another major event that has completely changed the vegetation structure throughout the lower Colorado River basin was the introduction of the exotic tamarisk tree. In 1894, Means (1907) estimated that about 160,000-180,000 ha of alluvial bottomland between Fort Mohave and Fort Yuma were comprised of riparian vegetation. As of 1986, total riparian vegetation comprised of only 40,000 ha, approximately 25% of the bottomland estimated by Means (Anderson and Ohmart 1984,

Yunker and Anderson 1986). Approximately 40% of the area remaining in 1986 was covered by tamarisk, 16% by honey mesquite and/or native shrubs, and only 0.7% by mature cottonwood or willow habitat (Ohmart et al. 1988).

The effects of these changes persist. Presently, tamarisk and Russian olive are the third and fourth most frequently occurring woody riparian plants in the Southwest (Friedman et al. 2005). Of the 43 sites we surveyed for cuckoos, 72% have been affected by agriculture and are bordered on at least on one side, by agriculture fields. Presently, riparian areas are still being cleared for agricultural and residential developments throughout the lower Colorado River basin. Therefore, many bird species continue to decline with the loss of riparian habitats (Rosenberg et al. 1991). The most dramatic changes are those birds species dependent on tall cottonwood-willow forests and mesquite bosques that originally filled the floodplains of the lower Colorado River basin (Hunter et al. 1987, Hunter et al. 1988, Rosenberg et al. 1991).

In arid regions, Yellow-billed Cuckoos are restricted to river bottoms, ponds, swampy areas, and damp thickets with relatively high humidity (Gaines and Laymon 1984, Hughes 1999). Most breeding pairs of Western Yellow-billed Cuckoos have been found nesting in riparian patches within 100 m of water (Laymon and Halterman 1987, Johnson et al. 2003, 2004). Therefore, standing water in cottonwood-willow groves may help lower the air temperature by evaporative cooling (Laymon and Halterman 1987, Hughes 1999). Large patches of mature cottonwood forest, with willow forming a sub-canopy layer, provide the best shading of any riparian habitat. Foraging birds may be found in stands of smaller mesquite trees or even tamarisk, but usually do not nest there. Tamarisk and open mesquite bosques may be inadequate in buffering extreme high temperatures. Habitat attributes that provide cooler temperatures and higher humidity are likely especially important to cuckoos in the lower Colorado River basin where the cuckoo is one of the last migratory summer breeders to arrive. Arrival is in mid to late-June and they depart by the end of August or mid-September. As a mid-summer breeder in the lower Colorado River basin, nesting cuckoos would be exposed to extremely high midsummer temperatures (e.g., over 100 degrees F / 35-45<sup>0</sup> C) common in this region. In 2005, many of the sites we surveyed for Yellow-billed Cuckoos lacked many of the habitat attributes that are likely needed for successful nesting.

In various locations in the lower Colorado River basin, re-vegetated stands have been established at Cibola National Wildlife Refuge, Quigley Pond State Management Area, Mitrity Lake, and Imperial NWR, and in 2005 we detected Yellow-billed Cuckoos in each of these sites. Only unpaired birds were detected with the exception of Quigley Pond, which had a pair of birds, displaying courtship behavior, although no nest or young of the year were ever detected at the site. Each of the re-vegetated stands is comprised of mature trees and appear to have the adequate plant species composition and structure for cuckoos to breed. However, Western Yellow-billed Cuckoos breed in large blocks of riparian habitat (Ehrlich et al. 1988, USDI 2001), and all of the re-vegetation sites are presently too small to provide breeding habitat (Laymon and Halterman 1987).

From our findings, it is apparent that substantial re-vegetation efforts, throughout the lower Colorado River basin, would be required to restore breeding habitat and provide for a healthy, viable Western Yellow-billed Cuckoo population. Efforts are currently being established in the lower Colorado River basin and other areas of the southwest to restore riparian habitats. The Yellow-billed Cuckoo is a covered species in each of these plans: lower Colorado River (LCR) Multi-species Conservation Program (MSCP) (LCR MSCP 2004), Clark County, NV Multiple Species Plan, Western Riverside, CA Multi-species Habitat Conservation Plan, CRIT (Colorado River Indian Tribes) re-vegetation plan, 1998, and the Salt River Project's Roosevelt Lake Habitat Conservation Plan, 2002. All have the goal of restoring riparian habitats and providing for at risk riparian wildlife, including the Western Yellow-billed Cuckoo.

## **MANAGEMENT RECOMMENDATIONS**

### **Restoration of Yellow-billed Cuckoo Habitat**

Despite concern over the it's fate, few aspects of the Yellow-billed Cuckoo's life history have been adequately studied. Particularly in the Southwest, its habitat selection patterns are largely unknown. Knowledge of habitat selection patterns and identification of potential breeding habitat is essential to guide conservation efforts (Laymon 1998, Hughes 1999).

To meet this need, concomitant with cuckoo surveys, habitat characterization, including measures of plant species composition and vegetation structure within riparian patches, riparian patch size, and the surrounding landscape matrix, should be conducted along the lower Colorado River and throughout the cuckoo's western breeding range. This habitat data (from multiple spatial scales) would be used to construct a habitat model to determine associations between riparian habitat characteristics and Yellow-billed Cuckoo breeding-season occurrences. This information can then be used to construct a predictive model for Yellow-billed Cuckoo breeding season occurrences. This knowledge of habitat selection patterns and identification of potential breeding habitat can be used to guide conservation efforts, including prioritization of areas for conservation and restoration, identification of areas for future surveys, and areas for monitoring changes in habitat distribution and quality over time. Additionally, information regarding Yellow-billed Cuckoo habitat needs can help predict the effects of management options such as livestock grazing and riparian restoration.

Currently, two habitat models for Yellow-billed Cuckoos have been developed (Gaines and Laymon 1984, Laymon and Halterman 1989). These models are based on habitat measurements taken along the Kern and Sacramento Rivers in California, therefore these models should be used with caution, since the riparian vegetation structure and composition along these river drainages differ from the lower Colorado River and cuckoo habitat requirements may vary geographically. The model by Gaines and Laymon (1984) showed that willow-cottonwood habitat of any age with high humidity and a habitat width of 325 feet (100 m) was necessary for suitable Yellow-billed Cuckoo habitat. Additional research based on occupancy rates allowed for refinement of the model; Laymon and Halterman (1989) concluded that sites > 80 ha (200 acres) in extent and wider than 600 m (1950 feet) were optimal patch size for Yellow-billed Cuckoos, sites 41-80 ha (101-200 acres) in extent and wider than 200 m (650 feet) were suitable, sites 20-40 ha (50-100 acres) in extent and 100-200 m (325-650 feet) in width were marginal, and sites <15 ha (38 acres) in extent and < 100 m (325 feet) in width were unsuitable (Laymon 1998).

Additional work by Launer et al. (1990) also recommended that in relation to protection of existing habitat, restoration efforts should be concentrated in areas adjacent to existing habitat patches, or in areas of sufficient extent to create comparatively large tracts of habitat (a minimum of 100 ha). Again, geographic considerations appear to be very important, and Launer et al. (1990) suggests restoration efforts in the southern portion of the cuckoo nesting range should have first priority.

In addition to affecting vegetation structure and composition, efforts to restore native riparian areas along the Lower Colorado River may also influence another habitat component: avian food resources. Many bird species that breed in riparian habitats are insectivorous, and the lush vegetation associated with riparian zones provides abundant food resources, especially when compared to surrounding upland habitats (Strong and Bock 1990). A particular food resource, the Apache cicada (*Deceroprocta apache*), has been suggested as a keystone species in the Lower Colorado riverine ecosystem through their herbivory (Karban 1980, Anderson 1987) and their roles as a prey species for birds and mammals (Rosenberg et al. 1982, Krohne et al. 1991).

In the southwest, Yellow-billed Cuckoo habitat use appears to be linked to cicadas. In cottonwood/willow habitat in the Colorado River Valley, Rosenberg et al. (1982) found Yellow-billed Cuckoos concentrated on cicadas, a superabundant, seasonally predictable resource (Strong and Bock 1990). The relatively late nesting period of the western population of cuckoo is thought to be an adaptation to the typical timing of cicada emergence (Rosenberg et al. 1982). In New Mexico, cuckoo nesting coincides with peak cicada (*Tibicen dealbatus*) emergence in unburned plots along the Middle Rio Grande River (Howe 1986). Emergence of cicadas prior to the cuckoo breeding season could be detrimental to the cuckoo's nesting success (Andersen 1994).

There is evidence in New Mexico (Smith et al. in press.) that cottonwood density and cottonwood canopy cover are important factors in cicada (*Tibicen dealbatus*) emergence density, and phenology; age and health of a cottonwood stand have a smaller effect on emergence density. Cottonwood canopy was correlated with lower soil temperatures, which are associated with later emergence dates (Smith et al. in press). These findings suggest that the recovery and sustainability of Yellow-billed Cuckoo populations in the southwest may depend on sustaining cicada populations. Riparian restoration should be designed to provide conditions so that cicadas emerge at densities and times that provide the greatest benefits to cuckoos. Studies are needed to understand the relationships between vegetation associations and annual cicadas, the effects of vegetation structure and climate on cicada emergence density and phenology in riparian habitats along the lower Colorado River.

#### ***EVALUATION OF SURVEY PROTOCOL FOR YELLOW-BILLED CUCKOOS***

Tape playback survey techniques have proven advantageous in eliciting responses from birds that are secretive, elusive or nocturnal. These techniques have also been helpful in the investigation of avian social behavior and territoriality and the estimation of population size. But, they have been used mainly during the breeding season to study the presence and distribution of many species (Glahn 1974, Griese et al. 1980, Sogge et al. 1997). The use of playback recording to survey birds has been shown to increase the total number of birds seen or heard for a given species in comparison to a conventional census (Johnson et al. 1981). This is especially true for species with low song activity (Robbins 1978).

However, the use of playback recording can also decrease response rates. Robbins (1978) found that the use of tape recordings during repeated visits during the breeding season can bias results, as birds may alter their habits or their territorial boundaries if they believe there are competing members of the same species holding a territory nearby. Studies of the use of playback recordings to survey Spotted Owls suggest that if censused too often, some individuals and/or species may become less responsive (Forsman et al. 1977). Also, the use of playback recordings can attract some individuals away from their territories, as in Elegant Trogons (Taylor 1978 and 1979 unpublished report, Coronado National Forest, AZ), and result in inflated population density estimates.

Our assessment of the use of playback recordings to survey for the presence and distribution for Yellow-billed Cuckoos has been challenging. We have long suspected that cuckoos have a fairly low response rate, and that the standard survey method using playback recordings may fail to detect all birds present in an area. In fact, we are finding that many birds that we know are present, are not responding to the recordings (Halterman 2004, Johnson et al. 2004, Johnson et al. 2005.). Halterman (2004) found that, during her test of survey methods, using adult cuckoos with radio transmitters, only 20% of the birds responded to the initial survey using playback recordings.

Thus, the survey protocol (Halterman et al. 2002) using playback recordings has been modified and refined as we learn more about the cuckoo's social and breeding behavior. For example, when it

became apparent that some individuals follow the surveyor broadcasting calls, the distance between survey points was increased to 300m (instead of 100m) in order to avoid recounting of the same individual and inflating population estimates.

Halterman (2004) also found that surveyors in the methods test did not always detect cuckoos even when the bird responded. We have also witnessed this and even though all surveyors are required to complete training to conduct surveys for Yellow-billed Cuckoos, song and call responses by cuckoos can vary and can be very subtle. Yellow-billed Cuckoos can also have a delayed response to the recording, long after the observer has already moved on to the next survey point (Halterman et al. 2002). Yellow-billed Cuckoos can also sound like many other birds such as Morning Doves, Greater Roadrunners and Yellow-breasted Chats.

To test the effectiveness of the Yellow-billed Cuckoo breeding survey protocol and develop a standardized YBCU protocol for use over the LCR Multi Species Conservation period is difficult in an area where there are so few birds. Of all the sites we surveyed in 2005, only one site had a possible pair, while all other sites where cuckoos were detected had unpaired birds. At Quigley Pond where the pair was detected, we tried to detect birds without using playback recordings during the two surveys. Each time the cuckoos were not detected until two hours later when we broadcast the recordings.

Halterman (2003) found birds breeding along the San Pedro River, AZ in late September. This has also been observed among cuckoos in California (Hughes 1999). We conducted an additional visit in mid September at each site where cuckoos had been previously detected to assess whether cuckoos were using the areas late in the breeding season. We did not detect any cuckoos, just as no cuckoos were detected in any of our fourth surveys, in August. But these results should be interpreted with caution as there is considerable annual variation in detection patterns across survey periods (Johnson et al. 2004, Johnson et al. 2005).

The chance of detecting cuckoos may be increased by increasing the number of surveys during the prime breeding period (1 July-15 August). We suggest adding one survey during this period of time. This would decrease the time between each survey and increase the number of surveys during this time period. We also suggest increasing the number of surveys later in the breeding season as the current methodology calling for four surveys could miss many birds later in the season. These additional surveys could increase the probability of detecting most or all individuals during a season (Halterman 2004).

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## LITERATURE CITED

- American Ornithologists' Union. 1983. Check-list of North American birds: The species of birds of North America from the Arctic through Panama, including the West Indies and Hawaiian Islands. American Ornithologists' Union: Washington, D.C. 877pp.
- American Ornithologists' Union. 1998. Check-list of North American Birds, 6<sup>th</sup> edition. American Ornithologists' Union, Washington, D.C.
- Andersen, D.C. 1987. Below-ground herbivory in natural communities: a review emphasizing fossorial animals. *Quart. Rev. Biol.*, 62:261-286.
- Andersen, D.C. 1994. Are cicadas (*Diceroprocta apache*) both a "keystone" and a "critical-link" species in Lower Colorado River riparian communities? *Southwestern Naturalist* 39(1): 26-33.
- Arizona Game and Fish Department. 2002. Arizona Game and Fish Department, Heritage Data Management System, [http://www.gf.state.az.us/frames/fishwild/hdms\\_site](http://www.gf.state.az.us/frames/fishwild/hdms_site).
- Arizona State Parks. 1988. Arizona wetlands priority plan. Arizona State Parks, Phoenix.
- Bibby, C.J., N.D. Burgess, and D.A. Hill. 1992. Bird census techniques. Academic Press. New York, NY. 257 pp.
- Bogan, M. A., C. D. Allen, E. H. Muldavin, S. P. Platania, J. N. Stuart, G. H. Farley, P. Mehlhop, and J. Belnap. 1998. Regional trends of biological resources: Southwest. *In* Mac, M. J., P. A. Opler, C. E. Puckett Haecker, and P. D. Doran. Status and trends of the nation's biological resources. 2 Vols. U.S. Department of the Interior, U.S. Geological Survey, Reston, Va. 964 pp.
- Corman, T.E., and R.T. Magill. 2000. Western Yellow-billed Cuckoo in Arizona: 1998 and 1999 Survey Report. Arizona Game and Fish, Technical Report 150. pp. 1-49.
- Corman, T.E. and C. Wise-Gervais. 2005. The Arizona Bird Atlas. University of New Mexico Press. 636 pp.
- Dawson, D. G. 1981. Experimental design when counting birds. *Studies in Avian Biology* No. 6: 392-398.
- Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1992. Birds in jeopardy. Stanford Univ. Press, Stanford, CA.
- Franzreb, K. 1987. Perspectives on managing riparian ecosystems for endangered bird species. *Western Birds* 18:10-13.
- Forsman, E. D., E. C. Meslow and M. J. Strub. 1977. Spotted Owl abundance in young versus old-growth forest, Oregon. *Wildl. Soc. Bull.* 5:43-47.
- Glahn, J. F. 1974. Study of breeding rails recorded calls in northcentral Colorado. *Wilson Bull.* 86:206-214.

