Version 3.4

Western Yellow-billed Cuckoo Natural History Summary and Survey Methodology

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Background

This natural history summary and description of methodologies is intended to provide consistent and standardized methods for collecting, analyzing, and reporting survey data for the Yellow-billed Cuckoo (*Coccyzus americanus*) in western states, particularly California, Nevada, and Arizona. It is intended to be used by researchers and trained surveyors for Yellow-billed Cuckoos. In addition to this document, standard recordings for survey broadcast are available from M. Halterman (contact information listed above). Please note that State permits for surveying for Yellow-billed Cuckoos may be required (it is a requirement in Arizona and California). Contact the respective state wildlife agency for more information. Additionally, it is necessary for all researchers to obtain permission from private landowners, tribal governments, and government agencies prior to conducting research on their land.

Natural History Summary

Changes in Historical Breeding Distribution and Abundance

Yellow-billed Cuckoos historically bred throughout riparian systems of western North America from southern British Columbia to Mexico, as well as in most of the eastern United States (Hughes 1999). In western North America cuckoos inhabited the deciduous riparian woodlands once lining most rivers and streams. Since historic times Yellow-billed Cuckoo populations appear to have declined dramatically (Roberson 1980, Gaines and Laymon 1984, Laymon and Halterman 1987) and cuckoos were extirpated over much of the western range, including British Columbia and Washington (Hughes 1999). It is difficult to determine the historic abundance of Yellow-billed Cuckoos in the west, due to the limited number of observers and the secretive nature of the species. Grinnell (1915) described the species as a common breeder in California, but reported that, by 1940, populations were much reduced (Grinnell and Miller 1944). In Arizona, the cuckoo was historically widespread and locally common (Phillips et al. 1964, Monson and Phillips 1981, Groschupf 1987), but studies along the lower Colorado River found rapid declines between 1975 and 1983 (Rosenberg et al. 1991). They occur irregularly in Oregon (Marshall et al. 2003), and have very small populations in Idaho (Taylor 2000) and Nevada (Halterman 2000).

Reasons for Decline

Major declines in the twentieth century among western populations are likely due to loss and fragmentation of riparian habitat from inundation by reservoirs, flood control activities (e.g., channelization), conversion to agricultural and urban development (Gaines and Laymon 1984, Hughes 1999), and associated local extinctions and low colonization rates (Laymon and Halterman 1989, Hughes 1999). Recent declines in nesting populations of cuckoos in California and Arizona are likely a function of continued degradation and loss of breeding habitat. Food availability, pesticide accumulation, and habitat loss on the wintering grounds may be other factors contributing to population declines (Laymon and Halterman 1987a, 1990). Factors affecting small, isolated populations may also be playing a role in declines, although this has not been studied.

Current Conservation Status

In 2001 the US Fish and Wildlife Service (USFWS) determined that western populations of the Yellow-billed Cuckoo comprised a "distinct population segment" and qualified as a candidate species warranting listing under the Endangered Species Act (ESA) of 1973, as amended. 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). The Yellow-billed Cuckoo is on the USFWS national list of birds of conservation concern in USFWS Region 1a and 2, and in Bird Conservation Region 5 (Northern Pacific forests-U.S. portion only), 9 (Great Basin), 10 (Northern Rockies-U.S. portion only), 16 (Southern Rockies/Colorado Plateau), 32 (Coastal California-U.S. portion only), 33 (Sonoran and Mojave Deserts-U.S. portion only), 34 (Sierra Madre Occidental-U.S. portion only), and 35 (Chihuahuan Desert-U.S. portion only; USFWS 2002b).

The Yellow-billed Cuckoo is listed as endangered by the California Department of Fish and Game (CDFG 2000), a species of concern by the Arizona Game and Fish Department (AGFD 2002), Colorado Division of Wildlife (CDW 2006), and Montana Fish, Wildlife and Parks (MFWP 2004), a species of special concern by Idaho Fish and Game (IFG 2006), a sensitive species by the Oregon Department of Fish and Wildlife (ODFW 1997) and Utah Division of Wildlife Resources (UDWR 2006), and a state candidate species in Washington (WDFW 2005).

