



Yellow-Billed Cuckoo Distribution, Abundance, and Habitat Use Along the Lower Colorado and Tributaries, 2006 Annual Report

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Yellow-billed Cuckoo © Bob Steele

Open-File Report 2007-1097

2007

Funded by Bureau of Reclamation, Boulder City, Nev.
Interagency Agreement # 06AA300005

U.S. Department of the Interior
U.S. Geological Survey

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Suggested citation:

Johnson, M.J., Holmes, J.A., Calvo, Christopher, Samuels, Ivan, Krantz, Stefani, and Sogge, M.K., 2007, Yellow-billed cuckoo distribution, abundance, and habitat use along the lower Colorado and tributaries, 2006 annual report: U.S. Geological Survey Open-File Report 2007-1097, 219 p. [<http://pubs.usgs.gov/of/2007/1097/>]

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Executive Summary

This 2006 annual report details the first season of a 2-year study documenting western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) distribution, abundance, and habitat use throughout the Lower Colorado River Multi-Species Conservation Plan boundary area. We conducted cuckoo surveys at 55 sites within 17 areas, between 11 June and 13 September. The 243 visits across all sites yielded 180 yellow-billed cuckoo detections. Cuckoos were detected at 27 of the 55 sites, primarily at the Bill Williams River National Wildlife Refuge AZ sites (n = 117 detections) and the Grand Canyon National Park–Lake Mead National Recreation Area AZ delta sites (n = 29 detections). There were also cuckoos at the Gila River–Colorado River Confluence, AZ (n = 9), Overton Wildlife Management, NV area (n = 7), and Limitrophe Division North, AZ (n = 6); however, at these sites the numbers were much lower and very few of these birds were considered to be paired or breeding. The greatest number of detections (n = 79) occurred during the second survey period (3–23 July). In 2006, we confirmed five breeding events, including one nesting observation and sightings of four juveniles; all confirmed breeding was at the Bill Williams River NWR and Grand Canyon NP–Lake Mead NRA delta sites. The breeding status of most of our detections were unknown, however, we observed 17 adult cuckoos carrying nest material or food and 40 cuckoo detections were detected while counter-calling occurred in same area during repeated surveys.

We used playback recordings to survey for western yellow-billed cuckoos. Compared to simple point counts or surveys, this method increases the number of detections of this secretive, elusive species. It has long been suspected that cuckoos have a fairly low response rate, and that the standard survey method of using playback recordings may fail to detect all birds present in an area. In 2006, we found that the majority (72%) of cuckoo detections were solicited through playback at all study sites. The number of solicited detections peaked during the first half of July and then declined as the breeding season progressed, while the number of unsolicited detections (cuckoos heard calling before playback was initiated) remained fairly constant. The majority (64%) of cuckoo detections, solicited or unsolicited, were aural; 27 percent were both heard and seen and nine percent were visual detections only. Cuckoos in areas with the largest populations had the highest rate of vocalizations before playback or after the first broadcast. In contrast, more than half the responses at sites with fewer cuckoos (with < 10 detections per site) first occurred after three or more playback recordings. This type of baseline information will be used to help refine the survey protocol for 2007, and to create hypotheses that can serve as the foundation for a full-scale evaluation and optimization of this survey technique.

Our preliminary analysis of vegetation data from occupied and unoccupied sites in 2006 focused on general patterns in the distribution and abundance of woody species. The density and composition of woody riparian vegetation varied considerably among the study areas. Much of the variation in tree density was due to the patterns of abundance of trees in the smallest size class (< 8 cm dbh). The dominant tree species at the cuckoo survey sites were cottonwood, willow, and tamarisk. Tamarisk was the most common tree, due to the abundance of small (< 8 cm dbh) individuals. When occupied and unoccupied sites were compared, occupied sites tended to have higher average canopy cover, attributable to higher average cover of the mid and low canopy. The dominant canopy at occupied sites most often consisted of cottonwood or willow trees. In addition, occupied sites in most areas had lower than average total tree density whereas unoccupied sites were denser than average. When densities of trees in different size classes were compared between occupied and unoccupied sites within areas, it appeared that cuckoos did not use areas with the highest density of small trees (< 8 cm dbh), mostly tamarisk.

We also measured microclimate variables (temperature, relative humidity, soil moisture) at occupied and unoccupied sites. Microclimate sampling in 2006 was delayed due to equipment procurement difficulties, so our preliminary conclusions are based on late-year data only; conclusions and patterns may change as new data (especially from the early season) are collected in 2007. Microclimate measurements at Grand Canyon NP–Lake Mead NRA and Bill Williams River NWR showed that locations occupied by yellow-billed cuckoos were generally slightly cooler and more humid than unoccupied sites. This was not true at Cibola NWR, where only mean nocturnal temperature was lower at occupied sites. On average, soil moisture was slightly higher at occupied cuckoo locations. Although microclimate conditions may play a significant role in cuckoo habitat selection or breeding ecology, the factors underlying the microclimate conditions in riparian patches are not currently known.

Chapter 1. Introduction

The Lower Colorado River Multi-Species Conservation Plan

The Lower Colorado River Multi-Species Conservation Program (LCR MSCP 2004) is a coordinated, comprehensive, long-term multi-agency effort to conserve native species, work towards the recovery of endangered species, and protect and maintain wildlife habitat on the lower Colorado River. The LCR MSCP's purposes are to (1) protect the lower Colorado River environment while ensuring the certainty of existing river water and power operations, (2) address the needs of threatened and endangered wildlife under the Endangered Species Act, and (3) prevent the listing of additional species on the lower Colorado River.

The MSCP covers areas up to and including the full-pool elevations of Lakes Mead, Mohave, and Havasu and the historical floodplain of the Colorado River from Lake Mead to the United States–Mexico Southerly International Boundary, a distance of about 400 river miles. Conservation measures currently focus on the area from Hoover Dam to the border, but may include the Grand Canyon in the future.

The LCR MSCP Habitat Conservation Plan (HCP) measures are designed to meet the biological goals for 26 covered species, including the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*). On 25 July 2001 the U.S. Fish and Wildlife Service (USFWS) found that the western yellow-billed cuckoo (i.e., populations west of the continental divide) represents a distinct population segment and warrants protection under the Endangered Species Act as “threatened,” but precluded. Thus, it became a Candidate Species under the Endangered Species Act (USFWS 2002a). The HCP requires the Bureau of Reclamation to restore 5,940 acres of cottonwood (*Populus* spp.)–willow (*Salix* spp.) habitat, including 4,050 acres specifically for the yellow-billed cuckoo. The Science Strategy is designed to provide Reclamation with a science-based process for ensuring that relevant new information generated over the 50-year term of the LCR MSCP (2004) is used to guide implementation of HCP conservation measures. The restoration goals are to create native cottonwood-willow habitat that promotes yellow-billed cuckoo conservation and recovery. Additionally, Reclamation plans to establish a standardized survey protocol and to monitor yellow-billed cuckoos at each restoration site and along the entire lower Colorado River to evaluate long-term trends and the effects of HCP conservation measures.

