

## **Supporting Information for the Listing of the Western Yellow-billed Cuckoo**

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Thank you for the opportunity to present additional biological information regarding the status of the Yellow-billed Cuckoo. While I agree with the conclusions of the 90-day finding (issued 7 February 2000) that the western subspecies/population of the Yellow-billed Cuckoo is in need of protection under the Endangered Species Act, I feel that the supporting arguments are weak and I hope that my input will help you strengthen these arguments. I am arranging these comments under the following broad headings for your convenience: I. Range Issues; II. Declines; III. Subspecies Issues; IV. Distinct Population Segment; V. Behavioral and Ecological Differences between Eastern and Western Cuckoos; VI. State and Regional Information on Yellow-billed Cuckoos; and VII. Literature Cited. If you have any further questions on these issues please feel to contact me.

### **I. Range Issues:**

The California Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) has an historic range which stretched from southern British Columbia, Canada, to western and southeastern Idaho, to central Utah and western Colorado, south through the western half of New Mexico and extreme western Texas and south through Sonora, Mexico to Zacatecas, Mexico, including southern Baja California, and southern California (AOU 1957; Hughes 1999). The range of the western subspecies of the Yellow-billed Cuckoo is approximately 871,300 square miles, of this, 20,000 square miles are in Canada (2.3%), 110,000 square miles are in Mexico (12.6%), and 741,300 square miles are in the United States (85.1%).

The range of the eastern subspecies of the Yellow-billed Cuckoo (*Coccyzus americanus americanus*) included the eastern United States and southern Ontario, Canada, west to the western Great Plains in eastern Montana, Wyoming, Colorado, and New Mexico south to Tamaulipas, Mexico, with a disjunct population on the northern Yucatan Peninsula, and small populations on some of the larger islands in the West Indies (AOU 1957; Hughes 1999) (Figure 2). The range of the eastern subspecies of the Yellow-billed Cuckoo is approximately 1,873,200 square miles, of this 45,000 square miles (2.4%) are in Canada, 65,000 square miles (3.5%) are in Mexico, and 1,763,200 square miles (94.1%) are in the United States. The range of the eastern subspecies is 68.3% of the Yellow-billed Cuckoo's total range, and the range of the western subspecies is 31.7% of the total (calculated from area of states and portion of states).

The Yellow-billed Cuckoo in the west has been extirpated from approximately 459,100 square miles of its original range (52.7% of Western subspecies' range and 16.7% of entire species range) (British Columbia, Washington, Oregon, part of Northern California, and Nevada) (Figure 2). In an additional 302,200 square miles (34.7% of the Western subspecies' range and 11.0% of the entire species range), the cuckoo's population is now highly fragmented and at dangerously low levels. (the remainder of California, Idaho, Utah, western Colorado, Arizona, western New Mexico). The population status of cuckoos in Mexico (12.6% of range) is unknown, but it is certain that many of the adverse pressures on riparian habitat that have been seen north of the border are also in play south of the border. Nowhere in the west is the cuckoo found in either moderate or high densities.

The Yellow-billed Cuckoo in the east has been nearly extirpated from approximately 6,200 square miles (Rhode Island and Connecticut) of its original range (0.3% of range of eastern subspecies) (Based on declines on BBS routes). In an additional 463,200 square miles (26.3% of range of eastern subspecies) the cuckoo's population is now declining rapidly, is highly fragmented, and at dangerously low levels (Maine, Massachusetts, New Hampshire, Vermont, Ontario, New York, Michigan, Nebraska, Wisconsin, Minnesota, and South Dakota). In an additional 481,200 square miles (27.3% of range of eastern subspecies) the cuckoo's population is still at low to moderate levels (1-6 cuckoos/BBS route), but is declining rapidly (Florida, Georgia, Illinois, Indiana, Iowa, Maryland, North Carolina, Ohio, Pennsylvania, Virginia, and West Virginia). In an additional 771,700 square miles (43.8% of range of eastern subspecies) the cuckoo's population is still at high levels (>6.0 cuckoos/BBS route), but is declining rapidly (Kansas, Kentucky, Missouri, Alabama, Mississippi, Tennessee, Texas, Arkansas, Louisiana, and Oklahoma). In 31,100 square miles (1.8% of range of eastern subspecies) the population is stable (South Carolina). In only 9,800 square miles (0.5% of range of eastern subspecies) is the population showing an increase (Delaware, and New Jersey) (Data from Breeding Bird Survey 1980-1998 trends, [www.mbr.nbs.gov/cgi-bin/trend98.pl](http://www.mbr.nbs.gov/cgi-bin/trend98.pl)).