- Griese, H. J., R. A. Ryder, and C. E. Braun. 1980. Spatial and temporal distribution of rails in Colorado. *Wilson Bull.* 92:96-102.
- Grinnell, J. 1914. An account of mammals and birds of the lower Colorado valley with special reference to the distributional problems presented. University of California Publications in Zoology. 12:51-294.
- Groschupf, K. 1987. Status of the Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) in Arizona and west Texas. Report prepared for the U.S. Fish and Wildlife Service. 34 pp.
- Gaines, D., and S. A. Laymon. 1984. Decline, status, and preservation of the Yellow-billed Cuckoo in California. *West.Birds* 15: 49-80.
- Gillis 1991. Should cows chew cheat-grass on common lands? *BioScience* 41:668-675.
- Halterman, M.D. 1991. Distribution and habitat use of the Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) on the Sacramento River, California, 1987-90. MS. Thesis California State University, Chico 49 pp.
- Halterman, M.D., M. J. Johnson, and J. A. Holmes. 2005. Western Yellow-billed Cuckoo natural history summary and survey methodology. Unpublished draft report, Southern Sierra Research Station, P.O. Box 1316 Weldon, CA 93283.
- Halterman M.D. 2005. Surveys and Life History Studies of the Yellow-Billed Cuckoo: Summer 2004. Administrative report to the Bureau of Reclamation, Boulder City, NV.
- Howe, W.H. 1986. Status of the Yellow-Billed Cuckoo in New Mexico Final Report. New Mexico Department of Game and Fish Share with Wildlife Program. Santa Fe, NM.
- Howell, S.N.G., and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford Univ. Press, New York.
- Hughes, J.M. 1999. Yellow-billed cuckoo (*Coccyzus americanus*). In *The Birds of North America*, No. 418 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Hunter, W.C., R.D. Ohmart, and B.W. Anderson. 1987. Status of breeding riparian-obligate birds in southwestern riverine systems. *Western Birds* 18:10-18.
- Hunter, W.C., R.D. Ohmart, and B.W. Anderson. 1988. Use of exotic saltcedar (*Tamarix chinensis*) by birds in arid riparian systems. *Condor* 90:113-123.
- Johnson, R. R. , B. T Brown, L. T. Haight, and J. M. Simpson. 1981. Playback recordings as a special avian censusing technique. Pp. 68-75 in C. J. Ralph and J. M. Scott (eds.) Estimating the numbers of terrestrial birds. *Stud. Avian Biol.* 6.
- Johnson, M.J. and C. O'Brien. 1998. Southwestern willow flycatcher and yellow-billed cuckoo surveys along the San Juan River, Utah (Four Corners Bridge-Mexican Hat): 1998. Final report to the Division of Wildlife Resources (Contract # 976475). Colorado Plateau Field Station/Northern Arizona University report. 45pp.

- Johnson, M. J., J. A. Holmes, and R. Weber. 2004. 2003 Final report: yellow-billed cuckoo distribution and abundance, habitat requirements, and breeding ecology in select habitats of the Roosevelt Habitat Conservation Plan. 22 pp.
- Johnson, M. J., J. A. Holmes, and R. Weber. 2005. 2004 Final report: yellow-billed cuckoo distribution and abundance, habitat requirements, and breeding ecology in select habitats of the Roosevelt Habitat Conservation Plan. 21 pp.
- Karban, R. 1980. Periodical cicada nymphs impose periodical oak tree wood accumulation. *Nature*, 287:326-327.
- Kingery, H.E., ed. 1998. Colorado breeding bird atlas. Colorado Wildlife Heritage Foundation, Denver, CO. 636pp.
- Knopf, F. L., R. R. Johnson, F. B. Samson, and R. C. Szaro. 1988. Conservation of riparian ecosystems in the United States. *Wilson Bulletin* 100: 272-284.
- Krohne, D.T., T.J. Couillard, and J.C. Riddle. 1991. Population responses of *Peromyscus leucopus* and *Blarina brevicauda* to emergence of periodical cicadas. *Amer. Midland Nat.*, 126:317-321.
- Launer, A.E., D.D. Murphy, S.A. Laymon, and M.D. Halterman. 1990. 1990 distribution and habitat requirements of the Yellow-billed Cuckoo in California. Admin. Rept. To The Nature Conservancy.
- Laymon, S.A. 1998. Yellow-billed cuckoo survey and monitoring protocol for California. Unpublished.
- Laymon, S.A. and M.D. Halterman. 1987. Can the western subspecies of the yellow-billed cuckoo be saved from extinction. *Western Birds* 18:19-25.
- Laymon, S.A., and M.D. Halterman. 1989. A proposed habitat management plan for Yellow-billed Cuckoos in California. USDA For. Serv. Gen. Tech. Rep. PSW-110: 272-277.
- Laymon, S. A. 1998. Yellow-billed Cuckoo (*Coccyzus americanus*). *In* The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. [http://www.prbo.org/calpif/htmldocs/riparian\\_v-2.html](http://www.prbo.org/calpif/htmldocs/riparian_v-2.html).
- Lower Colorado River Multi-Species Conservation Program (LCR MSCP). 2004. Lower Colorado River Multi-Species Conservation Program, Volume II: Habitat Conservation Plan. Final. December 17. (J&S 00450.00.) Sacramento, CA.
- Means, E. A. 1907. Mammals of the Mexican Boundary of the United States. A descriptive catalogue of the species of mammals occurring in that region, with a general summary of the natural history, and a list of trees. Smithsonian Institution, U.S. Natural Museum Bulletin 56, Government Printing Office, Washington, D.C., 530 pp.
- Navajo Endangered Species List. 1997. Navajo Nation, Navajo Fish and Wildlife Department, <http://www.heritage.tnc.org/nhp/us/Navajo/esl.html>.

- Noss, R. F., E. T. Laroe III, and J. M. Scott. 1995. Endangered ecosystems of the United States: a preliminary assessment of loss and degradation. National Biological Service Biological Report 28. 58 pp.
- Ohmart, R. D., B.W. Anderson, and W.C. Hunter. 1988. The ecology of the lower Colorado River from Davis Dam to the Mexico-United States International Boundary: a community profile. U.S. Fish and Wildlife Service Biological Report 85(7.19), 296 pp.
- Ohmart, R. D. 1994. The effects of human-induced changes on the avifauna of western riparian habitats. *Studies in Avian Biology* 15:273-285.
- Phillips, A., J. Marshall, and G. Monson. 1964. The birds of Arizona. University of Arizona Press, Tucson.
- Robbins, C. S. 1978. Census techniques for forest birds. Pp. 142-163 in R M. DeGraff (tech. coord.). Proceeding of the workshop on management of southern forests for nongame birds. U.S. For. Serv., Gen. Tech. Rep. WE-14, Asheville, N.C.
- Rosenberg, K.V., R.D. Ohmart, W. C. Hunter, and B.W. Anderson. 1991. Birds of the lower Colorado River Valley. University of Arizona, Tucson, AZ.
- Russell, S.M. and G. Monson. 1998. The birds of Sonora. University of Arizona Press. Tucson.
- Small, A. 1994. California bird: their status and distribution. Ibis Publishing Co.
- Smith, D.M., J. F. Kelly, and D.M. Finch. In Press. Emergence of Annual Cicadas in a New Mexico Riparian Forest: Ecosystem Consequences of a Shift from Flood to Wildfire Disturbance. Ecological Applications.
- Sogge, M.K., R.M. Marshall, S.J. Sferra, and T.J. Tibbitts. 1997. A Southwestern Willow Flycatcher Natural History Summary and Survey Protocol. National Park Service Technical Report NPS/NAUcprs/NRTR-97/12.
- Strong, T.R. and C.E. Bock. 1990. Bird species distribution patterns in riparian habitats in Southeastern Arizona. *The Condor* 92:866-885.
- Swarth, H.S. 1905. Summer birds of the Papago Indian Reservation and of the Santa Rita Mountains, Arizona. *Condor* 7:23-28, 47-50, 77-82.
- Swarth, H.S. 1914. A distributional checklist of the birds of Arizona. *Pacific Coast Avifauna* 10:1-33.
- U.S Fish and Wildlife Service. 2002. Yellow-billed Cuckoo candidate listing on Endangered Species List. *Federal Register* 67:114.
- Veit, R., and W. Petersen. 1993. Birds of Massachusetts. Mass. Audubon Soc., Lincoln, MA.
- Visher, S.S. 1910. Notes on the birds of Pima County, Arizona. *Auk* 27:279-288.

**Appendix 1.** Yellow-billed Cuckoo detections along the lower Colorado and Gila River during 2005 surveys. Surveys conducted at Cibola NWR, Imperial NWR, Mittry Lake WMA/Pratt Restoration Area, Limitrophe Division Area, Cocopah Indian Reservation, Colorado/Gila River Confluence, Gila River near hwy. 95, and Quigley Pond WMA.

<b>YBCU survey Site</b>	<b>Date/time</b>	<b>Observer</b>	<b>UTM/ bearing/dist.</b>	<b>Breeding status</b>	<b>Habitat at detection</b>	<b>Comments</b>
<b>Cibola NWR South Plantation</b>	7/12/2005 0827am	Mike Dionne	E715789 N3684637 Bearing: 270, Dist: 20m	Unpaired	Cottonwood plantation, patch too small	Visual then vocal response after 2 recordings
<b>Cibola NWR South Plantation</b>	7/26/2005 0719am	Mike Dionne	E715571, N3684557 Bearing: 90, Dist: 30m	Unpaired	Cottonwood plantation, good habitat in plantation, patch too small.	Visual response after 3 recordings. Flew in silently from the northwest.
<b>Cibola NWR South Plantation</b>	7/26/2005 0752am	Matt Paulson	E715571, N3684557 Bearing: 90, Dist: 30m	Unpaired	Cottonwood plantation, good habitat in plantation, patch too small.	Audio detection after 4 recordings. Response from across the river.
<b>Imperial NWR Plantation</b>	7/13/2005 0622am	Matt Paulson	E734273, N3635865 Bearing: 180, Dist: 50m	Unpaired	Cottonwood plantation patch too small.	Flew from plantation into marsh area, then back to same cottonwood in plantation.
<b>Imperial NWR Plantation</b>	7/30/2005 0647am	Matt Paulson	E734273, N3635865 Bearing: 160, Dist: 30m	Unpaired	Cottonwood plantation, patch too small.	Visual detection after 3 plays. Flew in silently.
<b>Mittry Lake WMA/Pratt Restoration Area</b>	7/07/2005 0605am	Mike Dionne	E735068, N3634279 Bearing: 80, Dist: 10m	Unpaired	Cottonwood plantation patch too small, marsh/ cottonwood overstory.	Vocal then visual detection flew into cottonwood stand near river.
<b>Limitrophe Division North Pts 3&amp;4</b>	6/17/2005 0527am	Mike Dionne and Matt Paulson	E710732, N3615600 Bearing: 297, Dist: 70m	Unpaired?	Unknown?	Detected across river on Mexico side.
<b>Limitrophe Division North Pts 3&amp;4</b>	6/30/2005 0526am	Mike Dionne and Matt Paulson	E710637, N3615542 Bearing: 270, Dist: 10m	Unpaired?	Mixed exotic habitat, good habitat with scattered cottonwood overstory.	Visual then vocal response after 4 recordings. Flew from Mexico side to U.S. side of the river.

Appendix 1 cont.

YBCU survey site	Date/time	Observer	UTM/ bearing/dist.	Breeding status	Habitat at detection	Comments
<b>Limitrophe Division North Pts 3&amp;4</b>	7/15/2005 0540am	Mike Dionne and Matt Paulson	E710637, N3615542 Bearing: 265, Dist: 60m	Unpaired	Mixed exotic habitat, good habitat with scattered cottonwood overstory.	Same location as detection on 6/30/2005. Vocal detection after waiting 20 min with no playback
<b>Limitrophe Division North Pts 3&amp;4</b>	7/28/2005 0600am	Mike Dionne and Matt Paulson	E710637, N3615542 Bearing: 320, Distance: Approx. 60m	Unpaired	Mixed exotic habitat, good habitat with scattered cottonwood overstory.	Same location as detection on 6/30/2005 and 7/15/2005.
<b>Limitrophe Division North Pt 11</b>	7/15/2005 0702am	Mike Dionne and Matt Paulson	E711802, N3618212 Bearing: 220, Dist: 30m	Unpaired	Mixed exotic habitat, good habitat with scattered cottonwood overstory.	Vocal then visual detection with no playback.
<b>Limitrophe Division North Pts 15-17</b>	6/22/2005 0700am	Fred Wong	E712982; N3620748 Bearing: 0, Dist: 0m	Unpaired	Mixed- native habitat, good habitat with marsh.	Vocal response after 1 recording.
<b>Limitrophe Division South Pts 1-16</b>	7/14/2005 0613am	Mike Dionne and Matt Paulson	E706464, N3600002 Bearing: 250, Dist: 100+m	Unpaired	Mixed exotic habitat, good habitat with scattered cottonwood overstory.	Vocal then visual response after 3 plays.
<b>Quigley Pond WMA</b>	6/22/2005 0536am	Mike Dionne	E222488, N3625644 Bearing: 150, Dist: 80m	Unpaired	Mixed Native habitat, good habitat adjacent to good habitat with cottonwood overstory and marsh.	Responded both orally and visually after 3 plays. Flew in from southeast to with in 10m.
<b>Quigley Pond WMA</b>	7/10/2005 0536am	Matt Paulson	E222385, N3625433 Bearing: 175, Dist: 40m	Paired, carrying stick	Mixed Native habitat, good habitat adjacent to good habitat with cottonwood overstory and marsh.	Observed two YBCUs, one carrying a stick and following another. Flew west from eastern plantation to willow stand in bulldozed plot.

**Appendix 1 cont.**

<b>YBCU survey site</b>	<b>Date/time</b>	<b>Observer</b>	<b>UTM/ bearing/dist.</b>	<b>Breeding status</b>	<b>Habitat at detection</b>	<b>Comments</b>
<b>Quigley Pond WMA</b>	7/10/2005 0654am	Mike Dionne	E222385, N3625433 Bearing: 190, Dist: 40m	Single cuckoo	Mixed Native habitat, good habitat adjacent to good habitat with cottonwood overstory and marsh.	Visual detection made here flew from south across road to mesquite on north side. No mate detected.
<b>Quigley Pond WMA</b>	7/10/2005 0707am	Mike Dionne	E222385, N3625433 Bearing: 150, Distance: Approx. 125m	Single cuckoo	Mixed native habitat, good habitat adjacent to good habitat with cottonwood overstory and marsh.	Audio detection only.
<b>Quigley Pond WMA</b>	7/10/2005 0854 am	Matt Paulson	E222385, N3625433 Bearing: 150, Dist: 150m	Single Cuckoo	Mixed native habitat, good habitat adjacent to good habitat with cottonwood overstory and marsh.	Audio detection only possibly responding to tape playback.
<b>Quigley Pond WMA</b>	7/23/2005 0629am	Mike Dionne	E222385, N3625433 Bearing: 225, Dist: 30m	Single Cuckoo	Mixed native habitat, good habitat adjacent to good habitat with cottonwood overstory and marsh.	Not tape solicited visual detection only. Flew north into same mesquite as 7/10, 0654am detection.
<b>Quigley Pond WMA</b>	7/23/2005 0645am	Mike Dionne	E222620, N3625532 Bearing: 240, Dist: 8m	Single Cuckoo	Mixed native habitat, good habitat adjacent to good habitat with cottonwood overstory and marsh.	Both visually and orally detected. No nest found.
<b>Quigley Pond WMA</b>	8/10/2005 0637am	Matt Paulson	E222385, N3625433 Bearing: 130, Dist: 70m	Unpaired	Mixed native habitat, good habitat adjacent to good habitat with overstory and marsh.	Audio detection only. No nest found.