Specifically, the MSCP conservation measures relative to yellow-billed cuckoos include the following:

1. Conduct surveys and research, as appropriate, to collect information necessary to better define the yellow-billed cuckoo's habitat requirements and to design and manage fully functioning habitats.
2. Monitor and adaptively manage created habitat and evaluate the habitat needs of yellow-billed cuckoos. Reconstructed habitats covered under the MSCP will be managed to maintain their functions as habitat over the term of the LCR MSCP (2004). Created habitat will be monitored and adaptively managed over time to determine the types and frequency of management activities that may be required to maintain created cottonwood-willow and honey mesquite (*Prosopis* spp.) as habitat for yellow-billed cuckoos.
3. Create 1,639 ha (4,050 acres) of yellow-billed cuckoo habitat. Of the 2,404 ha (5,940 acres) of created cottonwood-willow, at least 1,639 ha (4,050 acres) will be designed to provide breeding and migration habitat for cuckoos along the lower Colorado River. A total of 1,093 ha (2,700 acres) will be designed and managed to provide habitat for both yellow-billed cuckoos and southwestern willow flycatchers (*Empidonax traillii extimus*); 546 ha (1,350 acres) will be geared specifically toward the cuckoo.

Breeding Biology, Habitat, Distribution, and Status

Breeding Biology

The yellow-billed cuckoo (*Coccyzus americanus*), a neotropical migrant, summers in northern Mexico, the United States, and southern Canada from early June through early September, and winters primarily in South America (Hughes 1999). Cuckoos begin arriving in Arizona in late May and in California in late May–early June (Bent 1940, Hughes 1999). Nesting activities usually take place between late June and late July, but can begin as early as late May, and continue through late September (Hughes 1999, Laymon et al. 1997, Halterman 2003). Nesting peaks in mid-June through August, later than most co-occurring bird species. The timing of nesting may be triggered by an abundance of cicadas, katydids, caterpillars, and other large prey items, which are the bulk of the species' diet (Hamilton and Hamilton 1965, Rosenberg et al. 1982, Hughes 1999).

Nest building takes 1–2 days. Incubation begins as soon as the first egg is laid, and lasts for 11 days (Hughes 1999). Clutch size in western populations averages just over two eggs, ranging up to four (Laymon et al. 1997). Both adults incubate the eggs and brood the young, and approximately one-third of nests have a third adult assisting with care of the young. Eggs hatch asynchronously, and nestlings are fed large food items such as katydids (*Tettigoniidae*), tree frogs (*Hylidae*), large caterpillars (*Lepidoptera*), and cicadas (*Cicadidae*; Laymon et al. 1997). After fledging at 5–7 days, young are dependent on the adults for approximately 3 weeks (Laymon and Halterman 1985). The number of broods reared per breeding season is unclear. Western populations were thought to be single-brooded (Hamilton and Hamilton 1965, Hughes 1999) but recent observations confirm that at least some individuals are double-brooded (M. Halterman, pers. comm.). Although it is not possible to differentiate between the sexes of cuckoos in the field, it is possible to identify second-year birds (one-year-olds) by their yellow orbital skin (Pyle et al. 1997).

Cuckoos do not exhibit classic territorial behavior, and the behaviors and vocalizations of unpaired birds are unknown (Hughes 1999, Laymon et al. 1997, Halterman 2002). Cuckoos can also move broadly throughout riparian and adjacent habitats, especially early in the season and post-breeding. Such cuckoos may be foraging or evaluating potential breeding sites for the current or subsequent breeding seasons. Similarly, migrating cuckoos can be found in habitats that may not have the same vegetation types or characteristics as those in which they breed. As a result, cuckoos are sometimes detected in non-riparian habitats or within riparian habitats that are not suitable for breeding, so not every location at which a cuckoo is detected can necessarily be considered breeding habitat. The level of adult breeding site fidelity is not well known, but may be relatively low, based on large yearly fluctuations in cuckoo detections at some sites. These natural history traits complicate the determination and characterization of breeding habitat.

Habitat Requirements

Western yellow-billed cuckoos require structurally complex riparian habitats with tall trees and a dense woody vegetative understory (Halterman 1991, Hughes 1999). They breed in large blocks of riparian habitat, particularly woodlands with cottonwoods and willows (Ehrlich et al. 1988, USFWS 2002a). Nesting cuckoos along the Sacramento River in California were estimated to need riparian habitat patches ranging from 10 to 40 ha (Gaines 1974, Laymon et al. 1997, Halterman 1991). In California, dense riparian understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat (Laymon et al. 1997, USFWS 2002a). Nesting in the West occurs almost exclusively close to water and many researchers have hypothesized that the species may be restricted to nesting in moist river bottoms because of humidity requirements for successful breeding (Hamilton and Hamilton 1965, Rosenberg et al. 1991).

Much of what is known about yellow-billed cuckoo habitat use in Arizona is the result of surveys conducted by the Arizona Game and Fish Department (AGFD) and the U.S. Geological Survey's Colorado Plateau Research Station (CPRS) in 1998 and 1999 (Corman and Magill 2000). The AGFD-CPRS surveys show that cuckoo detection rates were highest in cottonwood-willow-ash (*Fraxinus* spp.) and mesquite bosque-hackberry (*Celtis* spp.) habitats. Yellow-billed cuckoos were much less common in Arizona sycamore (*Platanus wrightii*)-cottonwood habitat, sycamore-alder (*Alnus* spp.) habitat, and areas with more than 75 percent tamarisk (*Tamarix* spp.) cover.

Historic Abundance and General Breeding Distribution

Western yellow-billed cuckoos have 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). Comparisons of historic and current information suggest that the yellow-billed cuckoo's range and population numbers have declined substantially across much of the western United States over the past 50 years (USFWS 2002a). Analysis of population trends is difficult because quantitative data, including historic population estimates, are generally lacking. However, rough extrapolations based on both observed densities of yellow-billed cuckoos and historic habitat distribution indicate that western populations were once substantial (USFWS 1985, USFWS 2002a).