In the 90-day finding the FWS states that the Yellow-billed Cuckoo is not threatened or endangered in a significant portion of its' range. This argument is based on the following: (1) The FWS states that the area of the western states where the western subspecies of the Yellow-billed Cuckoo is found is only 27% of the species' range. While this is an underestimate, it is close to the actual 31.7%. (2) FWS then states "...this number includes the entire area of States and does not represent the distribution or area of habitat suitable or available for the species. (3) More than 95 percent of the riparian habitat area within the species' U.S. range is located east of the Continental Divide, and less than 5 percent is located west of the divide."

This argument by the FWS is confusing available habitat with range. In biogeography and ecology the term range means simply the area within which a species occurs. The definition in "A Dictionary of Ecology, Evolution, and Systematics" (Lincoln et al., 1998) supports this, stating "Range: (1) The limits of the geographical

distribution of a species or group.” This is a very straightforward and well-accepted concept and definition.

The amount of habitat available to a species does not come into play with the discussion of range. It is a separate issue. Within the range of a species, subspecies, or population, some areas may be good habitat, some poor habitat, and some non-habitat. This is true of all species, but has nothing to do with the extent of the range of the species. So, to accept the FWS’s argument that the species is not endangered or threatened in a significant portion of its’ range we must conclude that 31.7% of a species range is not a significant portion, a conclusion that few biologists would be willing to accept.

This logic also ignores the population trends and status in the eastern United States. When the range of the species is viewed in total (both eastern and western subspecies/populations) it has been extirpated or found in highly fragmented and declining populations in 44.8% of its range and is found at moderate or high densities but is rapidly declining in 47.3% of its range. The population is stable or increasing in only 1.5% of its range and the population status and trend in Mexico (6.4% of the species range) is unknown.

## **II. Decline:**

### Breeding Bird Survey Results

Yellow-billed Cuckoos were detected on Breeding Bird Surveys in 40 states and 1 Canadian Province. The overall trend for the species in North America is one of decline. There has been a yearly decrease in cuckoos detected on these surveys of 1.7%. While this appears to be a small yearly decline, it is a 42.2% decrease between 1966 and 1998. Interestingly enough, nearly the entire decline has occurred since 1980 with a 3.0%/year decrease and a total decrease of 42.2%. To put these declines into perspective, a population of 1000 cuckoos in 1966 experiencing a 1.7%/year decline, would have been reduced to 568 cuckoos by 2000, 364 cuckoos by 2025, 236 cuckoos by 2050, and 98 cuckoos 100 years from now. The population would reach extinction about 2200, 200 years from now. This same population of 1000 cuckoos in 1980 experiencing a 3% loss would be reduced to 532 cuckoos by 2000, 242 cuckoos by 2025, 109 cuckoos by 2050 and 22 cuckoos 100 years from now. This population would reach extinction about 2130, only 130 years from now. This information brings FWS’s conclusion that the eastern Yellow-billed Cuckoo is common and secure into question. (This entire section is based on data from National Biological Service web site, 29 February 2000, <http://www.mbr.nbs.gov/cgi-bin/trend98.pl>).

Cuckoos were not detected on Breeding Bird Surveys in eight states: Washington, Oregon, and Nevada where they formerly were a breeder, but are now extirpated; Wyoming, Idaho, Utah, and North Dakota where they may still breed in small numbers in isolated locations; and California where they still breed in a few isolated locations (Table 1).

Table 1. States where Yellow-billed Cuckoos have not been recorded on Breeding Bird Survey Routes.