**Appendix 1 cont.**

<b>YBCU survey site</b>	<b>Date/time</b>	<b>Observer</b>	<b>UTM/ bearing/dist.</b>	<b>Breeding status</b>	<b>Habitat at detection</b>	<b>Comments</b>
<b>Gila River at Highway 95 Detections</b>	7/11/2005 0645am	Mike Dionne	E744478, N3628276 Bearing: 160, Dist: 30m	Unpaired	Mixed exotic poor habitat with tamarisk and scattered cottonwood and willow.	Vocal then visual response after 4 recordings. Flew into tamarisk from south southeast.
<b>Colorado/Gila River Confluence Site A</b>	6/18/2005 0554am	Mike Dionne	E731797, N3623282 Bearing: 270, Dist: 60m	Unpaired	Mixed exotic, poor habitat with tamarisk and scattered cottonwood and willow.	First heard from large willow and then flew 10m to another willow.
<b>Colorado/Gila River Confluence Site A</b>	6/18/2005 0613am	Matt Paulson	E731520, N3623149 Bearing: 170, Dist: 20m	Unpaired	Mixed exotic habitat with good to poor structure dominated by tamarisk and scattered cottonwoods.	Vocal response after 3 recordings. Flew in from south and perched in cottonwood.
<b>Colorado/Gila River Confluence Site A</b>	7/09/2005 0542am	Mike Dionne	E731932, N3623624 Bearing: 240, Dist: 150m	Unpaired	Mixed exotic habitat with good to poor structure dominated by tamarisk and scattered cottonwoods.	Vocal response after 1 play. Flew in from southwest to cottonwood stand 40m away.
<b>Colorado/Gila River Confluence Site A</b>	7/09/2005 0615am	Matt Paulson	E731653, N3623359 Bearing: 20, Dist: 300+m	Unpaired	Mixed exotic habitat with good to poor structure dominated by tamarisk and scattered cottonwoods.	Vocal response with no playback. vocal detection from cottonwood stand across agricultural field.
<b>Colorado/Gila River Confluence Site A</b>	7/09/2005 0629am	Matt Paulson	E731520, N3623149 Bearing: 60, Dist: 20m	Unpaired	Mixed exotic habitat with good to poor structure dominated by tamarisk and scattered cottonwoods.	Vocal and visual response after 3 recordings. Flew into cottonwood from where detection at 0542am detection occurred.

**Appendix 1 cont.**

<b>YBCU survey site</b>	<b>Date/time</b>	<b>Observer</b>	<b>UTM/ bearing/dist.</b>	<b>Breeding status</b>	<b>Habitat at detection</b>	<b>Comments</b>
<b>Colorado/Gila River Confluence Site A</b>	7/22/2005 0627am	Mike Dionne	E731653, N3623359 Bearing: 210, Dist: 20m	Unpaired	Mixed exotic habitat with good to poor structure dominated by tamarisk and scattered cottonwoods.	Visual response after 4 plays. Flew high into cottonwoods. Then flew north into agricultural cotton field.
<b>Colorado/Green River Confluence Site B</b>	7/09/2005 0717am	Mike Dionne	E731136, N3622586 Bearing: 340, Dist: 10m	Unpaired	Mixed exotic habitat with good to poor structure dominated by tamarisk and scattered cottonwoods.	Visual then vocal detection after 3 plays. Flew in silently then gave series of kuks.
<b>Colorado/Green River Confluence</b>	7/08/2005 0711am	Matt Paulson	E729173, N3622954 Bearing: 60, Dist: 30m	Unpaired	Mixed exotic habitat with good to poor structure dominated by tamarisk and scattered cottonwoods.	Audio detection only after 1 play. Heard from various places but was never seen.
<b>Colorado/Green River Confluence</b>	7/08/2005 0808am	Mike Dionne	E729619, N3623118 Bearing: 230, Dist: 150	Unpaired	Mixed exotic habitat with good to poor structure dominated by tamarisk and scattered cottonwoods	Vocal and visual response after 2 plays. Flew into willows at 200 degrees, 20 meters away.
<b>Colorado/Green River Confluence</b>	7/21/2005 0925am	Mike Dionne	E729441, N3623048 Bearing: 37, Dist: 100m	Unpaired	Mixed exotic habitat with good to poor structure dominated by tamarisk and scattered cottonwoods.	Vocal response after 1 play. No mate detected. No legs seen. No nest found.

**Appendix 2A.** Habitat photos of Yellow-billed Cuckoo survey sites at Cibola NWR, AZ, 2005. Listed with each photo are site name, UTM location of where the photo was taken, and whether a cuckoo was detected at the site.

### **Cibola NWR – Horseshoe Plantation**



Cibola NWR, Horseshoe Plantation, E716006, N3694490.



Cibola NWR, Horseshoe Plantation, E715875, N3694245.

### **Cibola NWR – South Plantation**



Cibola NWR, South Plantation, E715789, N3684637. Yellow billed Cuckoo detected here.



Cibola NWR, South Plantation, E715645, N3684682.

Appendix 2A cont.

**Cibola NWR – South Plantation**



Cibola NWR, South Plantation, E715871,  
N3684557. Yellow-billed Cuckoo detected here on  
7/26/2005.



Cibola NWR, South Plantation, E715753,  
N3684675.

**Cibola NWR – Eucalyptus Plantation**



Cibola NWR, Eucalyptus Plantation, E713873,  
N3693265.



Cibola NWR, Eucalyptus Plantation, E713790,  
N3693714.

Appendix 2A cont.  
**Cibola NWR – Eucalyptus Plantation**



Cibola NWR, Eucalyptus Plantation Site, E713887, N3693161.



Cibola NWR, Eucalyptus Plantation Site, E713887, N3693161.

**Cibola NWR- Cross River Site**



Cibola NWR, Cross River Site, E716937, N3683832



Cibola NWR, Cross River Site, E716907, N3683832

**Appendix 2A cont.**  
**Cibola NWR- Cross River Site**



Cibola NWR, Cross River Site, E716698, N3683859. Yellow-billed Cuckoo detected here on 7/26/2005.



Cibola NWR, Cross River Site, E716698, N3683859. Yellow-billed Cuckoo detected here on 7/26/2005.



Cibola NWR, Cross River East Side Site, E717258, N3683328.



Cibola NWR, Cross River East Side Site, E717258, N3683328.

**Appendix 2B.** Habitat photos of Yellow-billed Cuckoo survey sites at Imperial NWR in Arizona and California Cibola NWR, AZ, 2005. Listed with each photo are site name, UTM location of where the photo was taken, and whether a cuckoo was detected at the site.

## Imperial NWR South Plantation



Imperial NWR, Imperial South Plantation, Overview, E734199, N3653697.



Imperial NWR, Imperial South Plantation, Pt.2, E734273, N3653865. Yellow-billed cuckoo detected here on 7/30/2005.



Imperial NWR, Imperial South Plantation, Overview from River, E734239, N3653840. Yellow-billed cuckoo detected here on 7/13/2005.



Imperial NWR, Imperial South Plantation, Pt.3, E734109, N3653819. Yellow-billed cuckoo detected here on 7/13/2005.

**Appendix 2B cont.**  
**Imperial NWR North**



Imperial NWR, Imperial North, Overview from River, E714065, N3666173.



Imperial NWR, Imperial North, Overview from River, E714065, N3666173.

**Imperial NWR North**



Imperial NWR, Imperial North, Overview from River, E714189, N3666498.



Imperial NWR, Imperial North, Pt.2, E714092, N3666165.

**Appendix 2C.** Habitat photos of Yellow-billed Cuckoo survey sites at Picacho State Park, California, 2005. Listed with each photo are site name, UTM location of where the photo was taken, and whether a cuckoo was detected at the site.

## Picacho State Park



Picacho State Park,, Overview, E722554, N3656213.



Picacho State Park,, Pt.3, E722565, N36565231.



Picacho State Park,, Overview, E723094, N3656506.



Picacho State Park, Pt.2, E722504, N3656523.

**Appendix 2D.** Habitat photos of the Yellow-billed Cuckoo survey sites at Mittry Lake WMA/Pratt Restoration Area, AZ, 2005. Listed with each photo are site name, UTM location of where the photo was taken, and whether a cuckoo was detected at the site.

## Mittry Lake State WMA/Pratt Restoration Area



Betty's Kitchen, Pt.7, E735161, N3634136. Yellow-billed cuckoo detected here on 7/7/2005.



Pratt Restoration Area, Overview, E735381, N3634591.



Pratt Restoration Area, Overview, E735381, N3634591.



Mittry Lake, Pt.14, E735068, N3634279. Yellow-billed cuckoo detected here on 7/7/2005.

**Appendix 2E.** Yellow-billed Cuckoo habitat photos of the sites surveyed along the lower Colorado River at the Limitrophe Division north and south areas, AZ, 2005. Listed with each photo are site name, UTM location of where the photo was taken, and whether a cuckoo was detected at the site.

## Limitrophe Division North

### Points 1 & 2:



Limitrophe Division North, Pts.1&2, E709926,  
N3614194



Limitrophe Division North, Pts.1&2, E709926,  
N3614194

### Points 1 & 2:



Limitrophe Division North, Pts.1&2, E709926,  
N3614194

### Points 3 & 4:



Limitrophe Division North, Pts.3&4, E710637,  
N3615542

Appendix 2E cont.  
**Limitrophe Division North**

**Points 3 & 4:**



Limitrophe Division North, Pts3&4, E710727,  
N3615620.



Limitrophe Division North, Pts.3&4, E710637,  
N3615542. Yellow-billed cuckoo detected here on  
6/17/2005, 6/30/2005, 7/15/2005 & 7/28/2005.

**Points 5-8:**



Limitrophe Division North, Pts.5-8, E711102,  
N3615982



Limitrophe Division North, Pts.5-8, E710961,  
N3615802

Appendix 2E cont.

**Limitrophe Division North**

**Points 5-8:**



Limitrophe Division North, Pts.5-8, E711143, N3616103.

**Points 9 & 10:**



Limitrophe Division North, Pts.9&10, E711553, N3617675.

**Point 11:**



Limitrophe Division North, Pt.11, E711802, N3618212. Yellow-billed cuckoo detected here on 7/15/2005.

**Points 12-14:**



Limitrophe Division North, Pts.12-14, E712115, N3618775.

Appendix 2E cont.  
**Limitrophe Division North**

**Points 15-17:**



Limitrophe Division North, Pts.15-17, E712115, N3618775.



Limitrophe Division North, Pts.15-17, E712942, N3620713. Yellow-billed cuckoo detected on 6/22/2005



Limitrophe Division North, Pts.15-17, Nearby Agriculture and canal, E712919, N3620099

Appendix 2E cont.

## Limitrophe Division South

### Points 1-16:



Limitrophe Division South, Pts. 1-16, E706510,  
N3599646.



Limitrophe Division South, Pts. 1-16, E706388,  
N3599934. Yellow-billed cuckoo detected here on  
7/14/2005.



Limitrophe Division South, Pts. 1-16, E706464,  
N3600002.



Limitrophe Division South, Pts. 1-16, E706503,  
N3600796.

Appendix 2E cont.

## Limitrophe Division South

### Points 1-16:



Limitrophe Division South, Pts.1-16, E706567,  
N3600394.

### Points 17 & 18:



Limitrophe Division South, Pts.17 &18, E707293,  
N3603840.

### Points 19-22:



Limitrophe Division South, Pts.19-22, E707423,  
N3604328.



Limitrophe Division South, Pts.19-22, E707505,  
N3604494.

**Appendix 2F.** Habitat photos of the Yellow-billed Cuckoo survey sites along the lower Colorado River at the Cocopah Indian Reservation, AZ, 2005. Listed with each photo are site name, UTM location of where the photo was taken, and whether a cuckoo was detected at the site.

## Cocopah Indian Reservation Sites

### Points 1-6:



Cocopah Indian Reservation, Pts.1-6, E707070,  
N3605823



Cocopah Indian Reservation, Pts.7-12, E706981,  
N3605784.

### Points 1-6:



Cocopah Indian Reservation, Pts.1-6, E707330,  
N3605725

### Points 7-12:



Cocopah Indian Reservation, Pts.7-12, E706553,  
N3608367.

Appendix 2F cont.

## Cocopah Indian Reservation Sites

### Points 7-12:



Cocopah Indian Reservation, Pts.7-12, E706552,  
N3608139



Cocopah Indian Reservation, Pts.1-6, E706552,  
N3608139

### Points 7-12:



Cocopah Indian Reservation, Pts.7-12, E706534,  
N3608472

### Points 13-15:



Cocopah Indian Reservation, Pts.13-15, E709039,  
N3611254.

Appendix 2F cont.

## Cocopah Indian Reservation Sites

### Points 13-15:



Cocopah Indian Reservation, Pts.13-15, E709039, N3611254.

### Points 16-20:



Cocopah Indian Reservation, Pts.16-20, E709622, N3613739.

### Points 16-20:



Cocopah Indian Reservation, Pts.16-20, E709680, N3613833.



Cocopah Indian Reservation, Pts.16-20, E709767, N3613892.

**Appendix 2G.** Habitat photos of the Yellow-billed Cuckoo survey sites at the Colorado River/Gila River Confluence area, AZ, 2005. Listed with each photo are site name, UTM location of where the photo was taken, and whether a cuckoo was detected at the site.

## Colorado/Gila River Confluence Sites



Colorado/Gila Confluence, Colorado Confluence, E730151, N3623349.



Colorado/Gila Confluence, Colorado Confluence, E729978, N3623198.

## Site A:



Colorado/Gila Confluence, Site A, E737932, N3623624. Yellow-billed cuckoo detected here 7/9/2005.



Colorado/Gila Confluence, Site A, E731811, N3623473. Yellow-billed cuckoo detected here 7/9/2005.

Appendix 2G cont.

**Colorado/Gila River Confluence**



Colorado/Gila Confluence, Site A, E731520, N3623149. Yellow-billed cuckoo detected here on 6/18/2005 & 7/9/2005.



Colorado/Gila Confluence, Site A, E731797, N3623282. Yellow-billed cuckoo detected here on 6/18/2005.

**Site B:**



Colorado/Gila Confluence, Site B, E731164, N3622665. Yellow-billed cuckoo detected here on 7/9/2005.



Colorado/Gila Confluence, Site B, E731164, N3622665. Yellow-billed cuckoo detected here on 7/9/2005.

Appendix 2G cont.

## Colorado/Gila River Confluence

### Site C:



Colorado/Gila Confluence, Site C, E730128,  
N3622623.



Colorado/Gila Confluence, Site C, E730128,  
N3622623.

### Site D:



Colorado/Gila Confluence, Site D, E731614,  
N3622829.

### Site E:



Colorado/Gila Confluence, Site E, E731411,  
N3622198.

Appendix 2G cont.

## Colorado/Gila River Confluence

### Site E:



Colorado/Gila Confluence, Site E, E731352,  
N3622401.



Colorado/Gila Confluence, Site E, E731305,  
N3622146.

### Site F:



Colorado/Gila Confluence, Site F, E730892,  
N3622209.

### Site G:



Colorado/Gila Confluence, Site G, E730316,  
N3621992.

Appendix 2G cont.

## Colorado/Gila River Confluence

### Site G:



Colorado/Gila Confluence, Site G, E730242,  
N3621930.



Colorado/Gila Confluence, Site G, E729923,  
N3621968.