Cuckoo populations have suffered severe range contractions during the last 80 years, and have been 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). The yellow-billed cuckoos found in California, Arizona, and southern Nevada are western yellow-billed cuckoos; we use the two names interchangeably when discussing any yellow-billed cuckoo west of the continental divide.

Current Conservation Status in the Western United States

Yellow-billed cuckoo populations have declined throughout the species' range (Hughes 1999); western populations, in particular, have decreased and suffered range reductions during the last 80 years (Laymon and Halterman 1987a, Hughes 1999). In 1986, a petition was filed to establish the western yellow-billed cuckoo as endangered in the states of California, Washington, Oregon, Idaho, and Nevada (Manolis et al. 1986). The published 12-month finding determined that the petitioned action was not warranted, because the petitioned area did not encompass either a distinct subspecies or a distinct population segment. Another petition was filed, resulting in a 25 July 2001 finding by the USFWS that the western yellow-billed cuckoo (i.e., populations west of the continental divide) represents a distinct population segment and warrants protection under the Endangered Species Act as "threatened," but precluded. Thus, it became a Candidate Species under the Endangered Species Act; it is a species for which the Fish and Wildlife Service "has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of the proposed listing regulation is precluded by other higher priority listing activities" (USFWS 2002a). Candidate species receive no statutory protection under the ESA. However, the Fish and Wildlife Service "encourages the formation of partnerships to conserve these species because they are by definition species that may warrant future protection under the ESA" (USFWS 2002a).

Probable factors believed to have contributed to population declines in the West 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 1987a, Hughes 1999). Local extinctions and low colonization rates may also have

contributed to the declines (Laymon and Halterman 1989). Populations may be further limited by food availability for the young; they may not nest if the food supply at the breeding grounds is inadequate (Veit and Petersen 1993) and food availability is likely affected by drought conditions (Newton 1980, Durst 2004, Scott et al. 2004).

The early literature documents dozens of locations in California where the species was reported and/or collected historically, sometimes in apparent abundance, but where they have not been found subsequently (Gaines 1974, Gaines and Laymon 1984, Hughes 1999). During the late 19th century, the California breeding population was estimated to be at least 15,000 pairs (Hughes 1999). However, Gaines (1974) believed that predevelopment cuckoo populations in California were even greater than implied by the early literature, due to the species' inconspicuous behavior and the fact that large tracts of floodplain riparian habitat had already been lost to development before the first records and before accounts of the species began appearing in the literature. Grinnell (1915) described yellow-billed cuckoos as a common breeder, widely distributed in suitable river bottom habitats, but by 1940 the cuckoo was much reduced in population due to declines in the amount and suitability of habitat (Grinnell and Miller 1944, Small 1994). Many modern investigators have concluded that there was a catastrophic decline of the cuckoo in California following the start of the major era of development, beginning about the mid-1800s (Gaines and Laymon 1984, Laymon and Halterman 1987b, Launer et al. 1990). The species was listed as threatened in California in 1971, and was listed as endangered in 1987. Statewide surveys in 1986–87 found that only three areas in California supported 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).

In Arizona, the yellow-billed cuckoo was once considered a fairly common breeding species within riparian forests dominated by cottonwood, willow, and/or mesquite throughout the state (Stephens 1903, Swarth 1905, 1914, Visher 1910, Phillips et al. 1964, Corman and Magill 2000). A 1977 statewide Arizona survey of suitable habitat found an estimated total of 205–214 pairs, with more than half of these along the lower Colorado River (Gaines and Laymon 1984). Past estimates suggested that fewer than 200 pairs remained in 1986 (Laymon and Halterman 1987a), and that fewer than 50 pairs were present 5 years later (Ehrlich et al. 1992). Prompted by continued concern regarding severe population declines, habitat loss, and the lack of statewide data, the USFWS initiated yellow-billed cuckoo surveys in 1998 and 1999. Cuckoos were documented along 25 drainages; an estimated 73 pairs were detected in 1998 and 172 pairs in 1999. The primary concentrations in the state were along the major drainages of the Agua Fria, San Pedro, and Verde Rivers, Cienega and Sonoita Creeks, and the Bill Williams River tributary along the lower Colorado River (Corman and Magill 2000). The Arizona Game and Fish Department has designated the yellow-billed cuckoo as Wildlife of Special Concern in Arizona, and the U.S. Forest Service Regional Forester designated it a Sensitive Species on National Forests within Arizona (AGFD 2002). In addition, it is considered likely to become an endangered species throughout all or a significant portion of its range on the Navajo Nation (Navajo Nation 2005).

Until recently, there were few details about cuckoo distribution and abundance in Nevada. From 2000 to 2004, the Nevada Division of Wildlife (NDOW) coordinated surveys at selected riparian areas in southern Nevada, with results varying greatly by year and site. For example, detections at Warm Springs Ranch and Moapa NWR varied from 19 individuals (4 pairs and 11 single cuckoos) in 2001 (Furtek et al 2002) to just a single bird in 2003 (Braden et al. 2005a) and in 2004 (Braden et al. 2005b). The number of detections at Mormon Mesa Littlefield North and Mesquite Bridge also varied: there were 8 in 2000, 6–10 in 2001, 0 in 2002, and 1 in 2003 (Braden et al. 2005a). From 2000 through 2002, the Southern Sierra Research Station (SSRS) also surveyed four sites in southern Nevada: Clover Creek at Caliente, Upper Pahranaagat Lake, the Virgin River at Littlefield, and Meadow Valley Wash from river miles 39 to 57. SSRS detected one mated cuckoo at Pahranaagat and one individual at Littlefield in 2000 (Halterman 2001), and four pairs and five single cuckoos in 2001 (Halterman 2002); SSRS and NDOW detected one

or two pairs in 2002 (Halterman 2003). The Nevada Natural Heritage Program ranks the western yellow-billed cuckoo as critically imperiled (Nevada Natural Heritage Program 2004)

Historic Population Status along the Lower Colorado River

Yellow-billed cuckoos were once considered abundant throughout the riparian floodplain along the lower Colorado River. Grinnell and Miller (1944) cited only Stephen's (1903) observations of several cuckoos near Needles in 1902. Surveys in mid-June 1964 along the lower Colorado River near Laguna Dam indicated that the density of yellow-billed cuckoos was similar to, and possibly higher than, that on the San Pedro River in southeastern Arizona (Hamilton and Hamilton 1965).