Statewide Surveys in California and Arizona

Statewide surveys in California were conducted in1986 and 1987 by Laymon and Halterman (1987b) for the California Department of Fish and Game. The southern half of the state was surveyed in 1986 and the northern half in 1987. Breeding pairs of cuckoos were detected along the upper Sacramento River, lower reach of the Feather River, South Fork Kern River, Santa Ana River (Prado Flood Control Basin), Amargosa River near Tecopa, and Lower Colorado River. Populations were concentrated mainly along the Sacramento River from Red Bluff to Colusa, along the South Fork of the Kern River, and portions of the Lower Colorado River. Based on the 1986 and 1987 surveys, a total of 31-42 pairs were estimated to breed in California (Laymon and Halterman 1987). This represented a decline of 65-81% from the 122-163 pairs estimated in a previous statewide survey conducted in 1977 (Gaines and Laymon 1984, Laymon and Halterman 1987).

The first statewide surveys in Arizona were conducted in 1998 and 1999 by AGFD and the USGS Colorado Plateau Research Station (CPRS). These surveys were mostly confined to publicly owned lands, and included few surveys on private lands. During these surveys, Yellow-billed Cuckoos were documented along 25 drainages. An estimated 73 pairs were found in 1998 and an estimated 172 pairs were detected in 1999. The survey methodologies (i.e., counting detections 100 meters apart as separate individuals and estimating pairs based on vocalization type) may have led to an overestimation of the number of cuckoos; these methods have since been modified (as described below). The major concentrations of cuckoos in Arizona were along the Agua Fria, San Pedro, and Verde rivers, and Cienega and Sonoita creeks (Corman and Magill 2000). Surveys conducted between 2001 and 2006 on the

San Pedro Riparian National Conservation Area, Arizona found an estimated 60-100 pairs of cuckoos (M. Halterman unpublished data).

Breeding Chronology and Biology

In California, nesting occurs between late June and late July, but may begin as early as late May, and continue into late August. Cuckoos have been observed in the state as late as mid-September (M. Halterman, pers obs). In Arizona and New Mexico, nesting activities may begin in late May, but typically begin in mid-June and end in late August (Hughes 1999). In southeastern Arizona, nesting may continue into September (Corman and Magill 2000, Halterman 2002).

Little is known about cuckoo courtship, but nest building may take as little as half a day, with additional material added to the nest as incubation proceeds (Halterman 2004). Eggs (which are a pale bluish-green) are usually laid every second day, but the interval may be highly variable (Hughes 1999).

Eggs are incubated from 9-11 days (Hughes 1999) and young cuckoos fledge 5-8 days after hatching. They continue to be dependent on the adults for approximately the next 14-21 days, seeking food from adults by giving short "cuk-cuk-cuk" calls. At approximately 14 days, fledglings give louder calls, but lack the full range of adult vocalizations. The fledglings may continue to be dependent on the adults until they are 28-32 days old, and can be distinguished by the nearly total lack of yellow coloration on the bill, and slightly paler color on the tail (dark gray instead of black; Pyle 1997).

During the breeding season, cuckoos use a large home range, varying in size between 5 and 20 hectares (ha), with 10 ha being the average in California and western Arizona (Halterman 2002). Smaller home ranges were observed in Nevada and central and southeastern Arizona (Halterman 2002).

Breeding Habitat Use

Western Yellow-billed Cuckoos breed in large blocks of riparian habitat, particularly riparian woodlands with cottonwoods and willows (USFWS 2001). In California, Halterman (1991) found that three factors explained 47% of the variance in the density of cuckoos nesting on the Sacramento River: patch size, extent of riparian habitat in 8-kilometer river sections, and presence of low woody vegetation. In Arizona, occupancy rates (the percent of patches surveyed with at least one cuckoo detection) were highest in cottonwood/willow/ash/ mesquite habitat (70.7% occupancy), cottonwood/willow/ash/mesquite/with less than 75% tamarisk habitat (60.7% occupancy), and mesquite bosque/hackberry habitat (60.0% occupancy). 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).