**Appendix 2H.** Habitat photos of the Yellow-billed Cuckoo survey sites at the Gila River Highway 95 area, AZ, 2005. Listed with each photo are site name, UTM location of where the photo was taken, and whether a cuckoo was detected at the site.

## Gila River at Highway 95

### Site B:



Gila River at Highway 95, Site B, E750692, N3624172.

### Site C:



Gila River at Highway 95, Site C, E749834, N3624598.

### Site D:



Gila River at Highway 95, Site D, E748736, N3627968.



Gila River at Highway 95, Site D, E748770, N3628103.

Appendix 2H cont.

## Gila River at Highway 95

### Site E:



Gila River at Highway 95, Site E, E747404,  
N3628202.



Gila River at Highway 95, Site E, E747404,  
N3628202.

### Site F:



Gila River at Highway 95, Site F, E745008,  
N3628254.



Gila River at Highway 95, Site F, E744906,  
N3628259.

Appendix 2H cont.

## Gila River at Highway 95

### Site F:



Gila River at Highway 95, Site F, E744582,  
N3628281.



Gila River at Highway 95, Site F, E744487,  
N3628273. Yellow-billed cuckoo detected here on  
7/11/2005.

### Site G:



Gila River at Highway 95, Site G, E744860,  
N3628831.



Gila River at Highway 95, Site G, E744992,  
N3628956.

Appendix 2H cont.

## Gila River at Highway 95

### Site G:



Gila River at Highway 95, Site G, E744461,  
N3628599.

### Site H:



Gila River at Highway 95, Site H, E744049,  
N3628520.

### Site I:



Gila River at Highway 95, Site I, E743964,  
N3628176.



Gila River at Highway 95, Site I, E743877,  
N3628040.

Appendix 2H cont.

## Gila River at Highway 95

### Site I:



Gila River at Highway 95, Site I, E743655,  
N3627817.

### Site J:



Gila River at Highway 95, Site J, E743398,  
N3627654.

### Site J:



Gila River at Highway 95, Site J, E747404,  
N3628202.



Gila River at Highway 95, Site J, E743398,  
N3627654.

**Appendix 2I.** Habitat photos of the Yellow-billed Cuckoo survey sites along the Gila River at the Quigley Pond WMA, AZ, 2005. Listed with each photo are site name, UTM location of where the photo was taken, and whether a cuckoo was detected at the site.

## Quigley Pond Wildlife Management Area



Quigley Pond, E222627, N3625652. Yellow-billed cuckoo detected here on 7/23/2005



Quigley Pond, E222627, N3625652. Yellow-billed cuckoo detected here on 7/23/2005.

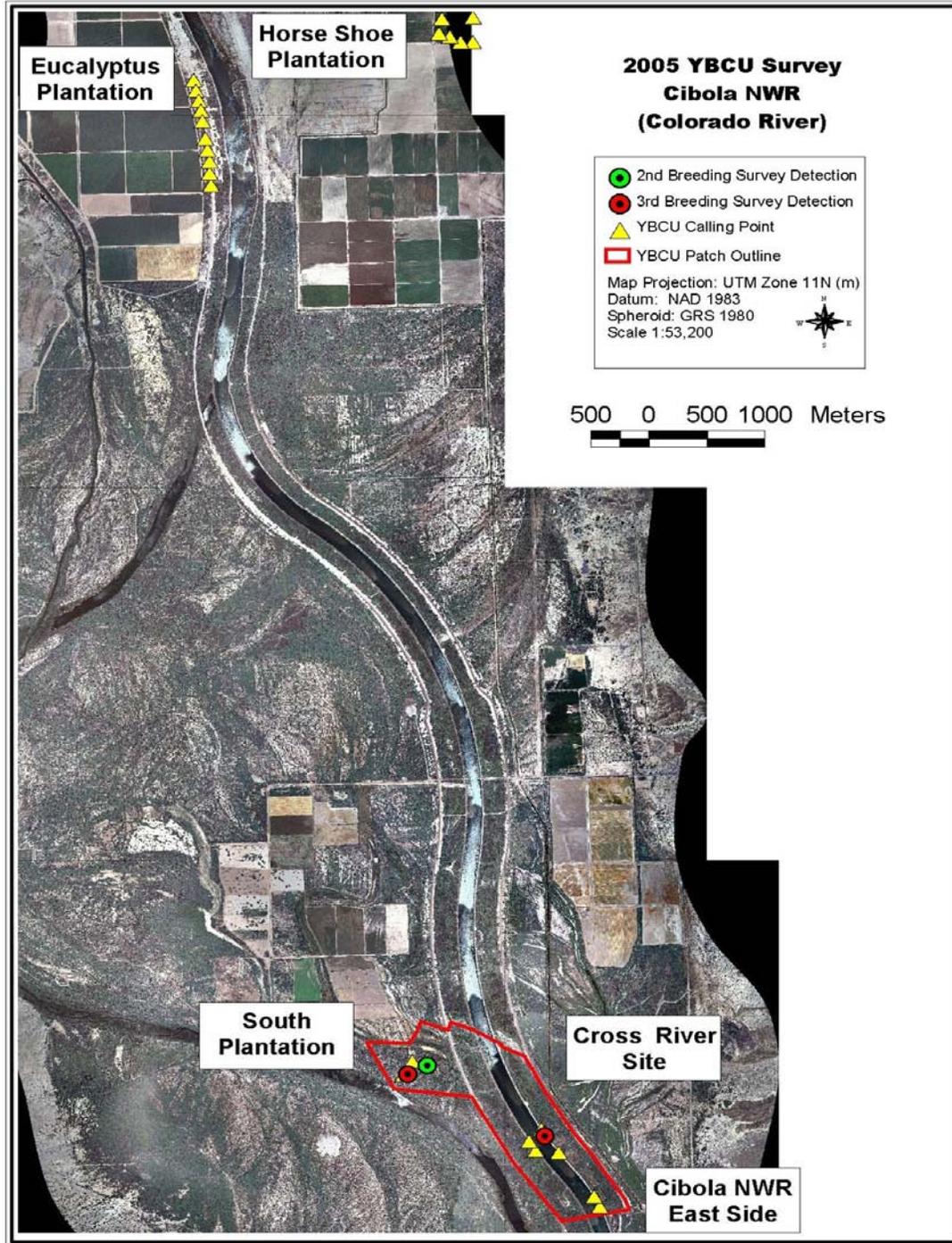


Quigley Pond, E222405, N3625647. Yellow-billed cuckoo detected here on 7/10/2005, 7/23/2005, & 8/7/2005.



Quigley Pond, E222599, N3625576. Yellow-billed cuckoo detected here on 6/22/2005.

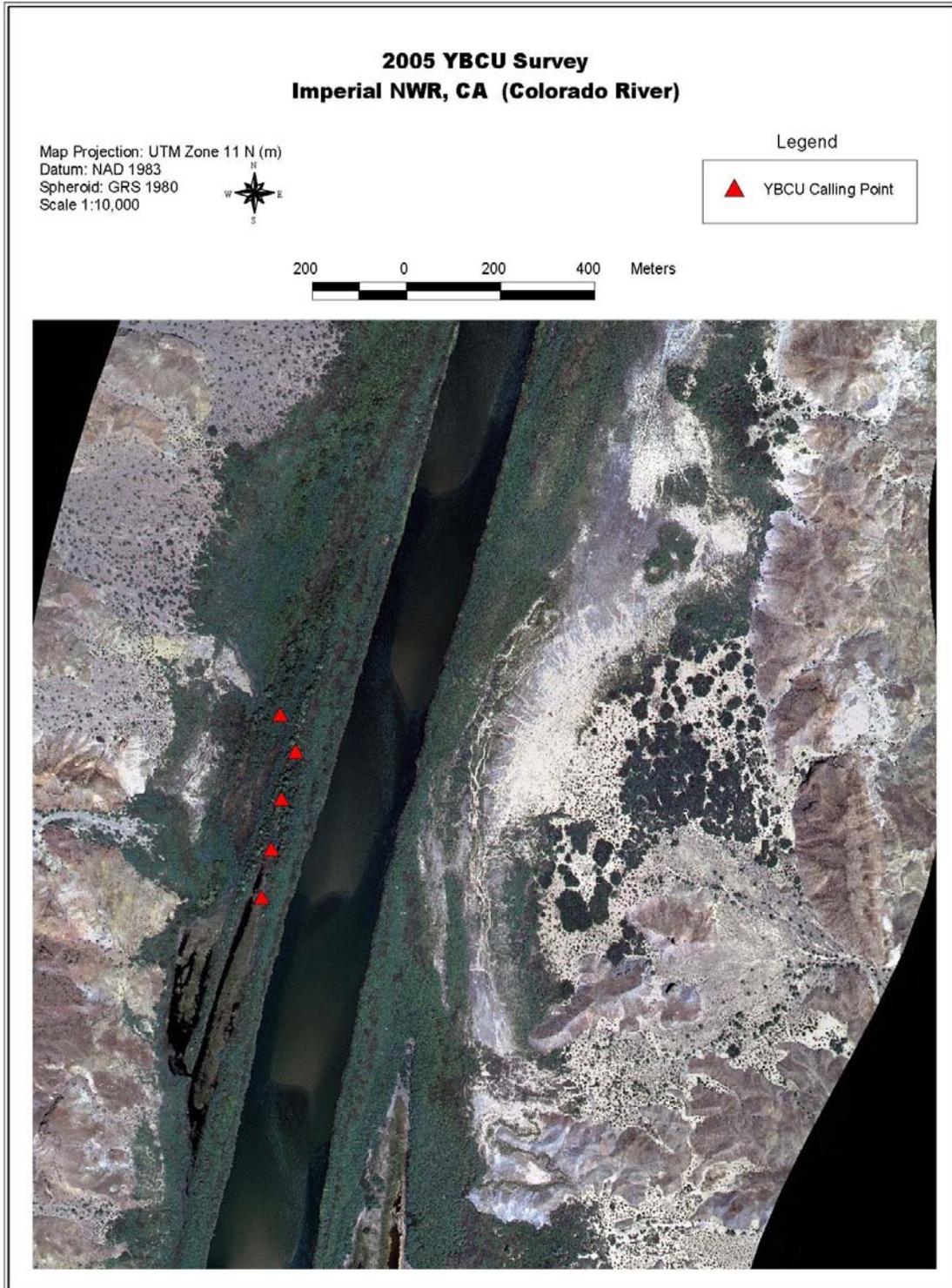
**Appendix 3A.** Yellow-billed Cuckoo survey points, detection locations and occupied cuckoo patch border at Cibola National Wildlife Refuge area, Arizona, 2005.



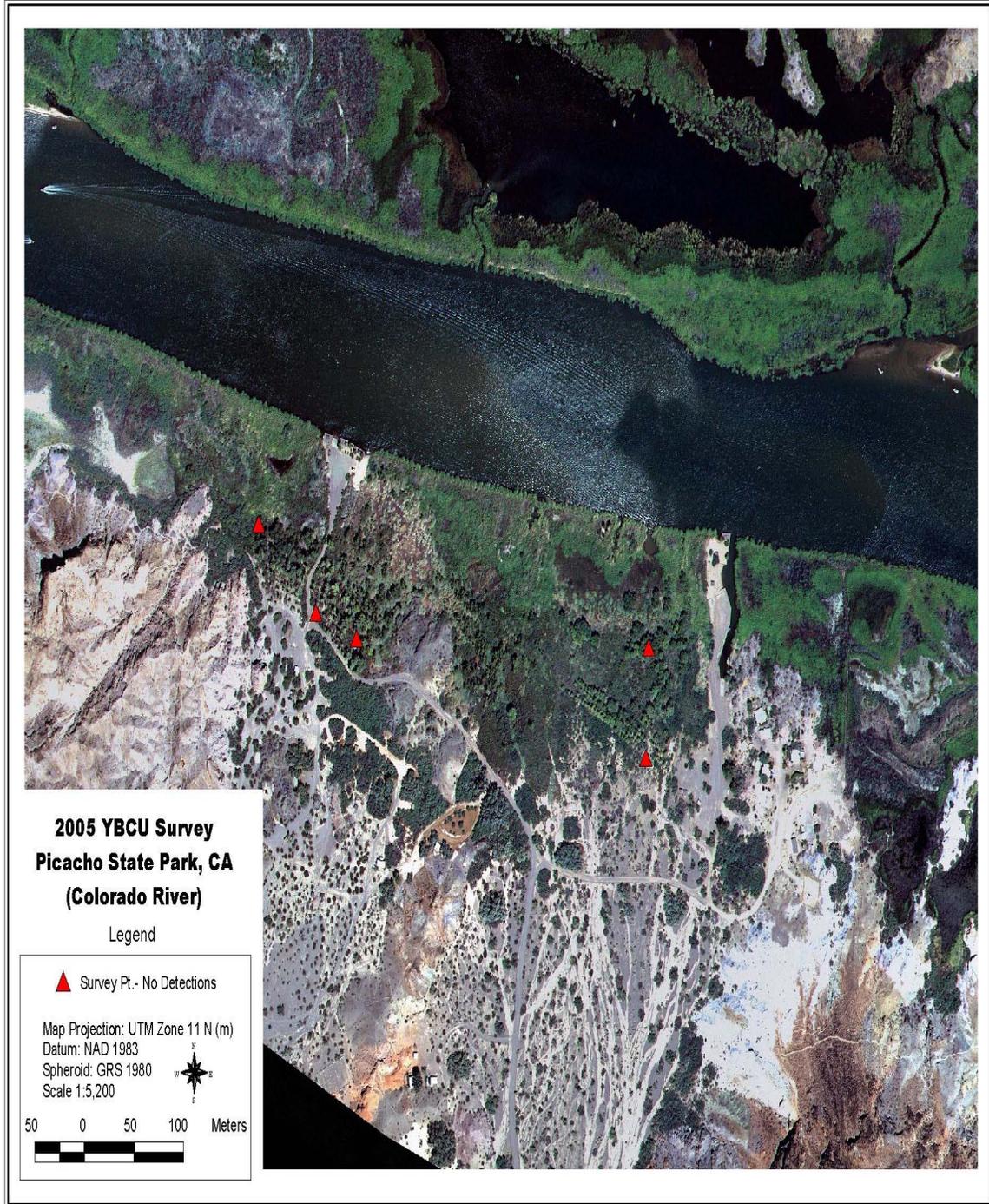
**Appendix 3B.** Yellow-billed Cuckoo detection locations, survey points and occupied cuckoo patch border at Imperial National Wildlife Refuge re-vegetation site along the lower Colorado River, AZ., 2005.