A substantial population of cuckoos was detected north of Laguna Dam during the 1960s and 1970s, suggesting that the Colorado River above Laguna Dam may have been the last stronghold for the yellow-billed cuckoo in California (Gaines and Laymon 1984). Four to twelve cuckoos per season were reported from 1964 to 1975 near Laguna Dam in June and July (Gaines and Laymon 1984). Then using species-specific protocols, Gaines (1977) detected 65 cuckoos along the lower Colorado River on the California side of the river. During surveys in the 1970s and 1980s a dramatic decline of the species was noted along the lower Colorado River. In both Arizona and California, the lower Colorado River and its tributaries 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 along the lower Colorado River between 1976 and 1986, coinciding with habitat loss from high water levels of long duration in 1983–84 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 1976–77 (Halterman 1998). Losses have been greatest at lower elevations, below 900 m (3000 ft) along the lower Colorado River and its major tributaries, which have been strongly affected by upstream dams, flow alterations, channel modifications, and clearing of land for agriculture (Groschupf 1987).

The Bill Williams River National Wildlife Refuge (NWR), a tributary of the lower Colorado River, has had the largest known population of yellow-billed cuckoos since the 1960s. The refuge consists primarily of riparian habitat along the Bill Williams River from Lake Havasu upstream to Planet Ranch, approximately 16 km (10 miles). The riparian habitat is dominated by a cottonwood and willow overstory with a dense understory of cottonwood, willow, and tamarisk. The Bill Williams River NWR riparian habitat is the most continuous unfragmented habitat of its kind in the lower Colorado River basin.

The Bill Williams River NWR cuckoo population was surveyed in 1993, 1994, and 1997–2004 (Halterman and Laymon 1994, 1995; Halterman 1998, 2001, 2002, 2003, 2004). Despite repeated surveys, trends in abundance are difficult to detect from these survey results because the amount of survey effort varied annually, and prior to 2001 survey results were given in terms of estimated numbers of pairs rather than numbers of detections. Estimated pairs ranged from 28 to 30 in 1993, 26 in 1994, 12 in 1997, and 6 to 9 in 1999. A total of 11 nests were found in 1993, 1994, and 1997. Then starting in 2001, results were reported as numbers of detections, which varied from 78 in 2001 to 34 in 2002 and 42 in 2003.

Prior to the 2006 field season, the most recent yellow-billed cuckoo surveys along the lower Colorado River were from 2005 (Johnson et al. 2006). The area of focus began at Cibola NWR and progressed south to San Luis, Arizona, at the United States–Mexico Southerly International Boundary. Additional surveys were conducted along the lower Gila River, at historical detection sites and locations that had appropriate yellow-billed cuckoo habitat. Across all sites and visits, there were 33 cuckoo detections during the 2005 breeding season, with most during July. The survey included behavioral observations and searching for nests in the sites with cuckoo detections; only one pair of cuckoos was confirmed. Breeding was not confirmed, and other detections were of unpaired cuckoos.

Project Objectives

The objectives of this project, initiated in 2006 as part of the LCR MSCP, were to document the distribution, abundance, and habitat use of yellow-billed cuckoos in riparian areas of the lower Colorado River, and to provide information relevant to the Habitat Conservation Plan measures. Yellow-billed cuckoo surveys provide information on their status and distribution, and establish baseline data that can be used for continued monitoring of cuckoo populations and riparian vegetation under the MSCP. There are four specific project objectives.

1. Conduct comprehensive, repeatable surveys in all potentially suitable habitat types within the MSCP project boundary. This work contributes to baseline information on yellow-billed cuckoo populations within these areas. All other avian species encountered within riparian habitats are also recorded.
2. Determine breeding habitat selection and preferences in the areas of concern. This includes identifying the characteristics of habitats used during the breeding season, and comparing characteristics between occupied and unoccupied sites to identify factors that may influence habitat selection by cuckoos.
3. Identify core yellow-billed cuckoo breeding habitat to use as a basis for future habitat expansion through restoration efforts.
4. Evaluate the effectiveness of the current yellow-billed cuckoo breeding season survey protocol (Halterman et al. 2006) and refine it to use over the term of the Multi-Species Conservation Plan.

Document Organization

This document is organized into six chapters. Chapter 2 (Yellow-billed Cuckoo Breeding Surveys) describes the survey design, survey effort, and results of the yellow-billed cuckoo surveys conducted during the 2006 breeding season. Chapter 3 (Survey Methodology) provides descriptive information about how cuckoos responded to our survey methodology. It also poses hypotheses and questions that may prove useful in further optimizing the cuckoo survey protocol. Chapter 4 (Yellow-billed Cuckoo Habitat Vegetation) describes the riparian vegetation sampling design, provides preliminary results on vegetation characteristics in the study areas, and compares characteristics of occupied and unoccupied sites. Chapter 5 (Microclimate Analysis) describes the design and results of microclimate sampling in occupied and unoccupied patches of riparian habitat. Chapter 6 (Riparian Habitat and Yellow-billed Cuckoo Distribution and Status in the Lower Colorado River Basin) describes the history of change in riparian habitat, how this may have contributed to changes in the yellow-billed cuckoo's status and distribution within the region, and the potential effects on the cuckoo of riparian conservation and restoration under the LCR MSCP.

Chapter 2: Yellow-Billed Cuckoo Breeding Surveys

The Lower Colorado River Multi-Species Conservation Plan of 2004 calls for surveys to identify areas that cuckoos use and to collect information necessary to better define the species' habitat requirements. This information will then be used to design and maintain riparian habitat suitable for yellow-billed cuckoos in the LCR MSCP planning area, which should help reduce the likelihood of future federal listing of this species. This project was initiated in the spring of 2006, and cuckoo surveys were conducted, using standardized methodologies, throughout the breeding season.

Survey Location and Selection of Study Sites

The MSCP boundary covers areas up to and including the full-pool elevations of Lake Mead, Lake Mohave, Lake Havasu, and the historical floodplain of the Colorado River from Lake Mead to the United States–Mexico Southerly International Boundary, a distance of about 644 river km (400 river miles). To examine historic yellow-billed cuckoo breeding range and to determine the current range throughout the lower Colorado River basin, we expanded surveys in 2006 to include sites along the Gila River near Yuma, Arizona, the Virgin and Muddy Rivers in Southern Nevada, and Pahrnagat National Wildlife Refuge in the White Water River drainage, Nevada (Figure 2.1).

Specific yellow-billed cuckoo survey sites were selected prior to the initial survey season, using the “look see” method. This method, which was employed during previous AGFD-CPRS surveys (see Bibby et al. 1992), calls for identification of suitable habitats before 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. 2006). We also selected sites based on historical detections, which 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. Many of the yellow-billed cuckoo survey sites selected in 2006 overlap with Southwestern willow flycatcher surveys sites, which have their own site names (Table 2.1). Some of these site names we adopted for the 2006 cuckoo survey, however a number of our sites encompass a much larger area than the flycatcher sites or do not overlap at all, and therefore many names that were established during cuckoo surveys in 2005 (Johnson et al. 2006) remained the same.