State	Status
Western States	
Washington	Formerly a breeder, now extirpated
Oregon	Formerly a breeder, now extirpated
Idaho	May still breed in small numbers at isolated locations
Utah	May still breed in small numbers at isolated locations
California	Still breeds in small numbers at isolated locations
Wyoming	May breed in small numbers at isolated locations
Nevada	Formerly a breeder, now believed extirpated
Midwestern States	
North Dakota	May breed in small numbers at isolated locations

Table 2. States with very low occurrence (less than 1.0 bird/route) of Yellow-billed Cuckoos on Breeding Bird Survey Routes.

State	Average/Route	Routes Detected	Trend
Western States			
Arizona	0.03	2	Too little data (NS)
Colorado	0.03	4	Too little data (NS)
New Mexico	0.06	7	Too little data (NS)
Montana	0.03	2	Too little data (NS)
Northeastern States			
Connecticut	0.56	15	Decline (<0.05)
Maine	0.02	3	Too little data (NS)
Massachusetts	0.16	14	Decline (NS)
New Hampshire	0.07	6	Too little data (NS)
New York	0.30	62	Decline (<0.05)
Rhode Island	0.37	2	Too little data (NS)
Vermont	0.05	4	Too little data (NS)
Midwestern States & Provinces			
Michigan	0.58	55	Decline (<0.05)
Minnesota	0.13	23	Decline (NS)
Ontario	0.08	28	Increase (NS)
South Dakota	0.13	15	Decline (NS)
Wisconsin	0.51	58	Decline (<0.1)
Nebraska	0.85	33	Decline (NS)

Yellow-billed Cuckoos were detected in low numbers (<1.0 bird/survey route) in 16 states and one Canadian Province. In eight states their numbers were too low (<0.1/route) and/or detections too infrequent (detected on less than 10 routes) to

determine a trend. Four of these were western states: Arizona, Colorado, New Mexico, and Montana. The remaining four were northeastern states: Maine, New Hampshire, Rhode Island, and Vermont. Declines were recorded in the remaining eight states. Significant declines were found in the northeastern states of Connecticut and New York, and the mid-western states of Michigan and Wisconsin. Non-significant declines were found in Massachusetts, Minnesota, South Dakota, and Nebraska. No significant increases were found and the only non-significant increase was found in Ontario Province (Table 2).

Yellow-billed Cuckoos were detected in moderate numbers (1.0-6.0 cuckoos/survey) in 14 states. These states were primarily in the Midwest, the Mid-Atlantic, and Southeastern regions. Of these 14 states, eight showed significant decreases (Pennsylvania, Illinois, Indiana, Ohio, Maryland, North Carolina, Virginia, and Georgia); and four showed non-significant decreases (Iowa, West Virginia, New Jersey, and Florida). Two states showed increases, Delaware, where it was significant, and South Carolina, where it was not. The significant increase in Delaware was the only one found in any state in the Breeding Bird Survey (Table 3).

Table 3. States with moderate occurrence (1.0-6.0/route) of Yellow-billed Cuckoos on Breeding Bird Survey Routes.

State	Average/Route	Routes Detected	Trend
Western States			
None			
Northeastern States			
Pennsylvania	1.60	108	Decrease (<0.05)
Midwestern			
Illinois	3.68	76	Decrease (<0.05)
Indiana	3.15	43	Decrease (<0.05)
Iowa	1.03	33	Decrease (NS)
Ohio	1.77	71	Decrease (<0.05)
Mid Atlantic States			
West Virginia	2.26	48	Decrease (NS)
Delaware	2.91	12	Increase (<0.05)
Maryland	4.69	64	Decrease (<0.05)
New Jersey	1.71	32	Decrease (NS)
North Carolina	5.58	61	Decrease (<0.05)
Virginia	5.78	74	Decrease (<0.05)
Southeastern States			
Florida	3.38	89	Decrease (NS)
Georgia	5.54	66	Decrease (<0.05)
South Carolina	5.83	28	Increase (NS)
South-central States			
None			

Yellow-billed Cuckoos were detected in high numbers (>6.0 cuckoos/survey) in 10 states. All of these states were in the southern Midwest, the southeast, and the south-central portions of the country. Of these 10 states, all showed decreases, seven significant (Kansas, Kentucky, Missouri, Alabama, Tennessee, Arkansas, and Texas) and three non-significant decreases (Oklahoma, Mississippi and Louisiana) (Table 4).