Vocalizations

Yellow-billed Cuckoo vocalizations are described by Hughes (1999) and others (Bent 1940, Hamilton and Hamilton 1965, Potter 1980). Known calls include a "coo" call, with or without "kowlp" notes, and variations of the "kowlp" call. A very soft "coo" call seems to be a call given by an adult to nestlings (T. Gallion, pers. comm.). Adults also give an alarm call consisting of a low, "wooden knocking" call, continued until the threat leaves the area. This call is typically given in the vicinity of a nest.

Cuckoos are more vocal and responsive to taped calls during courtship and nest-building than after incubation begins, however they will still occasionally call from the nest (Halterman 2001). During courtship, pairs move about their home range together, calling back and forth. After the eggs hatch, and for the 6-7 day brooding period, the adults may become more vocal and responsive to taped calls. The young are dependant on the adults for about three weeks post-fledging, and the adults seem to be less vocal during this time (Halterman 2004).

Survey Methodologies

Yellow-billed Cuckoo Survey Design

The methodology we use was originally developed in cooperation with the AGFD and the USGS CPRS in Flagstaff, AZ, and using information provided by Laymon (unpublished 1998). Since the statewide surveys in Arizona and California (described above), the methodology has been modified slightly, as described below, and is currently in use in California, Arizona, Nevada, Utah and New Mexico.

Timing and Number of Visits

Performing repeated surveys during the early to mid-nesting season maximizes the probability of detecting cuckoos and determining their breeding status. This survey protocol requires a minimum of four surveys at each site, one during each period outlined below, to document presence of Yellow-billed Cuckoos. Successive surveys must be at least 12 days apart; surveys conducted more closely are not considered to be in separate survey periods. This spacing ensures full coverage during the different stages of the nesting cycle and increases the probability of detecting the maximum number of individuals. Successive surveys should be conducted no more than 20 days apart.

Survey 1: – Early to late June:

The timing of this survey is intended to coincide with the period when cuckoos arrive on their breeding grounds. Not all cuckoos may have arrived by this time, however, and migrants may still be present and calling during this period. Survey period 1 is also the earliest time during which nesting activity may begin in most years.

Survey 2: Late June to mid-July:

Cuckoos detected during this time period are more likely to be breeders than during the previous period. (e.g., if detected during survey 1 but not survey 2, the first detection may have been a migrant). Detecting a cuckoo at the same site on surveys 1 and 2 increases the probability that there is a breeder at that site (but does not confirm it). Few migrant Yellow-billed Cuckoo should still be passing through; therefore, any cuckoos detected are probably breeders or non-breeding floaters. Surveyors should watch closely for nesting activity.

Survey 3: Mid-July – early August:

Yellow-billed Cuckoos should have arrived on their breeding grounds by this time. Most breeding cuckoos will have initiated nesting activity during this survey period. It is also possible that small numbers of juveniles from earlier nests may be detected during this period.

Survey 4: Early August – early September:

This survey period is recommended, as studies on the Bill Williams River National Wildlife Refuge (NWR) found several new cuckoo locations during a survey conducted in mid to late August (Halterman 2002). A fifth survey is recommended in early to mid September, if time allows, in order to determine if cuckoos are still breeding and how long cuckoos may use the area before migrating. Most cuckoos detected during this period will be adults and fledglings.

If presence/absence surveys are being conducted, fewer than four visits may be required. If breeding confirmation is required, more visits will be needed, and it may not be possible to definitively verify breeding activity during a season. If Yellow-billed Cuckoos are observed carrying either nest material or copulating, this is conclusive verification of breeders as opposed to migrants. Four visits are the minimum necessary to determine with 80% confidence that Yellow-billed Cuckoos are not breeding at a site in a given year (Halterman *in prep*).

Within a study area all potentially suitable habitat patches should be surveyed. A patch is defined as an area of riparian habitat two ha or greater in extent that is separated by at least 300m from an adjacent patch of apparently suitable cuckoo habitat. Two ha is considered an absolute minimum size for cuckoo occupancy, as no cuckoos have been detected attempting to nest in patches of this size or smaller in Arizona or California (Corman and Magill 2000, Halterman et al. 2001). Suitable habitat falls into two types: 1. multi-layered riparian vegetation, with riparian canopy trees (at least a few within the patch) and at least one layer of understory vegetation; 2. Mesquite and/or hackberry bosque. Depending on the goals of the study, consider surveying tamarisk (*Tamarix* spp.)-dominated patches with little or no native riparian trees, as Yellow-billed Cuckoos have been reported using these areas and more information on habitat use is needed.