Table 2.1. Yellow-billed cuckoo (YBCU) and Southwestern willow flycatcher (SWIFL) 2006 sites names in the Lower Colorado River watershed along the Muddy, Virgin, and White Rivers in Nevada, and the Colorado, Bill Williams, and Gila Rivers in Arizona and California.

YBCU 2006 Site Name	SWIFL 2006 Site Name
Littlefield Bridge	Littlefield North
Mesquite Bridge	Mesquite East
Pahrnagat NWR-Pahrnagat North	Pahrnagat North
Pahrnagat NWR-Pahrnagat East	Pahrnagat Maps to the southwest
Pahrnagat NWR-Pahrnagat South	Pahrnagat South
Pahrnagat NWR-Pahrnagat West	Pahrnagat Maps & Pahrnagat West
Overton WMA-Honeybee Pond	Overton WMA to the south
Overton WMA-Overton North	None
Overton WMA-Overton Tamarisk	Overton WMA
Overton WMA-Overton Wildlife	Overton WMA
Grand Canyon NP/Lake Mead NRA-Spencer Canyon	None
Grand Canyon NP/Lake Mead NRA-RM 274.5	RM 274.5N
Grand Canyon NP/Lake Mead NRA-River Delta/RM 285.3N	RM 285.3N
Grand Canyon NP/Lake Mead NRA-Cuckoo Beach	Kowlp Corner, RM 286N, Twin Coves

Table 2.1 (continued)

YBCU 2006 Site Name	SWIFL 2006 Site Name
Grand Canyon NP/Lake Mead NRA-Iceberg Ridge	Bradley Bay
Grand Canyon NP/Lake Mead NRA-Chuckwalla Cove	Chuckwalla Cove
Lake Mohave-Waterwheel Cove	None
Lake Mohave-Mohave Patch	None
Havasu NWR-Pintail Slough	None
Havasu NWR-North Dike	None
Havasu NWR-Topock Marsh Restoration	None
Havasu NWR-Sacramento Wash	None
Havasu NWR-Havasu Tamarisk	None
Havasu NWR-Topock Tamarisk	None
Bill Williams River NWR-Cave Wash	Site 8
Bill Williams River NWR-Mineral Wash	Beaver Pond, Site 8
Bill Williams River NWR-Big Bend	Mineral Wash & Beaver Pond
Bill Williams River NWR-Gibraltar Rock	None, Site 5 near
Bill Williams River NRA-Sandy Wash	Site 5
Bill Williams River NWR-Fox Wash	Site 5
Bill Williams River NWR-Mosquito Flats	Site 3 & Site 5
Bill Williams River NWR-Saguaro Slot	Site 1, Site 2, Site 3, Site 4, Site 11
Bill Williams River NWR-Bill Williams River Marsh	Site 1, Site 2, Site 4, Site 11
Cibola NWR-Cibola North Restoration	None
Cibola NWR-Cibola Nature Trail Restoration	Cibola Nature Trail
Cibola NWR-Cibola Eucalyptus Restoration	None
Cibola NWR-Cibola South Restoration	None
Cibola NWR-Cibola Cross River	Cibola Site 2
Cibola NWR-Cibola East Side	Cibola Site 1
Picacho SRA	Picacho NW
Imperial NWR-Imperial Paradise	Paradise
Imperial NWR-Imperial South Restoration	Imperial Nursery, Nursery NW
Mittry Lake WMA/Pratt Restoration	Mittry South
Gila/Colorado River Confluence-Colorado River	Gila Confluence North, Gila Confluence West
Gila/Colorado River Confluence-Gila River	Gila Confluence North, Gila Confluence West
Yuma West Wetlands	None
Limitrophe Division-Limitrophe Division North	Morelos Dam
Limitrophe Division-Limitrophe Division South	Gadsden, Hunters Hole
Gila River Highway 95-Gila 95 Bridge	None
Gila River Highway 95-Gila 95 Canal	None
Gila River Highway 95-Gila 95 Tall Tamarisk	None
Gila River/Ligurta	None
Gila River/Wellton	None
Gila River/Quigley Pond WMA	None