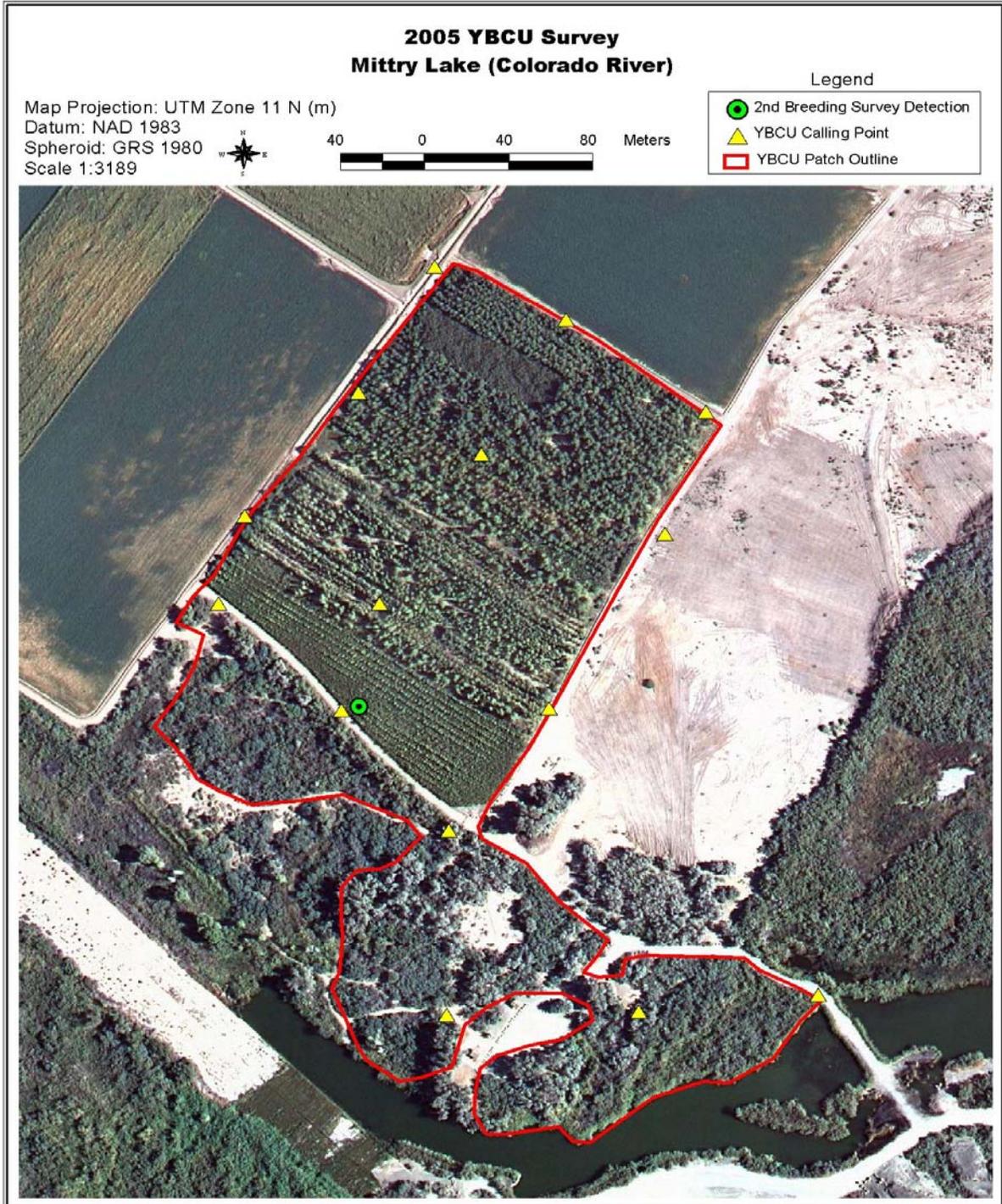
**Appendix 3C.** Yellow-billed Cuckoo survey points at a northern section of Imperial National Wildlife Refuge along the lower Colorado River, CA, 2005.



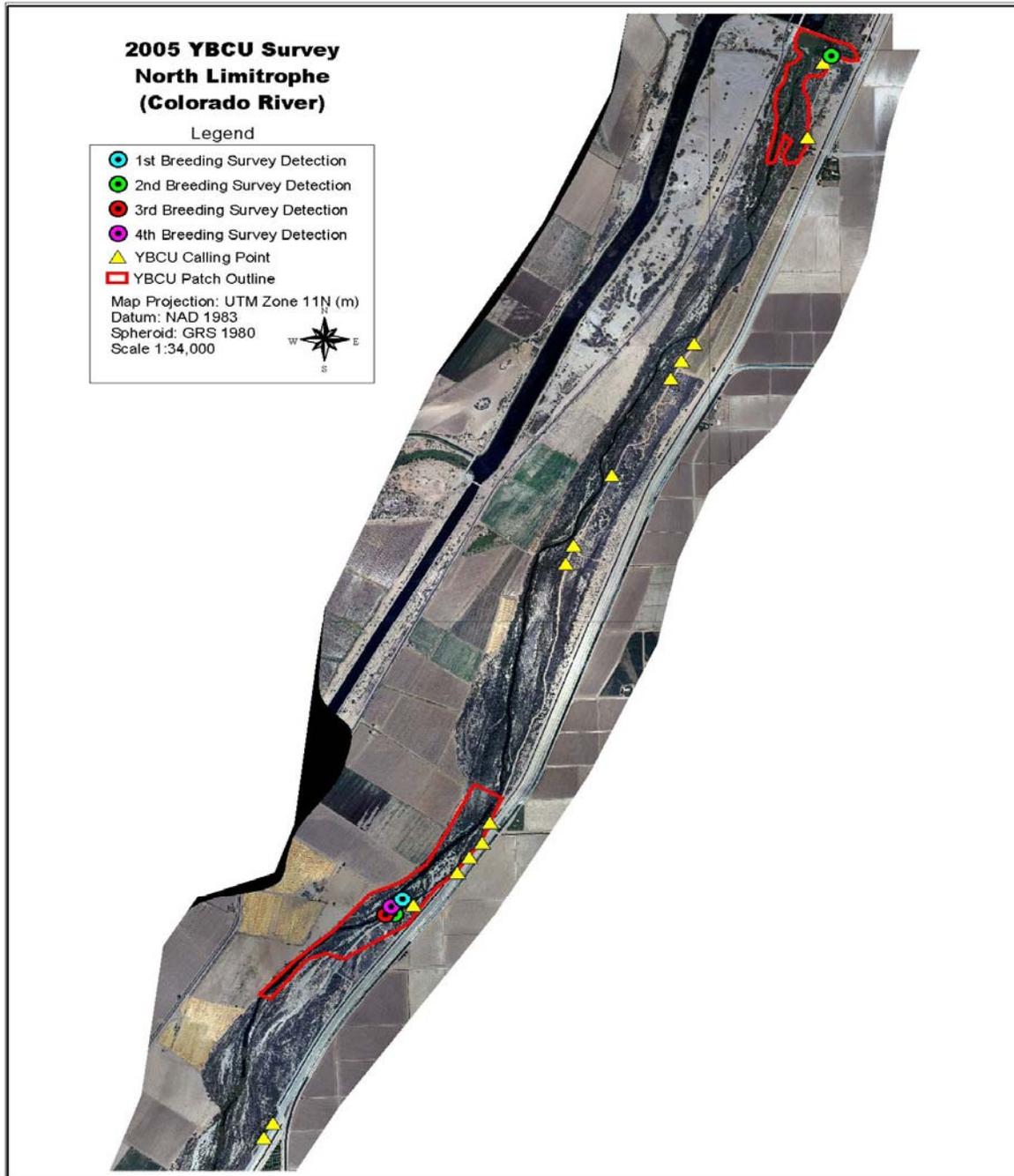
**Appendix 3D.** Yellow-billed Cuckoo survey points at Picacho State Park along the lower Colorado River, CA, 2005.



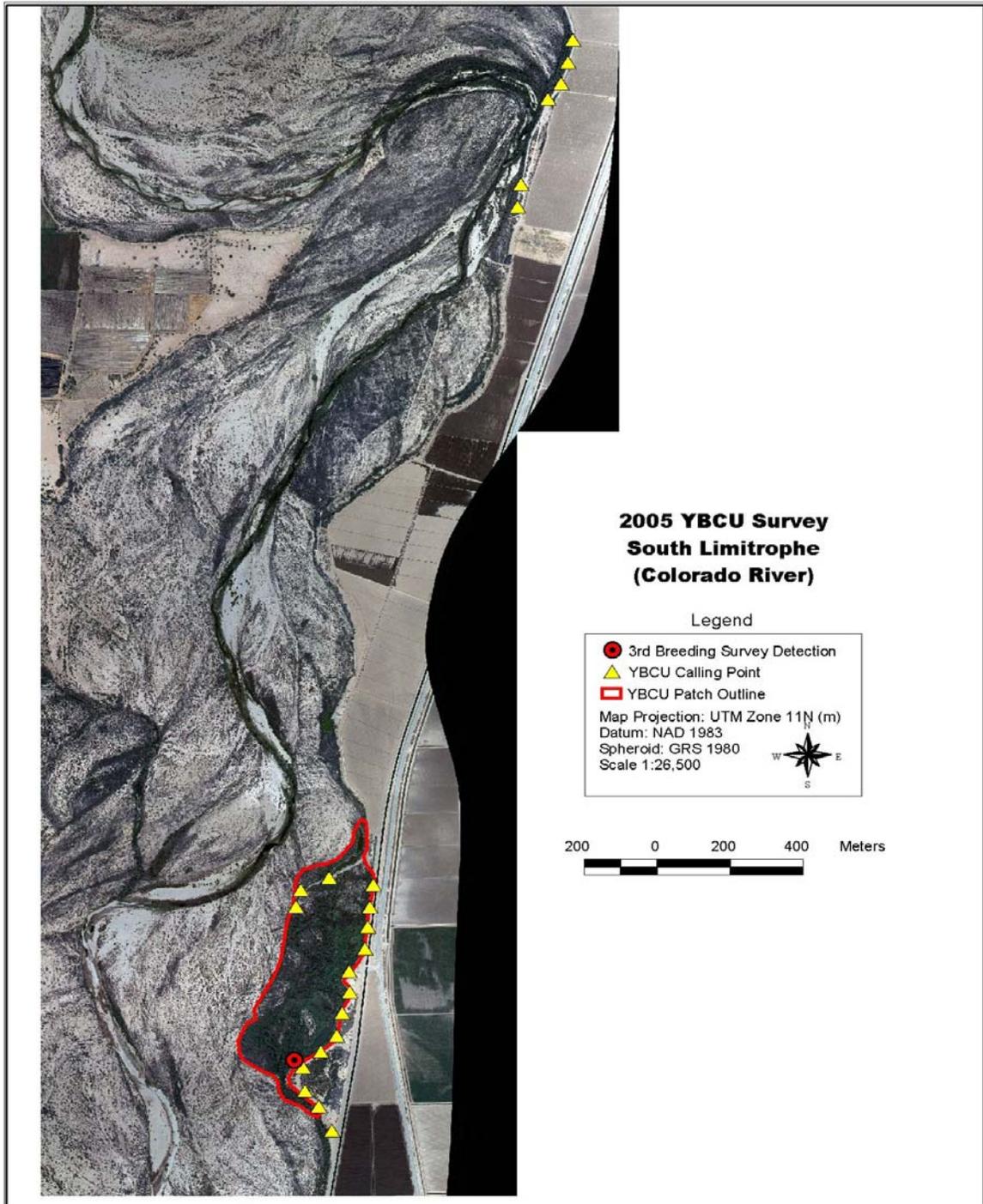
**Appendix 3E.** Yellow-billed Cuckoo survey points, detection locations and occupied cuckoo patch border at Mittry Lake WMA/Pratt Restoration Area along the lower Colorado River, AZ, 2005.



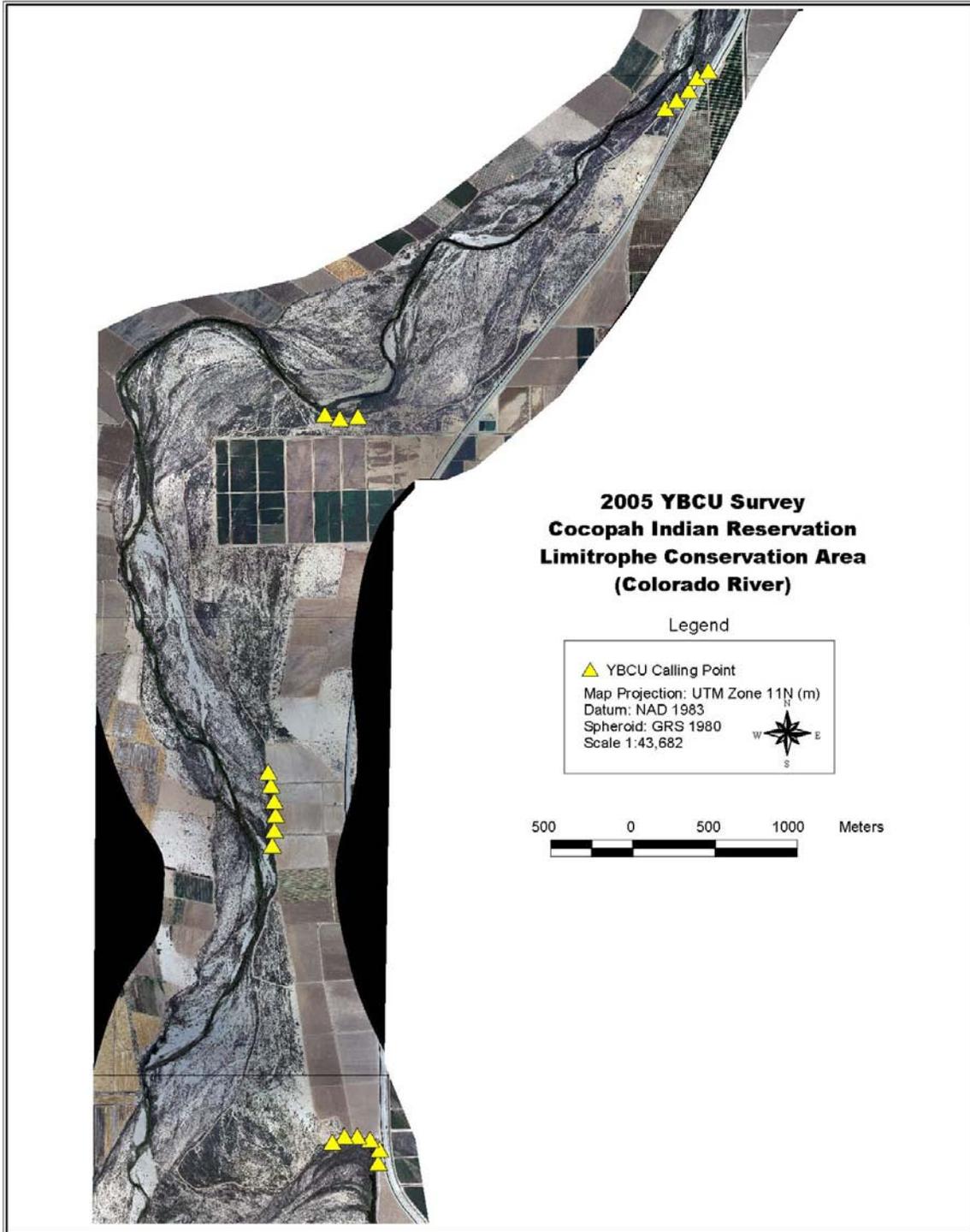
**Appendix 3F.** Yellow-billed Cuckoo survey points, detection locations and occupied cuckoo patch border at the northern points of the Limitrophe Division area sites along the lower Colorado River, AZ, 2005.