Yellow-billed Cuckoos showed significant declines in 19 states. In eight states, they showed significant declines both from 1966 to 1998 and from 1980 to 1998. In four states (Arkansas, Illinois, Michigan, and Tennessee) they showed significant declines from 1966 to 1998 but not from 1980 to 1998 and in seven states (Maryland, New York, North Carolina, Kansas, Pennsylvania, Virginia, and Wisconsin) they showed significant declines only from 1980 to 1998 (Table 5). The percent decline for the two time periods was obtained by multiplying the yearly decline times 32 years for the 1966 to 1998 time period and 18 years for 1980 to 1998 time period, while calculating for declining numbers of cuckoos each year. These declines range from a high of 99.9% from 1980 to 1998 in Connecticut (where they are no longer detected on Breeding Bird Surveys) to a low of 27.5% from 1966 to 1998 in Arkansas (Table 5). The average decline in the 12 states showing significant declines from 1966 to 1998 was 56.7%, while the average decline in the 15 states showing significant declines from 1980 to 1998 was 60.4%.

Table 4. States with high occurrence (>6.0/route) of Yellow-billed Cuckoos on Breeding Bird Survey Routes.

State	Average/Route	Routes Detected	Trend
Western States			
None			
Northeastern States			
None			
Midwestern States			
Kansas	7.59	36	Decrease (<0.05)
Kentucky	8.31	49	Decrease (<0.05)
Missouri	9.76	59	Decrease (<0.05)
Mid-Atlantic States			
None			
Southeastern States			
Alabama	8.59	84	Decrease (<0.05)
Mississippi	14.37	36	Decrease (NS)
Tennessee	8.86	47	Decrease (<0.05)
South-central States			
Arkansas	12.89	36	Decrease (0.05)
Louisiana	9.93	54	Decrease (NS)
Oklahoma	12.77	58	Decrease (NS)
Texas	7.95	144	Decrease (<0.05)

I then retrieved the graph of cuckoo trends off of the NBS Web Site and extrapolated the beginning and ending cuckoo abundance for the 1966 to 1998 time period (Table 6). This analysis shows that for the 25 states with declining trends (and available graphs), the average number of cuckoos per route was 6.2 in 1966 and 3.9 in 1999 (Figure 1). This was an average decline of 2.3 cuckoos per route or an actual decline of 41% during the 32 year time period.

While examining the graphs I found that cuckoos are no longer detected on Breeding Bird Survey Routes in two states, Connecticut and Rhode Island. The decline in Connecticut is most disturbing because they started out with an average of 5.2 cuckoos/survey in 1966 and then dropped to zero. In addition to these two states with 100% declines, the largest declines (>50%) were in states at the northern periphery of the species range, Illinois, Michigan, Wisconsin, and New York. Most northerly states (e.g. Indiana, Kentucky, Ohio, Maryland, Missouri, and West Virginia) also showed high declines (25%-49%), while a few other northerly states (e.g. Kansas, Nebraska, and Pennsylvania) were in the more moderate decline bracket (10%-24%). High declines of 25% to 49% were also found near the center of the species' range in Alabama, Florida, Georgia, Tennessee, Texas, and Virginia. Lesser declines of 10% to 24% were found in Arkansas, Louisiana, North Carolina, and Oklahoma. The only increasing trends were found in Delaware and New Jersey and the population was stable in South Carolina and Mississippi (Table 6).

Table 5. Significant declines on Breeding Bird Survey Routes. Percent declines obtained by calculating 32 or 18 year declines from yearly declines.