Surveys do not need to be conducted within the habitat, but surveyors should be no more than 10m from the habitat edge. Areas with small, narrow stringers of habitat, steep banks, and backwater sloughs can be surveyed by playback from a boat. Be sure to cover the habitat thoroughly during each visit, with transects through the habitat when it exceeds 200m in width. The surveyor can skip over areas of unsuitable habitat (e.g., a monoculture of young

tamarisk, an extensive cobble bar) between patches (i.e., the unsuitable habitat is at least 300 m in extent).

When developing a survey schedule for multiple surveyors, care should be given to scheduling so that multiple surveyors do not overlap areas, and the risk of a surveyor mistaking a broadcast call for a cuckoo is eliminated.

Conducting Yellow-billed Cuckoo Surveys

Surveys should be conducted from sunrise until temperatures reach 40 degrees C (104 F), or until 1200, whichever comes first. Surveys should not be conducted if sustained winds exceed 10 mph (Beaufort = 3) with stronger gusts, or if it is raining hard enough to make hearing difficult. Depending on project objectives, additional evening surveys can be conducted from 1700 to 1930. Surveys should not be conducted if excessive noise (i.e. construction, powerboats, jet skis, etc.) might prevent detection of cuckoos.

Standardized forms should be used during surveys (Appendices 1, 2 and 3). Crews should be instructed in using the forms and correctly describing cuckoo behavior and vocalizations. Data collected include: time and date of surveys, number of survey stops, hectares of habitat surveyed (this may be calculated later using GIS tools), land ownership, and universal transverse mercator (UTM) locations of each survey patch. Also, we suggest recording the UTM location of each survey point within a site (using GPS units, see below).

Equipment

The following equipment is necessary to conduct the surveys:

(1) Global Positioning System (GPS) unit - for determining survey coordinates and verifying location of survey plots on maps.

(2) Maps of the area; the most recent aerial photos are most useful, but older aerial maps or USGS topographical maps can also be used. Aerial photographs can significantly improve your surveys by allowing you to accurately target your efforts, thus saving time (and energy) in the field. Check with local planning offices and/or state/federal land management agencies for availability. Take color xerox copies, not the original aerials, with you in the field. (a marked copy to be attached to survey data sheet). Be sure to always submit a copy of a geo-referenced map with survey area and cuckoo sightings clearly marked.

(3) Lightweight, portable audio playback device (e.g. CD, mp3 or tape player) and portable amplified speakers with adequate volume and clarity to carry 100m.

(4) Standardized survey forms (bring more copies than you think you need).

(5) Yellow-billed Cuckoo CD or tape (if applicable); two or more CDs or tapes per surveyor (electronic equipment gets damaged and wears out in the field, extras are very important).

(6) Clipboard and permanent (waterproof) ink pen (we recommend recording survey results directly on the survey data form, to assure that you collect and record all required data).

(7) Binoculars and bird field guide.

The following equipment is recommended:

(1) Extra audio playback device and batteries (dirt, water, dust and heat often cause equipment failure, and having backup equipment avoids having to abort a survey).

(2) Camera and film (for habitat photos - especially at sites where cuckoos are found).

(3) Survey flagging (coordinate colors with local land managers) - for marking survey sites and/or areas where cuckoos are detected. Check with the local land owner or management agency before flagging sites.

All survey results (both negative and positive) should be recorded directly on data forms when possible. These data forms have been designed to prompt surveyors to record key information crucial to interpretation of survey results and characterization of study sites. Even if no cuckoos are detected or habitat appears unsuitable, this is valuable information and should be recorded. Standardized data forms are provided in Appendix 1.