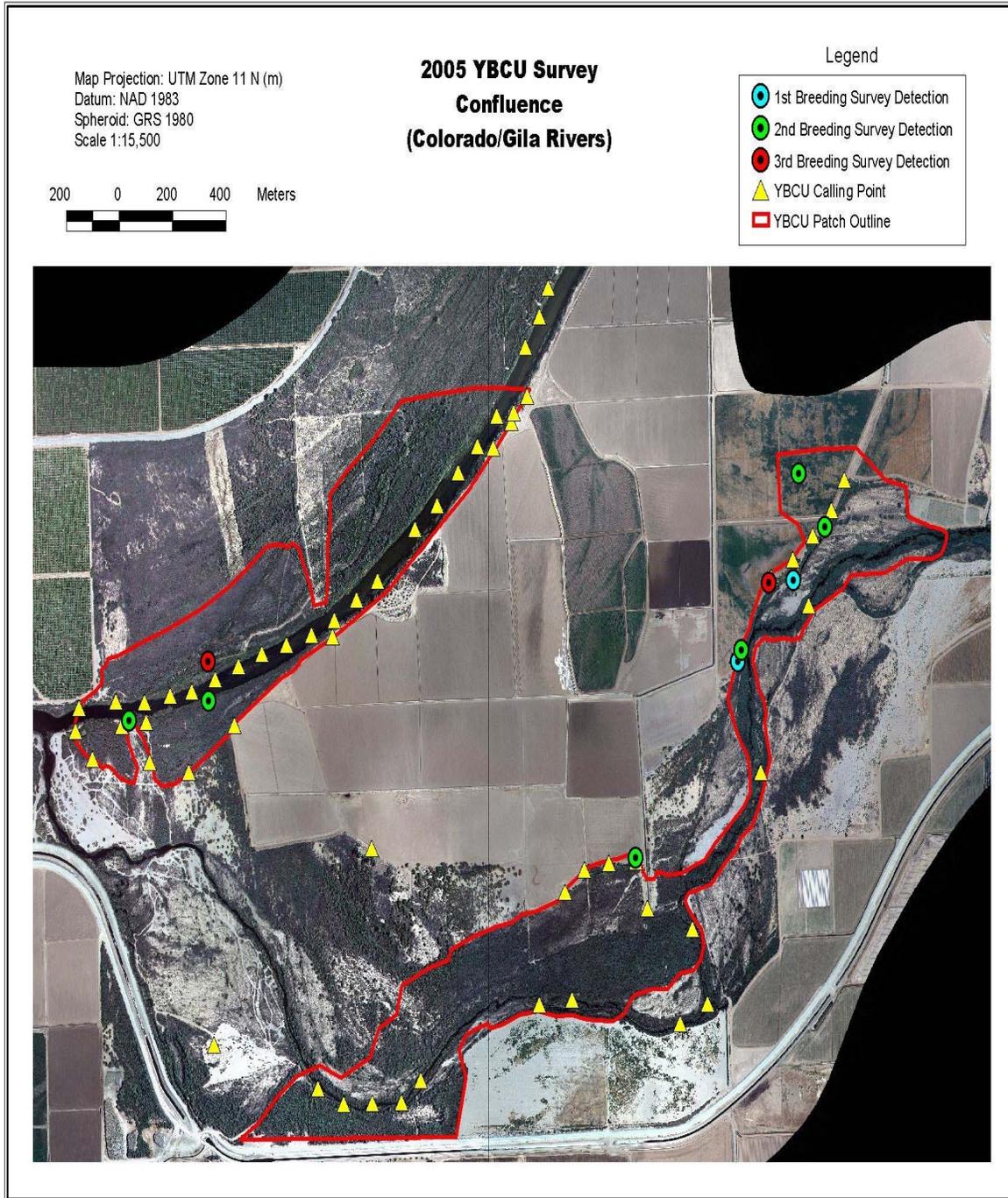
**Appendix 3G.** Yellow-billed Cuckoo survey points, detection locations and occupied cuckoo patch border of at the southern points of the Limitrophe Division area along the lower Colorado River, AZ, 2005.



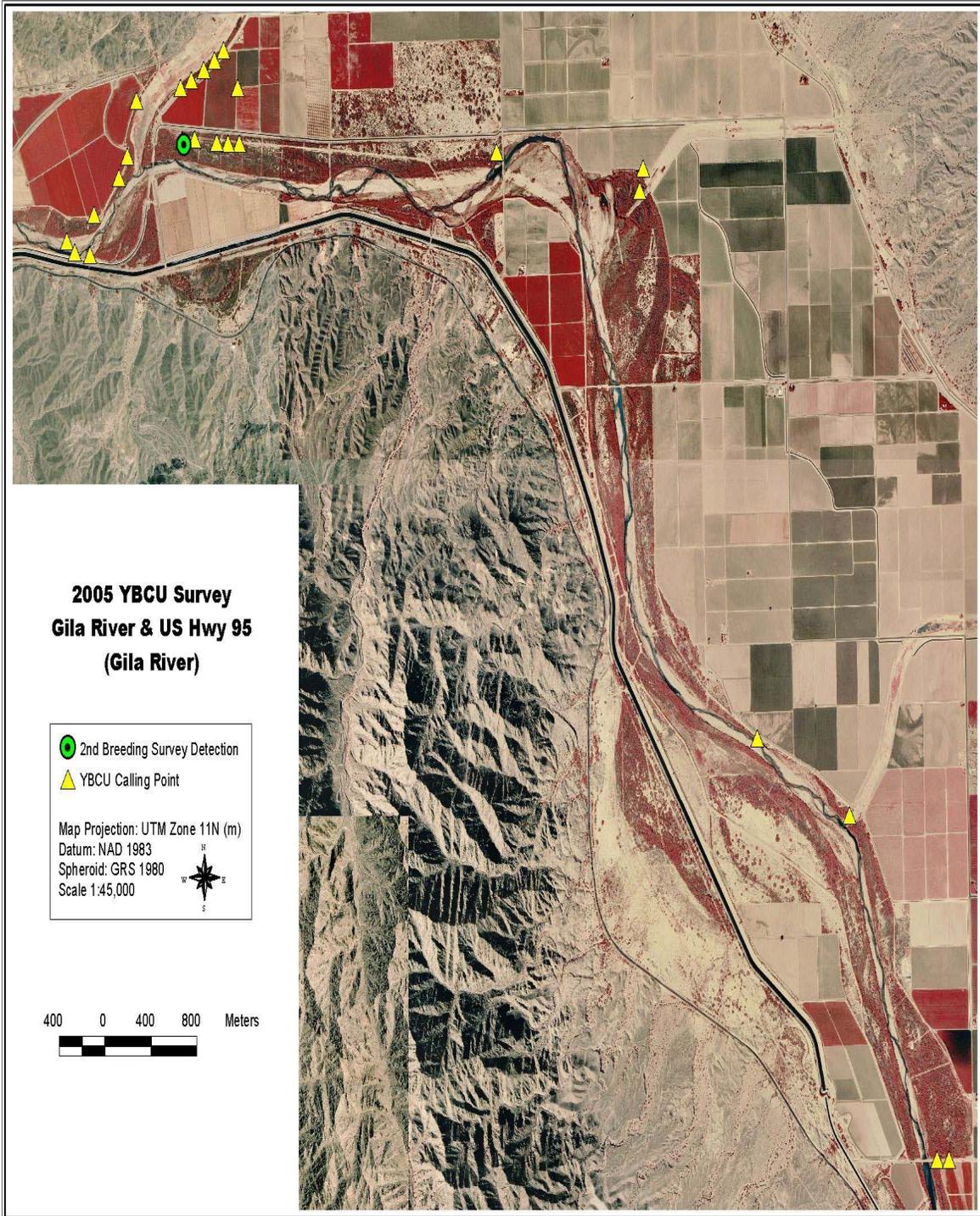
**Appendix 3H.** Yellow-billed Cuckoo survey points at the Cocopah Indian Reservation along the lower Colorado River, AZ, 2005.



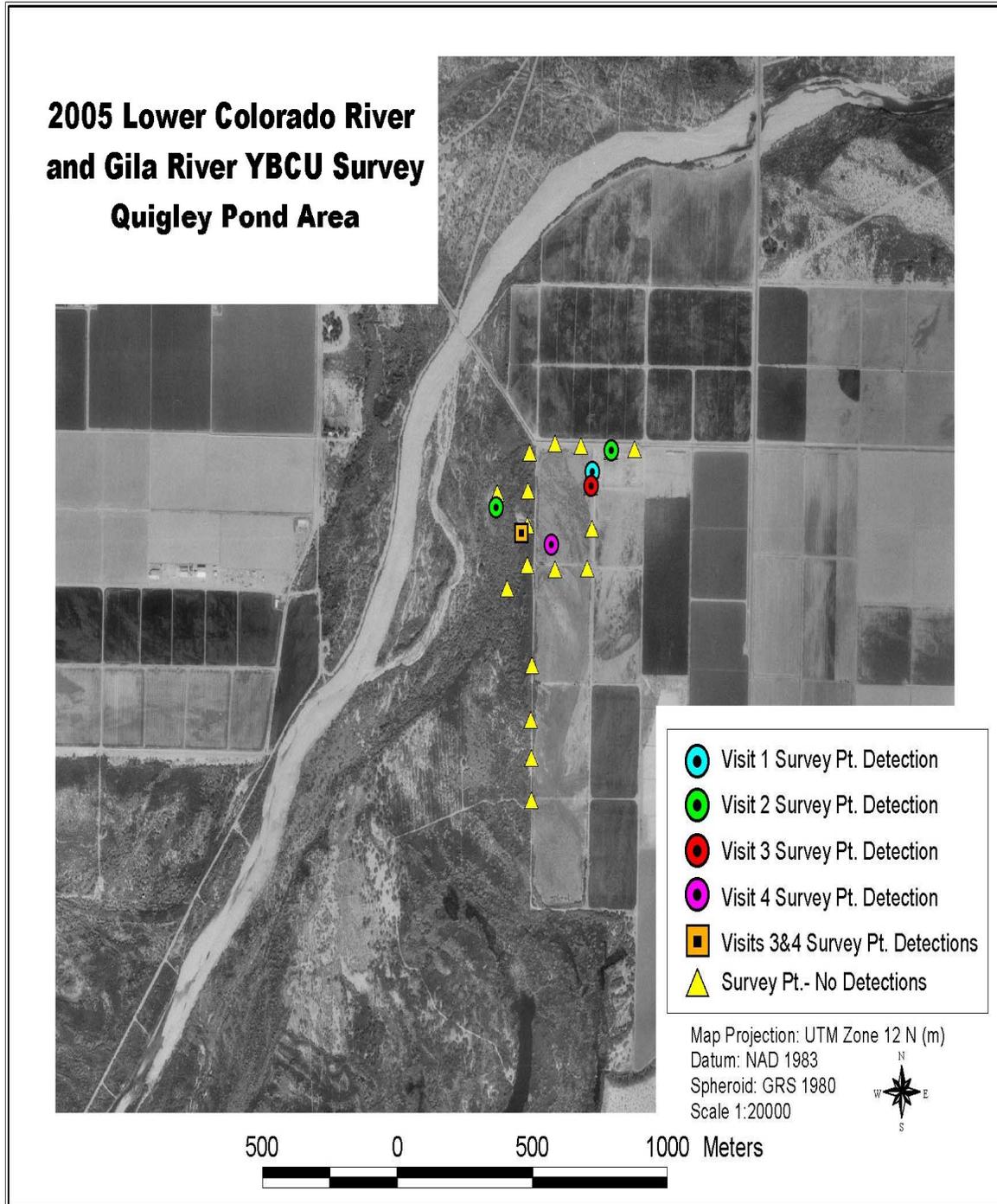
**Appendix 3I.** Yellow-billed Cuckoo survey points, detection locations and occupied cuckoo patch border along the Colorado/Gila River Confluence and Gila River sites, AZ, 2005.



**Appendix 3J.** Yellow-billed Cuckoo survey points and detection location along the Gila River near Highway 95, AZ, 2005.



**Appendix 3K.** Yellow-billed Cuckoo survey points and detection locations at Quigley Pond State Wildlife Management Area along the Gila River, AZ, 2005.



**Appendix 4.** List of bird species observed during 2005 Yellow-billed Cuckoo migration (M) and breeding (B) surveys at: Cibola NWR, Colorado/Gila River Confluence, Gila River near Highway 95, Limitrophe Division areas from Morales Dam – San Luis, Cocopah Indian Reservation, Mittry Lake WMA/Pratt Restoration Area, Quigley Pond WMA, Imperial NWR, AZ-CA, Picacho State Park, CA.

**Cibola NWR Bird Species List, 2005 (Lower Colorado River)**

Common Name	Scientific Name	1M	2M	1B	2B	3B	4B
Great Blue Heron	<i>Ardea herodias</i>	X				X	X
Great Egret	<i>Ardea alba</i>				X		
Green Heron	<i>Butorides virescens</i>					X	
White-faced Ibis	<i>Plegadis chihi</i>					X	
Turkey Vulture	<i>Cathartes aura</i>	X		X			
Mallard	<i>Anas platyrhynchos</i>	X				X	
Osprey	<i>Pandion haliaetus</i>				X		
Red-tailed Hawk	<i>Buteo Jamaicensis</i>					X	
American Kestrel	<i>Falco sparverius</i>				X		X
Gambel's Quail	<i>Callipepla gambelii</i>	X	X	X	X	X	X
Long-billed Curlew	<i>Numenius americanus</i>			X			
California Gull	<i>Larus californicus</i>				X		
Forster's Tern	<i>Sterna forsteri</i>					X	
White-winged Dove	<i>Zenaida asiatica</i>	X	X	X	X	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X	X	X	X
Common Ground-Dove	<i>Columbina passerina</i>				X		
Yellow-billed cuckoo	<i>Coccyzus americanus</i>			X	X		
Great Horned Owl	<i>Bubo virginianus</i>		X			X	
Burrowing Owl	<i>Athene cunicularia</i>		X	X			
Lesser Nighthawk	<i>Chordeiles acutipennis</i>					X	
Gila Woodpecker	<i>Melanerpes uropygialis</i>		X				
Willow Flycatcher	<i>Empidonax traillii</i>		X				
Black Phoebe	<i>Sayornis nigricans</i>					X	
Vermillion Flycatcher	<i>Pyrocephalus rubinus</i>		X				
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>		X				
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>		X	X	X	X	X
Western Kingbird	<i>Tyrannus verticalis</i>	X	X	X	X	X	X
Loggerhead Shrike	<i>Lanius ludovicianus</i>				X	X	X
Common Raven	<i>Corvus corax</i>					X	
Horned Lark	<i>Eremophila alpestris</i>			X			
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>			X			
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>	X	X				

**Appendix 4 cont. (Cibola NWR)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Black-tailed Gnatcatcher	<i>Poliophtila melanura</i>		X			X	
Northern Mockingbird	<i>Mimus polyglottos</i>			X			
Yellow Warbler	<i>Dendroica petechia</i>			X			
Common Yellowthroat	<i>Geothlypis trichas</i>			X	X	X	X
Yellow-breasted Chat	<i>Icteria virens</i>	X	X	X	X	X	X
Western Tanager	<i>Piranga ludoviciana</i>						X
Abert's Towhee	<i>Pipilo aberti</i>	X	X	X			X
Blue Grosbeak	<i>Passerina caerulea</i>		X		X	X	
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	X	X	X	X	X
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>		X				
Great-tailed Grackle	<i>Quiscalus mexicanus</i>	X	X	X	X	X	X
Brown-headed Cowbird	<i>Molothrus ater</i>		X	X	X		
Bullock's Oriole	<i>Icterus bullockii</i>		X	X	X		
House Finch	<i>Carpodacus mexicanus</i>	X		X			

**Imperial National Wildlife Refuge Bird Species List, 2005 (Lower Colorado River)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Least Bittern	<i>Ixobrychus exilis</i>				X		
Green Heron	<i>Butorides virescens</i>				X		
Turkey Vulture	<i>Cathartes aura</i>		X				
Gambel's Quail	<i>Callipepla gambelii</i>			X			X
American Coot	<i>Fulica americana</i>	X		X			X
Black-necked Stilt	<i>Himantopus mexicanus</i>			X	X		
White-winged Dove	<i>Zenaida asiatica</i>	X	X	X	X	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X	X	X	X
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>				X		
Great Horned Owl	<i>Bubo virginianus</i>			X			
Gila Woodpecker	<i>Melanerpes uropygialis</i>	X	X				
Ladder-backed Woodpecker	<i>Picoides scalaris</i>				X		
Western Kingbird	<i>Tyrannus verticalis</i>			X		X	X
Loggerhead Shrike	<i>Lanius ludovicianus</i>			X	X	X	X
Tree Swallow	<i>Tachycineta bicolor</i>					X	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>		X		X		
Verdin	<i>Auriparus flaviceps</i>			X		X	
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>		X				