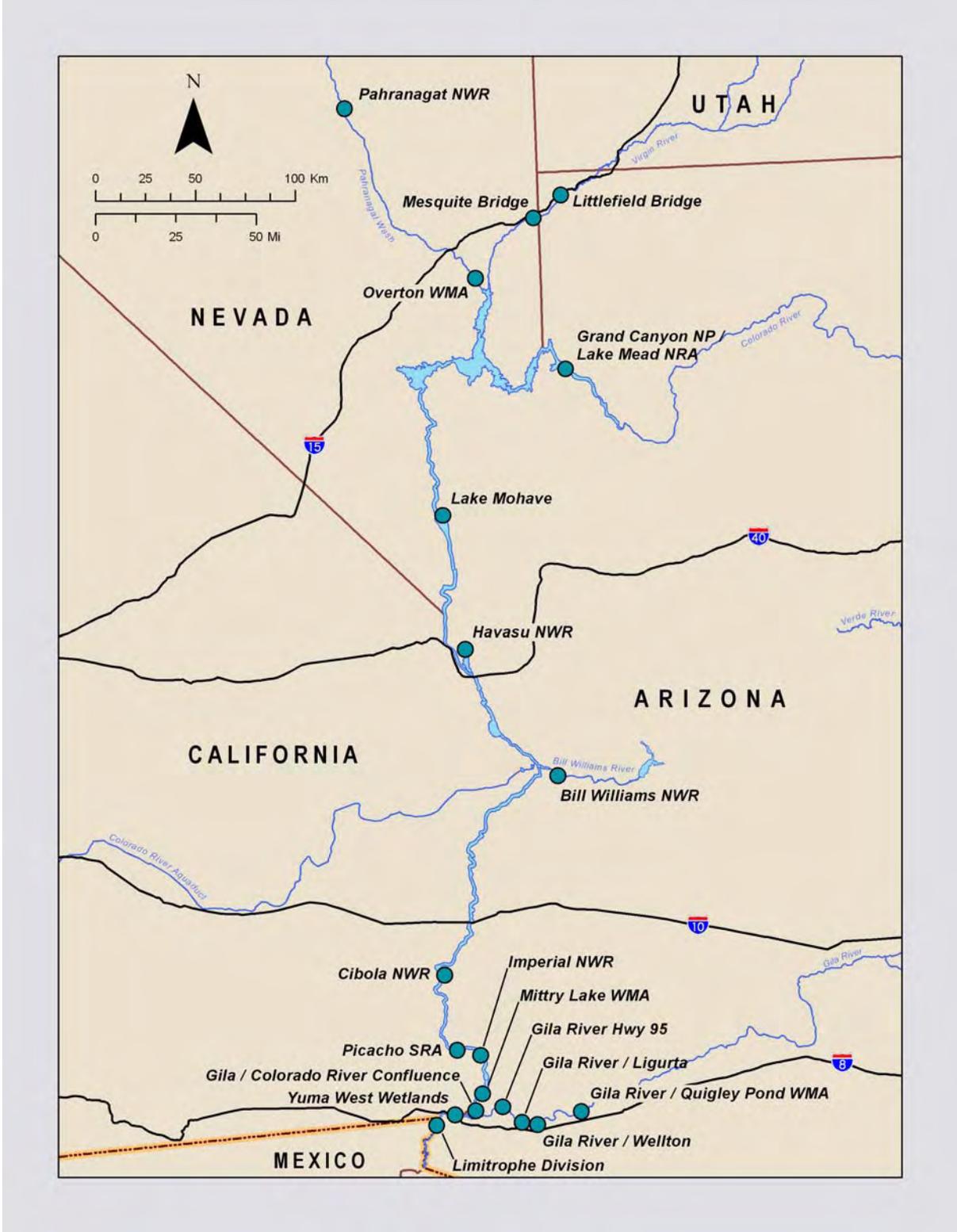


Figure 2.1. Yellow-billed cuckoo survey areas along the Virgin and Muddy Rivers, Nevada and lower Colorado, Bill Williams and Gila Rivers in Arizona and California, 2006.

Survey Methods

Surveys for presence/absence of cuckoos were conducted following established methodologies (Laymon 1998a, 1998b, Halterman et al. 2006, Johnson et al. 2006) that involve a minimum of four surveys distributed throughout the four survey periods between 10 June and 15 September (Table 2.2). Surveys at each site are conducted 10–14 days apart to assure visits throughout the potential breeding season and to increase the likelihood of detecting nesting cuckoos. If cuckoos were detected during the fourth survey period, which might indicate that they may still be breeding at that site, an additional (fifth) survey is then recommended to be conducted during that fourth period. Previous surveys on the Bill Williams River NWR, conducted in mid August, detected several new pairs (Halterman 2002).

Table 2.2. Number of visits and yellow-billed cuckoo detections per survey period in 2006 at sites in the Lower Colorado River watershed along the Muddy, Virgin, and White Rivers in Nevada, and the Colorado, Bill Williams, and Gila Rivers in Arizona and California.

Survey Period	Survey Dates	No. of Visits (n = 243)	Detections (n = 180)
1	6/11–7/02	65	46
2	7/03–7/23	67	79
3	7/24–8/10	67	36
4	8/11–9/13	44	19

We used a taped recording of the yellow-billed cuckoo’s *kowlp* call (Hughes 1999) during survey. Playback equipment was capable of projecting this call at least 100 m (328 ft) with a minimum of distortion. Surveys were conducted from half an hour before sunrise until 11:00 a.m., and were terminated if shade temperatures exceeded 41° C (110° F) 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 m (656 ft) of habitat width. Two hectares is considered an absolute minimum size for cuckoo occupancy, as no cuckoos have been detected attempting to nest in patches that size or smaller in Arizona or California (Corman and Magill 2000, Halterman et al. 2006). Because the playback vocalizations are broadcast loudly enough to cover a large area, surveys do not need always to be conducted within the habitat; however, surveyors should be no more than 15 m (49 ft) from the habitat edge. Choosing a survey point that is not surrounded by dense vegetation provides a better view of a larger swath of the riparian habitat, making it easier to detect cuckoos that respond by flying closer but do not vocalize. Broadcasting the *kowlp* recording from the edge of the habitat enables the call to be broadcast to a larger area. Being on the edge also allows the surveyor to see cuckoos coming in silently to the observer. Areas with small narrow stringers of habitat, steep banks, and backwater sloughs can be surveyed by playing the tape from a boat. We bypassed areas of unsuitable habitat (e.g., a monoculture of young tamarisk or an extensive cobble bar) between patches (i.e., the unsuitable habitat is at least 300 m in extent).

The surveyor initially stopped at a survey point and remained quiet for 1 minute to acclimate to the ambient noise and to listen for spontaneously calling cuckoos. If no cuckoos were heard in this 1-minute period, the surveyor then played the *kowlp* call once, followed by 1 minute of silence to listen for a response. If no detections occurred, this playback-listen sequence was repeated an additional four times. The surveyor then moved 100 m (328 ft) along the transect (by foot or by boat) and repeated the playback-listen protocol. If a cuckoo was detected at the survey point, the surveyor moved 300 m (984 ft) before resuming survey playbacks to reduce the probability of re-detecting or attracting the same bird.

At all survey points we recorded UTM coordinates (using GPS), estimated number of individual cuckoos detected, and estimated distance and direction (i.e., the compass bearing) from the surveyor to the detected cuckoo. At each survey site we also recorded the UTM coordinates of the survey site boundaries (including start and stop points) and provided a description of the habitat and surrounding area.

If a cuckoo was detected, the surveyor attempted to also observe the estimated number of individuals in the habitat patch, the appearance of a nesting pair, the stage of nesting, the cuckoo's use of the habitat patch, possible interactions between individuals, any apparent breeding behavior (e.g., food carry), and types of vocalization. The interpretation of these behaviors was later used to help determine breeding status.

Survey Site Classifications

Based on survey results across all four visits, sites were classified as either unoccupied (a site with no yellow-billed cuckoo detections), detected (a yellow-billed cuckoo had been detected at a site during one visit), occupied (a yellow-billed cuckoo had been detected at a site during at least two survey periods). The presence of a cuckoo at a site does not necessarily equate to pairing and breeding at that location. So at sites with one or more cuckoo detections, breeding was considered "confirmed" only if an attended cuckoo nest was found, copulation was observed, and/or recently fledged young were seen. The detection of multiple cuckoos during a single survey or throughout the season, or of cuckoos carrying food or nesting material, is suggestive of pairing and breeding, but was not considered confirmation.