To conduct surveys a version of the call-playback technique described by Johnson et al. (1981) for the detection of secretive species is recommended. This technique increases the detectability of species that occur in low densities or in dense vegetation (Johnson et al. 1981, Sogge et al. 1997). Surveys should be conducted using a recording of a cuckoos' "kowlp" call (available from M. Halterman), using a device powerful enough to broadcast the call approximately 100m through vegetation. In practice this requires using the highest volume possible, without distortion.

To conduct a survey, stops are made at call stations/survey points spaced every 100m along the edge of, or within, suitable habitat. A handheld GPS unit should be used to record the UTM coordinates of the starting point and ending point of the survey through each patch. In addition, we recommend recording the UTM coordinates of each call station/survey point. The surveyor arrives at the call station/survey point and waits a brief period (approximately one minute) to listen for unsolicited cuckoo calls (i.e., cuckoos that may be calling before broadcast of the calls). After the brief listening period, five "kowlp" calls, each spaced one minute apart, are played to elicit responses. After each broadcasted call, in the intervening minute, the surveyor listens and watches carefully for cuckoos responding to the broadcast.

When a cuckoo is detected at a call station/survey point, the broadcast is terminated; do not continue playing the recording once a bird is detected. Overuse of the recorded call is harassment and may negatively affect nest success. The UTM coordinates, time of detection, estimated distance and compass direction to the cuckoo, type of vocalization, estimated breeding status, and behavior are recorded. The surveyor then moves 300m further along the

transect before conducting the next survey broadcast, to avoid detecting the same cuckoo. While it is unusual for cuckoos to move 300m after being detected by a surveyor (Halterman 2004), the surveyor should be aware of the possibility, attempt to track an individual's movements, and use their judgment to estimate if they have detected separate individuals or whether the detections are likely of the same individual. All observations regarding individual movements, and reasoning used in determining number of individuals should be recorded under the comment section of the datasheet.

If a cuckoo is encountered between survey points (i.e., an unsolicited detection is made while traveling to, from, or between survey points), stop and record all information in the same manner as if the detection was made at a survey point. Do not broadcast calls. Then, continue 300m to the next survey point as when cuckoos are detected during surveys. Listen for one minute for the previous, unsolicited cuckoo to call, then conduct the survey as described above.

Interpreting Calls and Behavior

The breeding status of cuckoos can sometimes be determined using behavior. While it is not possible to determine the breeding status of most cuckoos encountered, detailed field notes on behavior can provide important clues for future estimates. Repeated detections and detailed observations on sequential survey visits can enable estimation of breeding status as mated birds may be encountered again on subsequent visits. When in doubt, mark the mating status as unknown and record all observations on the datasheet.

When a cuckoo is detected and observed the following information should be recorded:

- The type of call given, if any, or a description of it.
- If the cuckoo's legs are visible they should be examined for color bands. Band combinations should be recorded as follows: Left leg top → bottom, Right leg top → bottom.
- Other cuckoos seen or heard at the same time (a separate UTM should be recorded for each cuckoo detected, along with each cuckoo's vocalization and behavior information).
- The location in the vegetation of the individual (e.g., in the mid-canopy of a large cottonwood 40 cm DBH).
- What the individual is doing. For example, "moving from large willow to large cottonwood at canopy height; foraging in mid-canopy dense willow; seen with twig in bill then lost it, heading SSW from UTM point".
- If foraging, describe where in the tree the individual is and what it was eating (describe if unable to identify it). For example, "moving slow along larger limb of cottonwood, saw eat a large dark, furry caterpillar, also a bright green thing with long legs that was probably a katydid".

- Record, in as much detail as possible, any interactions with other cuckoos or other birds. Basically, record everything you can observe!

Interpreting and Reporting Survey Results (to be developed)

After the survey is completed, locations of cuckoos should be plotted as UTM coordinates on either USGS quad maps or on geo-referenced aerial photos. Detection locations can be compared to estimate the total number of cuckoos detected at a site during a survey season. Separation of adjacent detections is based primarily on the distance between detections. If cuckoos are located greater than 300m apart they are considered separate detections. Since it is difficult to accurately determine breeding status, it is best to report total detections of cuckoos along with evidence for those birds that may be mated. Most cuckoos detected during the third survey period are mated, so a separate accounting of number of detections during this period should be included in the final report.

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