**Appendix 4 cont. (Imperial NWR)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Marsh Wren	<i>Cistothorus palustris</i>		X	X			
Northern Mockingbird	<i>Mimus polyglottos</i>		X				
Yellow Warbler	<i>Dendroica petechia</i>	X	X	X		X	
Common Yellowthroat	<i>Geothlypis trichas</i>	X	X			X	
Yellow-breasted Chat	<i>Icteria virens</i>	X	X	X	X	X	
Summer Tanager	<i>Piranga rubra</i>				X		
Western Tanager	<i>Piranga ludoviciana</i>				X		
Song Sparrow	<i>Melospiza melodia</i>	X	X	X		X	
Blue Grosbeak	<i>Passerina caerulea</i>		X				
Red-winged Blackbird	<i>Agelaius phoeniceus</i>			X			
Western Meadowlark	<i>Sturnella neglecta</i>		X				
Great-tailed Grackle	<i>Quiscalus mexicanus</i>			X	X		
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X	X	X		
Bullock's Oriole	<i>Icterus bullockii</i>		X		X		

**Picacho State Park Bird Species List, 2005 (Lower Colorado River)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Double-crested Cormorant	<i>Phalacrocorax auritus</i>				X		
Least Bittern	<i>Ixobrychus exilis</i>				X		
Great Blue Heron	<i>Ardea herodias</i>				X		X
Green Heron	<i>Butorides virescens</i>				X		
Turkey Vulture	<i>Cathartes aura</i>				X	X	
American Kestrel	<i>Falco sparverius</i>				X		
Gambel's Quail	<i>Callipepla gambelii</i>		X	X		X	X
American Coot	<i>Fulica americana</i>				X	X	
Black-necked Stilt	<i>Himantopus mexicanus</i>		X				
Willet	<i>Catoptrophorus semipalmatus</i>				X		
Black Tern	<i>Chlidonias niger</i>					X	
White-winged Dove	<i>Zenaida asiatica</i>	X		X	X	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X	X	X	X
Great Horned Owl	<i>Bubo virginianus</i>						X
Lesser Nighthawk	<i>Chordeiles acutipennis</i>				X		
Gila Woodpecker	<i>Melanerpes uropygialis</i>	X		X	X	X	
Ladder-backed Woodpecker	<i>Picoides scalaris</i>				X		
Northern Flicker	<i>Colaptes auratus</i>					X	
Willow Flycatcher	<i>Empidonax traillii</i>		X				
Black Phoebe	<i>Sayornis nigricans</i>	X			X		X
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>			X			X
Western Kingbird	<i>Tyrannus verticalis</i>	X	X		X		
Loggerhead Shrike	<i>Lanius ludovicianus</i>		X	X			X
Bell's Vireo	<i>Vireo bellii</i>	X	X	X		X	
Black-tailed Gnatcatcher	<i>Polioptila melanura</i>	X	X	X	X	X	X

**Appendix 4 cont. (Picacho State Park)**

Common Name	Scientific Name	1M	2M	1B	2B	3B	4B
Northern Mockingbird	<i>Mimus polyglottos</i>					X	
Yellow Warbler	<i>Dendroica petechia</i>	X	X	X			
Common Yellowthroat	<i>Geothlypis trichas</i>		X			X	
Yellow-breasted Chat	<i>Icteria virens</i>	X		X			
Summer Tanager	<i>Piranga rubra</i>			X			
Western Tanager	<i>Piranga ludoviciana</i>				X		
Black-throated Sparrow	<i>Amphispiza bilineata</i>				X		
Blue Grosbeak	<i>Passerina caerulea</i>	X	X	X	X	X	X
Red-winged Blackbird	<i>Agelaius phoeniceus</i>		X				X
Great-tailed Grackle	<i>Quiscalus mexicanus</i>	X	X	X	X		X
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X	X	X	X	X
House Finch	<i>Carpodacus mexicanus</i>	X	X				X
Lesser Goldfinch	<i>Carduelis psaltria</i>			X			

**Mittry Lake WMA/Pratt Restoration Area Bird Species List, 2005 (Lower Colorado River)**

Common Name	Scientific Name	1M	2M	1B	2B	3B	4B
Snowy Egret	<i>Egretta thula</i>				X		
Cattle Egret	<i>Bubulcus ibis</i>				X		
Green Heron	<i>Butorides virescens</i>				X	X	
Turkey Vulture	<i>Cathartes aura</i>		X				
Gambel's Quail	<i>Callipepla gambelii</i>	X		X	X	X	X
Common Moorhen	<i>Gallinula chloropus</i>						X
American Coot	<i>Fulica americana</i>	X			X		
Killdeer	<i>Charadrius vociferus</i>	X	X	X			
Long-billed Curlew	<i>Numenius americanus</i>				X		
White-winged Dove	<i>Zenaida asiatica</i>	X	X	X	X	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X	X	X	X
Inca Dove	<i>Columbina inca</i>					X	
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>				X		
Great Horned Owl	<i>Bubo virginianus</i>			X		X	X
Lesser Nighthawk	<i>Chordeiles acutipennis</i>			X	X	X	
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	X	X		X		
Gila Woodpecker	<i>Melanerpes uropygialis</i>	X	X				X
Ladder-backed Woodpecker	<i>Picoides scalaris</i>		X		X		
Black Phoebe	<i>Sayornis nigricans</i>					X	
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>		X	X	X	X	
Western Kingbird	<i>Tyrannus verticalis</i>		X	X	X	X	X
Loggerhead Shrike	<i>Lanius ludovicianus</i>				X	X	X
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	X	X				
Verdin	<i>Auriparus flaviceps</i>		X			X	
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>		X				

**Appendix 4 cont. (Mittry Lake)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Black-tailed Gnatcatcher	<i>Poliophtila melanura</i>				X		
Yellow Warbler	<i>Dendroica petechia</i>	X	X	X	X		
Common Yellowthroat	<i>Geothlypis trichas</i>	X	X	X	X	X	X
Yellow-breasted Chat	<i>Icteria virens</i>	X	X	X	X		
Western Tanager	<i>Piranga ludoviciana</i>						X
Abert's Towhee	<i>Pipilo aberti</i>	X	X		X	X	X
Song Sparrow	<i>Melospiza melodia</i>			X			
Blue Grosbeak	<i>Passerina caerulea</i>		X	X		X	
Red-winged Blackbird	<i>Agelaius phoeniceus</i>		X		X	X	X
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>		X				
Great-tailed Grackle	<i>Quiscalus mexicanus</i>	X	X	X	X	X	
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X	X			
Hooded Oriole	<i>Icterus cucullatus</i>		X				
Bullock's Oriole	<i>Icterus bullockii</i>		X				
House Finch	<i>Carpodacus mexicanus</i>						X

**Limitrophe Division North-South Bird Species List, 2005 (Lower Colorado River)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Great Egret	<i>Ardea alba</i>		X				
Snowy Egret	<i>Egretta thula</i>		X	X			
Cattle Egret	<i>Bubulcus ibis</i>		X				
Green Heron	<i>Butorides virescens</i>		X		X	X	X
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	X	X	X			
White-faced Ibis	<i>Plegadis chihi</i>				X		
Turkey Vulture	<i>Cathartes aura</i>	X	X			X	
Osprey	<i>Pandion haliaetus</i>		X				
American Kestrel	<i>Falco sparverius</i>		X		X		
Ring-necked Pheasant	<i>Phasianus colchicus</i>	X	X	X	X		
Gambel's Quail	<i>Callipepla gambelii</i>	X		X	X	X	
Common Moorhen	<i>Gallinula chloropus</i>	X	X	X	X	X	X
American Coot	<i>Fulica americana</i>	X	X				
Killdeer	<i>Charadrius vociferus</i>	X	X	X	X		X
Black-necked Stilt	<i>Himantopus mexicanus</i>		X	X	X	X	X
Rock Pigeon	<i>Columba livia</i>		X			X	X
Eurasian Collared-Dove	<i>Streptopelia decaocto</i>						X
White-winged Dove	<i>Zenaida asiatica</i>	X	X	X	X	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X	X	X	X
Inca Dove	<i>Columbina inca</i>	X					X
Common Ground-Dove	<i>Columbina passerina</i>	X	X	X	X	X	X
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>			X	X	X	
Greater Roadrunner	<i>Geococcyx californianus</i>	X	X	X	X		X
Burrowing Owl	<i>Athene cunicularia</i>		X			X	X
Lesser Nighthawk	<i>Chordeiles acutipennis</i>		X			X	
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	X	X	X			

**Appendix 4 cont (Limitrophe)**

Common Name	Scientific Name	1M	2M	1B	2B	3B	4B
Anna's Hummingbird	<i>Calypte anna</i>				X		
Gila Woodpecker	<i>Melanerpes uropygialis</i>	X				X	X
Ladder-backed Woodpecker	<i>Picoides scalaris</i>	X	X	X	X	X	
Willow Flycatcher	<i>Empidonax traillii</i>	X	X				
Black Phoebe	<i>Sayornis nigricans</i>	X	X	X	X	X	X
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>			X	X		
Western Kingbird	<i>Tyrannus verticalis</i>		X	X	X	X	X
Loggerhead Shrike	<i>Lanius ludovicianus</i>				X		
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	X	X	X		X	
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	X	X		X	X	
Verdin	<i>Auriparus flaviceps</i>		X	X			X
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>		X	X	X	X	X
Marsh Wren	<i>Cistothorus palustris</i>		X				
Black-tailed Gnatcatcher	<i>Polioptila melanura</i>	X	X	X	X	X	X
Northern Mockingbird	<i>Mimus polyglottos</i>	X	X	X		X	
Curve-billed Thrasher	<i>Toxostoma curvirostre</i>			X			
Crissal Thrasher	<i>Toxostoma crissale</i>				X		
European Starling	<i>Sturnus vulgaris</i>		X	X		X	
Yellow Warbler	<i>Dendroica petechia</i>			X			
Common Yellowthroat	<i>Geothlypis trichas</i>	X	X	X	X	X	X
Yellow-breasted Chat	<i>Icteria virens</i>			X	X	X	X
Western Tanager	<i>Piranga ludoviciana</i>						X
Abert's Towhee	<i>Pipilo aberti</i>	X		X		X	X
Song Sparrow	<i>Melospiza melodia</i>	X	X	X	X		X
Blue Grosbeak	<i>Passerina caerulea</i>		X	X	X	X	X
Lazuli Bunting	<i>Passerina amoena</i>		X				
Red-winged Blackbird	<i>Agelaius phoeniceus</i>			X	X	X	X
Western Meadowlark	<i>Sturnella neglecta</i>		X				X
Great-tailed Grackle	<i>Quiscalus mexicanus</i>	X	X	X	X	X	X
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X	X	X	X	X
Bullock's Oriole	<i>Icterus bullockii</i>			X	X		
House Finch	<i>Carpodacus mexicanus</i>		X				
Lesser Goldfinch	<i>Carduelis psaltria</i>		X		X		
House Sparrow	<i>Passer domesticus</i>	X	X	X	X	X	

**Cocopah Indian Reservation Bird Species List, 2005 (lower Colorado River)**

Common Name	Scientific Name	2M	1B	2B	3B	4B
Great Egret	<i>Ardea alba</i>		X			
Cattle Egret	<i>Bubulcus ibis</i>				X	
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>				X	
Turkey Vulture	<i>Cathartes aura</i>			X	X	
American Kestrel	<i>Falco sparverius</i>		X			
Ring-necked Pheasant	<i>Phasianus colchicus</i>		X		X	

**Appendix 4 cont. (Cocopah)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Gambel's Quail	<i>Callipepla gambelii</i>	X	X	X	X	X
Killdeer	<i>Charadrius vociferus</i>				X	
Black-necked Stilt	<i>Himantopus mexicanus</i>				X	
White-winged Dove	<i>Zenaida asiatica</i>	X	X	X	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X		X
Inca Dove	<i>Columbina inca</i>		X			
Common Ground-Dove	<i>Columbina passerina</i>		X			
Greater Roadrunner	<i>Geococcyx californianus</i>	X	X		X	X
Burrowing Owl	<i>Athene cunicularia</i>			X	X	X
Lesser Nighthawk	<i>Chordeiles acutipennis</i>				X	
Black-chinned Hummingbird	<i>Archilochus alexandri</i>		X			
Ladder-backed Woodpecker	<i>Picoides scalaris</i>					X
Black Phoebe	<i>Sayornis nigricans</i>				X	X
Western Kingbird	<i>Tyrannus verticalis</i>	X	X	X	X	
Loggerhead Shrike	<i>Lanius ludovicianus</i>					X
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	X	X			
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>	X			X	
Black-tailed Gnatcatcher	<i>Poliopitila melanura</i>		X	X		
Yellow Warbler	<i>Dendroica petechia</i>	X		X		
Common Yellowthroat	<i>Geothlypis trichas</i>		X	X	X	X
Yellow-breasted Chat	<i>Icteria virens</i>		X			
Abert's Towhee	<i>Pipilo aberti</i>			X	X	
Song Sparrow	<i>Melospiza melodia</i>	X	X	X		
Blue Grosbeak	<i>Passerina caerulea</i>					X
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	X	X	X	X
Western Meadowlark	<i>Sturnella neglecta</i>		X			
Great-tailed Grackle	<i>Quiscalus mexicanus</i>		X	X	X	X
Brown-headed Cowbird	<i>Molothrus ater</i>			X	X	
Bullock's Oriole	<i>Icterus bullockii</i>			X		
House Finch	<i>Carpodacus mexicanus</i>		X		X	

**Colorado/Gila River Confluence Bird Species List, 2005**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Pied-billed Grebe	<i>Podilymbus podiceps</i>		X	X	X	X	X
Least Bittern	<i>Ixobrychus exilis</i>		X	X	X		X
Great Blue Heron	<i>Ardea herodias</i>	X	X	X	X	X	X
Great Egret	<i>Ardea alba</i>		X	X	X	X	X
Snowy Egret	<i>Egretta thula</i>		X	X	X	X	X
Cattle Egret	<i>Bubulcus ibis</i>	X		X			
Green Heron	<i>Butorides virescens</i>		X	X	X	X	X
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>		X				X
Turkey Vulture	<i>Cathartes aura</i>	X	X			X	
Mallard	<i>Anas platyrhynchos</i>			X	X		X
Osprey	<i>Pandion haliaetus</i>			X			