State	Decline 1966-1998	Decline 1980-1998	Average/Route
Alabama	-49.3%	-47.3%	8.59
Arkansas	-27.5%	NS	12.89
Connecticut	-99.7%	-99.9%	0.56
Georgia	-59.7%	-58.7%	3.48
Illinois	-62.3%	NS	3.68
Indiana	-66.9%	-61.0%	3.15
Kansas	NS	-54.7%	7.59
Kentucky	-49.3%	-29.2%	8.31
Maryland	NS	-40.0%	4.69
Michigan	-77.1%	NS	0.58
Missouri	-38.3%	-52.0%	9.76
New York	NS	-75.4%	0.30
North Carolina	NS	-52.0%	5.58
Ohio	-54.0%	-87.1%	1.71
Pennsylvania	NS	-66.5%	1.60
Tennessee	-44.1%	NS	8.86
Texas	-52.5%	-48.3%	7.95
Virginia	NS	-44.3%	5.78
Wisconsin	NS	-89.8%	0.51

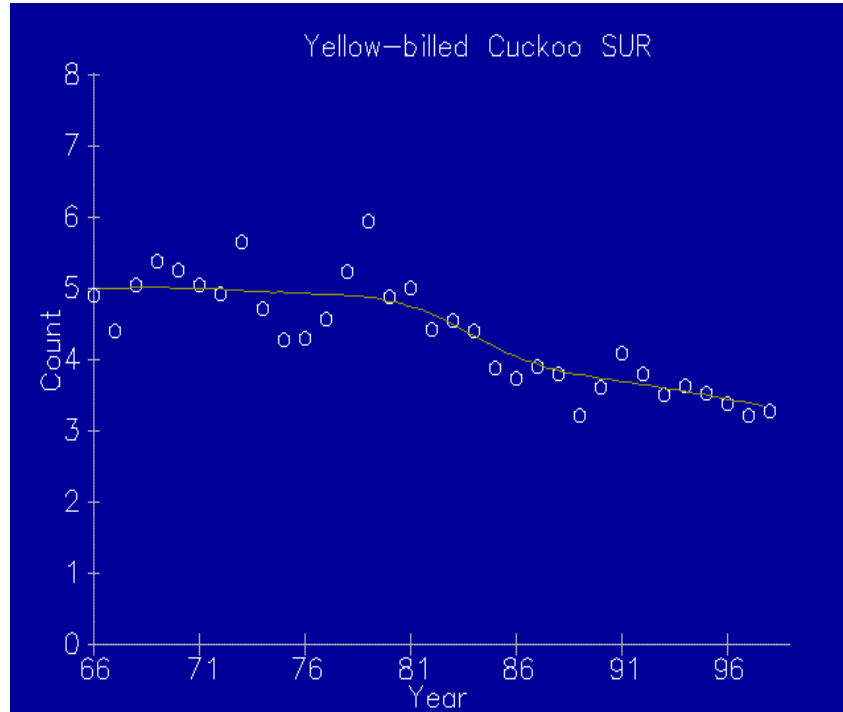
In total this analysis shows a rather bleak picture of Yellow-billed Cuckoo population trends, as opposed to the positive picture painted in the 90-day finding. We see a pattern of a population collapse at the northern edges of the range in the face of a global warming pattern that should be making these more northerly regions more hospitable to the species. Possibly most disturbing is the large percent declines shown at the center of the species range in the Southeast and South-central states. When we see a species rapidly declining both at the periphery of the range and at the center it is certainly time for concern, if not alarm.

Table 6. Average number of Yellow-billed Cuckoos on Breeding Bird Survey Routes in 1966 and 1998.