Nest Searching and Monitoring

Nest searching was conducted either when we detected a cuckoo during a survey or after surveys were completed. To get a vantage point of the possible nesting area, surveyors would move about 100 m (328 ft) back and search every tree for nests (Martin and Geupel 1993). Alternatively, two to three people would work together, triangulating on vocalizations of nesting cuckoos. When a nest was located, we took a GPS reading approximately 10 m (33 ft) from the nest to avoid disturbance; a more accurate reading was taken later when the nest was inactive. Nests were monitored every 5–8 days, and were checked from a distance of 20 m (66 ft) to avoid disturbing the birds. Nest contents were only checked if the adult was not on the nest, at which time we documented the number of eggs and young and estimated nestling age. Determining whether or not a nest actually fledged young can be difficult. In the absence of other cues, we assumed that chicks had fledged successfully if the median date between the last nest check during which the nest was active and the final nest check when the nest was empty was within 2 days of the predicted fledging date (Martin and Geupel 1993).

Spatial Data

From orthorectified color aerial photography provided by the Bureau of Reclamation, we produced digital orthophoto quarter quads (DOQQs) to create aerial maps of study sites (Appendix 4). These maps were overlain with survey points (the coordinate point from which a playback survey was conducted) and cuckoo detections (the coordinate point at which the surveyor estimated the cuckoo to be located). The GIS themes are projected in UTM Zone 11 north; the datums are NAD 1983 (horizontal) and NGVD 1929 (vertical), and the spheroid is GRS 1980. The software used to compile the maps, in meters, was ArcView GIS Version 3.3 (ESRI Corp.).

Survey Results

During the 2006 field season, we surveyed 55 sites between 10 June and 15 September, for a total of 521 survey hours (Appendix 1). The number of surveys varied per site due to the restructuring of survey sites. The 243 visits across all sites resulted in 180 yellow-billed cuckoo detections. The greatest number of detections occurred during the second survey period (3–23 July). At all sites, detections fell off sharply during the fourth breeding-season surveys in late August and early September (Appendices 2 and 3). Cuckoos were detected in 27 of 55 sites (49%), with the highest number at the Bill Williams River NWR area and Lake Mead NRA–Grand Canyon NP area (Figure 2.2; Appendix 2).

Survey sites and results are listed below beginning with the most upstream locations and progressing downstream; this is true both within the entire study area and for each side drainage. Additional details on each site and the associated surveys and detections are presented in Appendix 4.

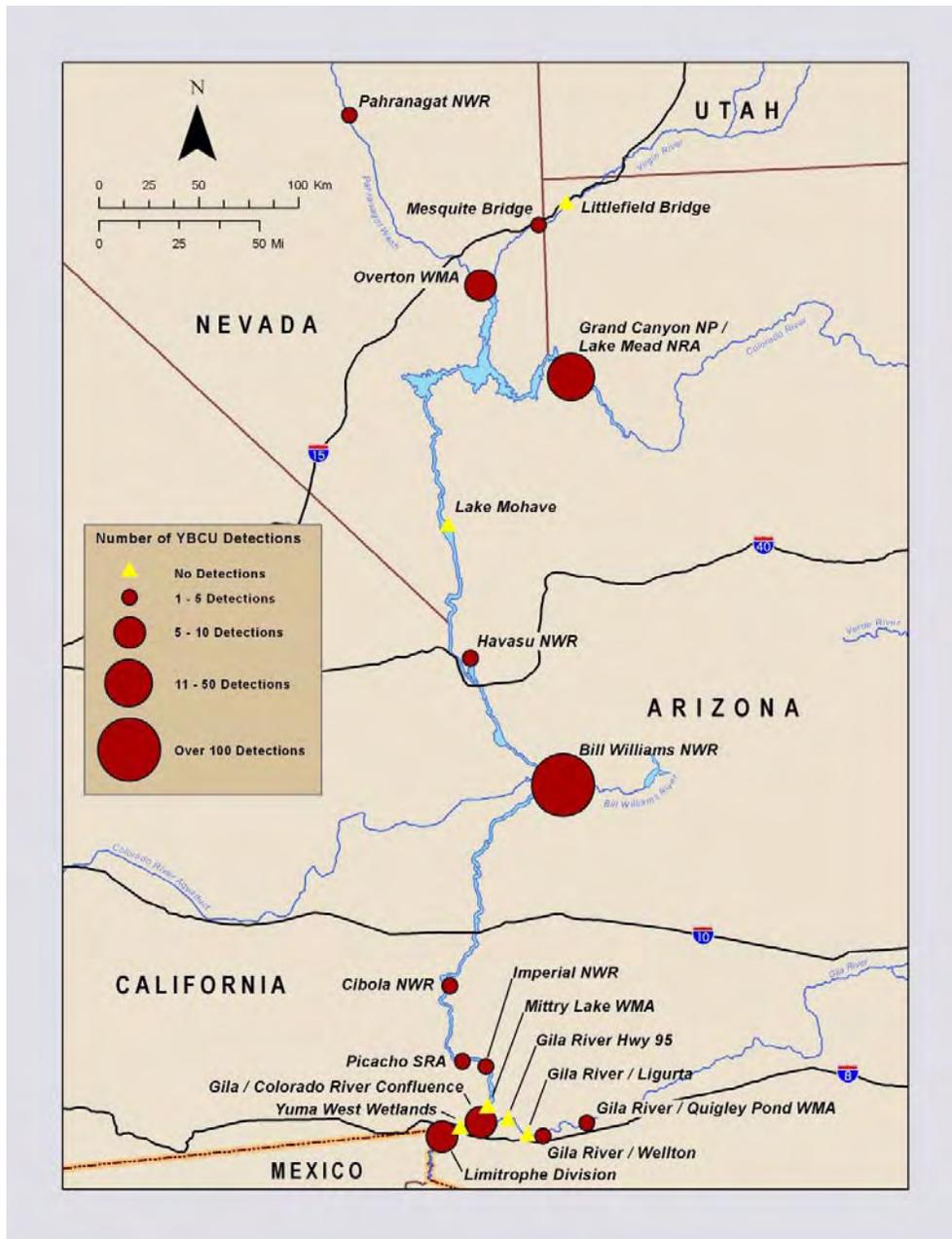


Figure 2.2. Yellow-billed cuckoo survey areas and number of cuckoo detections along the Virgin and Muddy Rivers, Nevada and lower Colorado, Bill Williams and Gila Rivers, Arizona and California, 2006.