**Appendix 4 cont. (Colo/Gila River Confl.)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Red-tailed Hawk	<i>Buteo Jamaicensis</i>					X	
American Kestrel	<i>Falco sparverius</i>		X				
Gambel's Quail	<i>Callipepla gambelii</i>	X	X	X	X	X	X
Common Moorhen	<i>Gallinula chloropus</i>	X	X	X	X	X	X
American Coot	<i>Fulica americana</i>	X	X	X	X	X	X
Killdeer	<i>Charadrius vociferus</i>	X	X		X	X	X
Black-necked Stilt	<i>Himantopus mexicanus</i>		X				
Spotted Sandpiper	<i>Actitis macularius</i>					X	X
White-winged Dove	<i>Zenaida asiatica</i>	X	X	X	X	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X	X	X	X
Inca Dove	<i>Columbina inca</i>	X	X		X	X	
Common Ground-Dove	<i>Columbina passerina</i>	X	X	X		X	X
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>			X	X	X	
Greater Roadrunner	<i>Geococcyx californianus</i>	X	X				X
Great Horned Owl	<i>Bubo virginianus</i>					X	X
Lesser Nighthawk	<i>Chordeiles acutipennis</i>			X			
Black-chinned Hummingbird	<i>Archilochus alexandri</i>		X				X
Anna's Hummingbird	<i>Calypte anna</i>		X	X	X		X
Belted Kingfisher	<i>Ceryle alcyon</i>						X
Ladder-backed Woodpecker	<i>Picoides scalaris</i>		X		X		
Willow Flycatcher	<i>Empidonax traillii</i>	X	X				
Black Phoebe	<i>Sayornis nigricans</i>			X	X	X	X
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	X	X				
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>		X	X		X	X
Western Kingbird	<i>Tyrannus verticalis</i>		X	X	X	X	
Loggerhead Shrike	<i>Lanius ludovicianus</i>				X	X	X
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>					X	
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>			X	X		
Verdin	<i>Auriparus flaviceps</i>		X	X	X	X	X
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>	X	X	X	X	X	X
Rock Wren	<i>Salpinctes obsoletus</i>	X	X				
Marsh Wren	<i>Cistothorus palustris</i>				X	X	
Black-tailed Gnatcatcher	<i>Polioptila melanura</i>	X	X	X	X	X	X
Northern Mockingbird	<i>Mimus polyglottos</i>			X			
Curve-billed Thrasher	<i>Toxostoma curvirostre</i>			X			
European Starling	<i>Sturnus vulgaris</i>					X	
Yellow Warbler	<i>Dendroica petechia</i>		X				
Common Yellowthroat	<i>Geothlypis trichas</i>	X	X	X	X	X	X
Yellow-breasted Chat	<i>Icteria virens</i>	X	X	X	X	X	
Abert's Towhee	<i>Pipilo aberti</i>	X	X	X	X	X	
Song Sparrow	<i>Melospiza melodia</i>	X	X	X	X	X	X

**Appendix 4 cont. (Colo/Gila River Confl.)**

Common Name	Scientific Name	1M	2M	1B	2B	3B	4B
Blue Grosbeak	<i>Passerina caerulea</i>		X	X	X	X	X
Red-winged Blackbird	<i>Agelaius phoeniceus</i>		X	X	X	X	X
Western Meadowlark	<i>Sturnella neglecta</i>		X				
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	X	X	X	X	X	X
Great-tailed Grackle	<i>Quiscalus mexicanus</i>	X	X	X	X	X	X
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X	X	X	X	
Bullock's Oriole	<i>Icterus bullockii</i>		X				
House Finch	<i>Carpodacus mexicanus</i>	X				X	

**Gila River at Highway 95 Bird Species List, 2005**

Common Name	Scientific Name	1B	2B	3B	4B
Great Blue Heron	<i>Ardea herodias</i>	X	X	X	X
Great Egret	<i>Ardea alba</i>	X	X	X	
Snowy Egret	<i>Egretta thula</i>	X		X	
Cattle Egret	<i>Bubulcus ibis</i>			X	
Green Heron	<i>Butorides virescens</i>	X	X	X	X
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>			X	
White-faced Ibis	<i>Plegadis chihi</i>		X		
Turkey Vulture	<i>Cathartes aura</i>	X			
Peregrine Falcon	<i>Falco peregrinus</i>				X
Gambel's Quail	<i>Callipepla gambelii</i>	X	X	X	
Common Moorhen	<i>Gallinula chloropus</i>	X	X		
American Coot	<i>Fulica americana</i>	X			
Killdeer	<i>Charadrius vociferus</i>	X			
Black-necked Stilt	<i>Himantopus mexicanus</i>			X	
Greater Yellowlegs	<i>Tringa melanoleuca</i>			X	
Spotted Sandpiper	<i>Actitis macularius</i>				X
Long-billed Curlew	<i>Numenius americanus</i>	X			
Caspian Tern	<i>Stern caspia</i>			X	
Eurasian Collared-Dove	<i>Streptopelia decaocto</i>				X
White-winged Dove	<i>Zenaida asiatica</i>	X	X	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X	X
Inca Dove	<i>Columbina inca</i>	X	X	X	X
Common Ground-Dove	<i>Columbina passerina</i>	X	X	X	X
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>		X		
Greater Roadrunner	<i>Geococcyx californianus</i>		X	X	
Great Horned Owl	<i>Bubo virginianus</i>				X
Lesser Nighthawk	<i>Chordeiles autipennis</i>			X	
Ladder-backed Woodpecker	<i>Picoides scalaris</i>				X
Black Phoebe	<i>Sayornis nigricans</i>		X	X	X
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>	X			

**Appendix 4 cont. (Gila River at Hwy 95)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>
Western Kingbird	<i>Tyrannus verticalis</i>	X	X		X
Loggerhead Shrike	<i>Lanius ludovicianus</i>	X	X	X	X
Horned Lark	<i>Eremophila aplestris</i>	X			
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	X			
Verdin	<i>Auriparus flaviceps</i>	X		X	
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>	X			
Black-tailed Gnatcatcher	<i>Polioptila melanura</i>	X			X
Northern Mockingbird	<i>Mimus polyglottos</i>	X			
Yellow Warbler	<i>Dendroica petechia</i>	X			
Common Yellowthroat	<i>Geothlypis trichas</i>	X	X	X	X
Yellow-breasted Chat	<i>Icteria virens</i>	X	X	X	X
Abert's Towhee	<i>Pipilo aberti</i>	X		X	X
Song Sparrow	<i>Melospiza melodia</i>	X		X	X
Blue Grosbeak	<i>Passerina caerulea</i>	X	X	X	X
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	X	X	X
Western Meadowlark	<i>Sturnella neglecta</i>	X			
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	X			X
Great-tailed Grackle	<i>Quiscalus mexicanus</i>	X	X		X
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X	X	
Bullock's Oriole	<i>Icterus bullockii</i>	X			
House Finch	<i>Carpodacus mexicanus</i>	X		X	
Lesser Goldfinch	<i>Carduelis psaltria</i>	X			
House Sparrow	<i>Passer domesticus</i>	X	X		

**Quigley Pond WMA Bird Species List, 2005 (Gila River)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Great Blue Heron	<i>Ardea herodias</i>		X		X		
Great Egret	<i>Ardea alba</i>			X			
Cattle Egret	<i>Bubulcus ibis</i>				X		
Green Heron	<i>Butorides virescens</i>				X	X	
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>		X	X			
White-faced Ibis	<i>Plegadis chihi</i>					X	
Gambel's Quail	<i>Callipepla gambelii</i>	X	X	X	X	X	X
Spotted Sandpiper	<i>Actitis macularius</i>						X
Western Sandpiper	<i>Calidris mauri</i>						X
Least Sandpiper	<i>Calidris minutilla</i>						X
White-winged Dove	<i>Zenaida asiatica</i>	X	X	X	X	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X	X	X	X
Common Ground-Dove	<i>Columbina passerina</i>	X	X		X		X
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>			X	X	X	X
Greater Roadrunner	<i>Geococcyx californianus</i>	X		X	X		
Lesser Nighthawk	<i>Chordeiles acutipennis</i>				X	X	
Anna's Hummingbird	<i>Calypte anna</i>		X	X	X		X
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	X	X				

**Appendix 4 cont. (Quigley Pond WMA)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Black Phoebe	<i>Sayornis nigricans</i>				X		
Willow Flycatcher	<i>Empidonax traillii</i>	X					
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>				X		
Western Kingbird	<i>Tyrannus verticalis</i>	X	X	X	X		
Bell's Vireo	<i>Vireo bellii</i>		X	X	X	X	
Warbling Vireo	<i>Vireo gilvus</i>						X
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>				X		
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>				X		X
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>		X				
Crissal Thrasher	<i>Toxostoma crissale</i>				X		
Yellow Warbler	<i>Dendroica petechia</i>	X	X	X	X		
Common Yellowthroat	<i>Geothlypis trichas</i>	X	X	X	X		
Wilson's Warbler	<i>Wilsonia pusilla</i>						X
Yellow-breasted Chat	<i>Icteria virens</i>	X	X	X	X	X	X
Western Tanager	<i>Piranga ludoviciana</i>					X	
Abert's Towhee	<i>Pipilo aberti</i>		X	X	X	X	X
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>					X	
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	X	X	X		X
Western Meadowlark	<i>Sturnella neglecta</i>		X	X	X		X
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>		X				
Great-tailed Grackle	<i>Quiscalus mexicanus</i>	X	X	X	X	X	
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X	X	X	X	X
Bullock's Oriole	<i>Icterus bullockii</i>				X	X	
House Finch	<i>Carpodacus mexicanus</i>						X
Lesser Goldfinch	<i>Carduelis psaltria</i>		X				X

Appendix 4 cont.

Bird Species List for lower Colorado River/Gila River at Yellow-billed Cuckoo Survey Sites, 2005.

Common Name	Scientific Name	1M	2M	1B	2B	3B	4B
Pied-billed Grebe	<i>Podilymbus podiceps</i>		X	X	X	X	X
Double-crested Cormorant	<i>Phalacrocorax auritus</i>				X		
Least Bittern	<i>Ixobrychus exilis</i>		X	X	X		X
Great Blue Heron	<i>Ardea Herodias</i>	X	X	X	X	X	X
Great Egret	<i>Ardea alba</i>		X	X	X	X	X
Snowy Egret	<i>Egretta thula</i>	X	X	X	X	X	X
Cattle Egret	<i>Bubulcus ibis</i>		X	X	X	X	
Green Heron	<i>Butorides virescens</i>		X	X	X	X	X
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	X	X	X		X	X
White-faced Ibis	<i>Plegadis chihi</i>				X	X	
Turkey Vulture	<i>Cathartes aura</i>	X	X	X	X	X	
Mallard	<i>Anas platyrhynchos</i>	X		X	X	X	X
Osprey	<i>Pandion haliaetus</i>		X	X	X		
Red-tailed Hawk	<i>Buteo Jamaicensis</i>					X	
American Kestrel	<i>Falco sparverius</i>	X	X	X	X		X
Peregrine Falcon	<i>Falco peregrinus</i>						X
Ring-necked Pheasant	<i>Phasianus colchicus</i>		X	X	X	X	
Gambel's Quail	<i>Callipepla gambelii</i>	X	X	X	X	X	X
Common Moorhen	<i>Gallinula chloropus</i>	X	X	X	X	X	X
American Coot	<i>Fulica Americana</i>	X	X	X	X	X	X
Killdeer	<i>Charadrius vociferus</i>	X	X	X	X	X	X
Black-necked Stilt	<i>Himantopus mexicanus</i>		X	X	X	X	X
Greater Yellowlegs	<i>Tringa melanoleuca</i>					X	
Willet	<i>Catoptrophorus semipalmatus</i>				X		
Spotted Sandpiper	<i>Actitis macularius</i>					X	X
Long-billed Curlew	<i>Numenius americanus</i>			X	X		
Western Sandpiper	<i>Calidris mauri</i>						X
Least Sandpiper	<i>Calidris minutilla</i>						X
California Gull	<i>Larus californicus</i>	X		X			
Caspian Tern	<i>Sterna caspia</i>					X	
Forster's Tern	<i>Sterna forsteri</i>						
Black Tern	<i>Chlidonias niger</i>					X	
Rock Pigeon	<i>Columba livia</i>	X	X			X	X
Eurasian Collared-Dove	<i>Streptopelia decaocto</i>						X
White-winged Dove	<i>Zenaida asiatica</i>	X	X	X	X	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X	X	X	X
Inca Dove	<i>Columbina inca</i>	X	X	X	X	X	X
Common Ground-Dove	<i>Columbina passerina</i>	X	X	X	X	X	X
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>			X	X	X	X
Greater Roadrunner	<i>Geococcyx californianus</i>	X	X	X	X	X	X
Great Horned Owl	<i>Bubo virginianus</i>	X	X	X		X	X
Burrowing Owl	<i>Athene cunicularia</i>	X	X	X	X	X	X
Lesser Nighthawk	<i>Chordeiles acutipennis</i>		X	X	X	X	
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	X	X	X	X		X
Anna's Hummingbird	<i>Calypte anna</i>		X	X	X		X

**Appendix 4 cont. (All Bird Species)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	X	X				
Belted Kingfisher	<i>Ceryle alcyon</i>						X
Gila Woodpecker	<i>Melanerpes uropygialis</i>	X	X	X	X	X	X
Ladder-backed Woodpecker	<i>Picoides scalaris</i>	X	X	X	X	X	X
Northern Flicker	<i>Colaptes auratus</i>					X	
Willow Flycatcher	<i>Empidonax traillii</i>	X	X				
Black Phoebe	<i>Sayornis nigricans</i>	X	X	X	X	X	X
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	X	X				
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>		X	X	X	X	X
Western Kingbird	<i>Tyrannus verticalis</i>	X	X	X	X	X	X
Loggerhead Shrike	<i>Lanius ludovicianus</i>		X	X	X	X	X
Bell's Vireo	<i>Vireo bellii</i>		X	X	X	X	
Warbling Vireo	<i>Vireo gilvus</i>						X
Common Raven	<i>Corvus corax</i>					X	
Horned Lark	<i>Eremophila aplestris</i>			X			
Tree Swallow	<i>Tachycineta bicolor</i>					X	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	X	X	X	X	X	
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	X	X	X	X	X	X
Verdin	<i>Auriparus flaviceps</i>	X	X	X	X	X	X
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>	X	X	X	X	X	X
Rock Wren	<i>Salpinctes obsoletus</i>	X	X				
Marsh Wren	<i>Cistothorus palustris</i>	X	X	X	X	X	
Black-tailed Gnatcatcher	<i>Poliophtila melanura</i>	X	X	X	X	X	X
Northern Mockingbird	<i>Mimus polyglottos</i>	X	X	X		X	
Curve-billed Thrasher	<i>Toxostoma curvirostre</i>			X			
Crissal Thrasher	<i>Toxostoma crissale</i>				X		
European Starling	<i>Sturnus vulgaris</i>	X	X	X		X	
Yellow Warbler	<i>Dendroica petechia</i>		X	X	X	X	
Common Yellowthroat	<i>Geothlypis trichas</i>	X	X	X	X	X	X
Wilson's Warbler	<i>Wilsonia pusilla</i>						X
Yellow-breasted Chat	<i>Icteria virens</i>	X	X	X	X	X	X
Summer Tanager	<i>Piranga rubra</i>			X	X		
Western Tanager	<i>Piranga ludoviciana</i>				X	X	X
Abert's Towhee	<i>Pipilo aberti</i>	X	X	X	X	X	X
Black-throated Sparrow	<i>Amphispiza bilineata</i>	X			X		
Song Sparrow	<i>Melospiza melodia</i>		X	X	X	X	X
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>					X	
Blue Grosbeak	<i>Passerina caerulea</i>		X	X	X	X	X
Lazuli Bunting	<i>Passerina amoena</i>		X				
Red-winged Blackbird	<i>Agelaius phoeniceus</i>		X	X	X	X	X
Western Meadowlark	<i>Sturnella neglecta</i>		X	X	X		X
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>		X	X	X	X	X
Great-tailed Grackle	<i>Quiscalus mexicanus</i>		X	X	X	X	X

**Appendix 4 cont. (All Bird Species)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>1M</b>	<b>2M</b>	<b>1B</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>
Brown-headed Cowbird	<i>Molothrus ater</i>		X	X	X	X	X
Hooded Oriole	<i>Icterus cucullatus</i>		X				
Bullock's Oriole	<i>Icterus bullockii</i>		X	X	X		
House Finch	<i>Carpodacus mexicanus</i>		X	X		X	X
Lesser Goldfinch	<i>Carduelis psaltria</i>		X	X	X		
House Sparrow	<i>Passer domesticus</i>		X	X	X	X	