Littlefield Bridge, NV (Virgin River, Beaver Dam Wash)

Littlefield Bridge lies along the Virgin River paralleling U.S Highway 91 within the town of Littlefield, approximately 15 km (9.3 miles) northeast of Mesquite, Nevada (Figure 2.1; Appendix 4). The Littlefield Bridge is the only site in this area. It consists of one large patch along the Beaver Dam Wash tributary, and another smaller patch that starts at the bridge and extends 500 m (1,640 ft) downstream along the Virgin River. The habitat consists of Fremont cottonwood (*Populus fremontii*) and Goodding's willow (*Salix gooddingii*), with large tamarisk patches intermixed. Stands of cattail (*Typha* spp.) and arrowweed (*Pluchea sericea*) are also present. Canopy height is 10–14 m (32–46 ft). In 2006, standing water was not present within the site, which is surrounded by urban development and desert upland scrub. Site elevation is 500 m (1,804 ft). Although two cuckoos were detected at this site in 2000 (McKernan and Braden 2001), no cuckoos were detected during the five surveys conducted in 2006 (Table 2.3).

Table 2.3. Dates (2006) for yellow-billed cuckoo surveys along the Virgin River at the Littlefield Bridge site.

Geographic Area	Site Name	Survey Period 1	Survey Period 2	Survey Period 3	Survey Period 4
Littlefield Bridge	Littlefield Bridge	6/20	7/03, 7/15	7/28	9/09

Mesquite Bridge, NV (Virgin River)

The Mesquite Bridge site lies along the Virgin River where Highway 170 crosses the river about 1.3 km (0.8 miles) south of Mesquite, Nevada (Figure 2.1; Appendix 4). The Mesquite Bridge is the only site in this area. The habitat consists of a dense stringer of Fremont cottonwood, Goodding's willow, and tamarisk, mainly along the south side of the Virgin River. Canopy height is 12–14 m (39–46 ft) and site elevation is 465 m (1,526 ft). Standing water was not present within this site in 2006. It is surrounded by agricultural and urban development on both sides of the river. Disturbance due to construction (home sites) has eliminated habitat on the north side of the river.

Cuckoos were detected at this site in 2000 and 2003 (McKernan and Braden 2001, Braden et al. 2005a). We conducted five surveys in 2006 (Table 2.4), and detected a cuckoo at the Mesquite Bridge site during the second survey period. This cuckoo responded immediately and aggressively to the tape playback and it was seen and heard by two observers (Appendix 2). Breeding of this individual cuckoo was not confirmed, and no cuckoos were detected during later surveys.

Table 2.4. Dates (2006) for yellow-billed cuckoo surveys along the Virgin River at the Mesquite Bridge site.

Geographic Area	Site Name	Survey Period 1	Survey Period 2	Survey Period 3	Survey Period 4
City of Mesquite	Mesquite Bridge	6/20	7/03, 7/15	7/28	9/09

Pahranagat National Wildlife Refuge, NV (White River Drainage)

The entire Pahranagat National Wildlife Refuge encompasses 2,177 ha (5,380 acres) in southern Nevada, approximately 15 km (9.3 miles) northwest of Las Vegas (Figure 2.1; Appendix 4). All surveys were conducted at upper Pahranagat Lake, the only site in the refuge with appropriate cuckoo habitat. The habitat consists of patches of native willow and cottonwood at the inflow and outflow of upper Pahranagat Lake, which is fed by Pahranagat Springs just north of the lake. The upland habitat adjacent to the lake is Mohave Desert consisting of creosote and desert scrub. We divided this area into four survey sites (see below), covering the lake perimeter where cuckoo habitat exists.

Yellow-billed cuckoos were detected in 2000 at Pahranaagat NWR (Halterman 2001). We conducted 17 surveys in 2006 (Table 2.5), and detected a single cuckoo at the Pahranaagat North site during the third survey period; no other cuckoos were detected in this area. Breeding of this individual cuckoo was not confirmed, and no cuckoos were detected during later surveys. This bird responded immediately after the first playback with *cooing* and *kowlping* that lasted about an hour (Appendix 2).

Table 2.5. Dates (2006) for yellow-billed cuckoo surveys conducted at Pahranaagat National Wildlife Refuge sites.

Geographic Area	Site Name	Survey Period 1	Survey Period 2	Survey Period 3	Survey Period 4
Pahranaagat NWR	Pahranaagat North	6/27	7/14	7/27	8/12, 8/25
	Pahranaagat East	6/27	7/14	7/27	8/12
	Pahranaagat South	6/27	7/14	7/27	8/12
	Pahranaagat West	6/27	7/14	7/27	8/11

Pahranaagat North (Elevation 1,026 m; 3,366 ft)

The north end of the lake is the best quality cuckoo habitat at the upper Pahranaagat Lake. It consists of Fremont cottonwood and Goodding's willow. Canopy height is 15–18 m (49–59 ft). In 2006, standing water was not present within this site; however, refuge personnel reported that standing water was present in May. This site is surrounded by marsh along the lake's edge, which consists mainly of lizard tail (*Yerba manza*).

Pahranaagat East (Elevation 1,015 m; 3,330 ft)

Pahranaagat East consists of a thin stringer of Fremont cottonwoods and Goodding's willow along the shore of the lake, with intermittent marsh understory. Canopy height is 13–15 m (43–49 ft). Standing water was not present within this site in 2006. The upland habitat adjacent to this site consists of creosote and desert scrub. A dirt road with a number of individual campsites surrounds the patch.

Pahranaagat South (Elevation 1,020 m; 3,346 ft)

Pahranaagat South consists of a relatively small stringer of Goodding's willow, coyote willow (*Salix exigua*), and Fremont cottonwood lining a developed channel that carries the outflow from upper Pahranaagat Lake. The site is bordered by open marsh on the lake side. Tamarisk and Russian olive (*Elaeagnus angustifolia*) form a sparse understory. Canopy height is 16–18 m (52–59 ft). Standing water was not present within this site in 2006. The upland habitat adjacent to this site is creosote and desert scrub. There are extensive trails and campsites in and around this site, with attendant impacts to the riparian vegetation.

Pahranaagat West (Elevation 1,020 m; 3,346 ft)

Pahranaagat West consists of thin stringers of Fremont cottonwoods that are pocketed between marsh areas, mainly along the lake shore. Canopy height is 14–16 m (46–52 ft). Standing water was not present within this site in 2006. The adjacent upland habitat is creosote and desert scrub. A dirt road intersects the site.

Overton Wildlife Management Area, NV (Muddy River)

The Overton Wildlife Management Area (WMA) consists of 7,146 ha (17,657 acres) located at the inflow of the Muddy River into the Overton Arm of Lake Mead (Figure 2.1; Appendix 4). The habitat comprises seasonally flooded marshes, dense tamarisk, willow patches, scattered mesquite thickets, and isolated stringers of Fremont cottonwood. There are agricultural fields and ponds throughout the WMA, which are managed for waterfowl. Numerous roads intersect the refuge, for easy access to all sites. Four survey sites