State	1966	1998	Absolute Change	Percent Change
Alabama	11.9	6.6	-5.3	-44.5%
Arkansas	13.5	11.3	-2.2	-16.3%
Connecticut	5.2	0.0	-5.2	-100.0%
Florida	4.2	2.9	-1.3	-31.0%
Georgia	7.0	3.7	-3.3	-47.1%
Illinois	5.0	2.3	-2.7	-54.0%
Indiana	4.7	2.5	-2.2	-46.8%
Kansas	7.6	6.5	-1.1	-14.5%
Kentucky	11.2	6.2	-5.0	-44.6%
Louisiana	11.4	8.7	-2.7	-23.7%
Maryland	5.3	2.7	-2.6	-49.1%
Michigan	0.9	0.3	-0.6	-66.7%
Missouri	12.7	7.8	-4.9	-38.6%
Nebraska	0.8	0.7	-0.1	-12.5%
New York	0.4	0.2	-0.2	-50.0%
N Carolina	4.6	3.7	-0.9	-19.6%
Ohio	2.5	1.6	-0.9	-36.0%
Oklahoma	12.3	11.0	-1.3	-10.6%
Pennsylvania	1.6	1.4	-0.2	-12.5%
Rhode Island	0.6	0.0	-0.6	-100.0%
Tennessee	10.8	6.1	-4.7	-43.5%
Texas	10.3	6.8	-3.5	-34.0%
Virginia	7.5	3.8	-3.7	-49.3%
West Virginia	2.6	1.8	-0.8	-30.8%
Wisconsin	0.6	0.3	-0.3	-50.0%
Avg. 25 states	6.2	3.9	-2.3	-41.0%



Figure 1. Graph showing decline of Yellow-billed Cuckoos on Breeding Bird Survey Routes 1966 to 1998 (www.mbr.nbs.gov). Population shows cyclical pattern until 1981 when a steady decline begins, interrupted only by a small, temporary increase from 1989-1991.



### III. Subspecies Issues - taxonomy

One of the most controversial aspects of the listing process for the Yellow-billed Cuckoo is the validity of the western subspecies, the California Yellow-billed Cuckoo, (*Coccyzus americanus occidentalis*). The western subspecies was described by Ridgway (1887) and was based on the larger size of western cuckoos and proportionately larger and stouter bills. Many subsequent references have accepted this taxonomy (AOU 1957; Oberholser 1974; Franzreb and Laymon 1993; Pyle 1997; Hughes 1999). The 90-day finding cites several authors who have questioned the taxonomy including Banks (1988 & 1990), Todd and Carriker (1922); Swarth (1929), Van Tyne and Sutton (1937), Bent (1940), and Monson and Phillips (1981). Only one of these references (Banks 1988) pertained to an actual study of the subspecies question.

Todd and Carriker (1922) studied birds in the Santa Marta region of Columbia and during their studies they collected seven specimens between 1 October and 21 November. They found both small and large birds among those collected and concluded, based on these birds collected during fall migration period, that the differences in size between eastern and western birds was too slight and inconsistent for recognition. They did not know the area of breeding origin of any of their specimens and the birds collected were well within the fall migration period. They were in error to make a judgement on subspecies differentiation based on their collection.

Swarth (1929) cited Todd and Carriker (1922) and felt they had questioned the western subspecies on good grounds (see above). Swarth collected four cuckoos in Arizona and measured an additional eight held in the California Academy of Sciences collection and the G.F. Morcom collection. He concluded that birds on the Pacific coast were the largest and that those from Arizona were closest to the type specimen for *C. a. occidentalis* which was collected in the Santa Rita Mountains of Arizona. He concluded by deferring to the opinions of others, but felt the subspecies was slightly differentiated. Since he did not measure any eastern cuckoos in this study it is hard to understand why he questioned the status of the subspecies.

Van Tyne and Sutton (1937) studied birds in Brewster County, Texas (Big Bend Region), collected 19 cuckoos and concluded that these cuckoos were typical *C. a. americanus*. Prior to this study, it had been assumed that the dividing line between eastern and western cuckoos was in central Texas. This study simply moved the dividing line farther west into Presidio County. They questioned the value of maintaining the western subspecies, but they don't give any reasons.

Bent (1964) cited Swarth (1929) and questioned the western subspecies by saying that it had been separated on very slight average characters. He did not conduct a study on the issue.

Monson and Phillips (1981) conducted no study on the cuckoo subspecies issue but said the Arizona specimens were of the "dubious" western form. Monson has

recently signed a letter supporting the listing of the Western subspecies of the Yellow-billed Cuckoo.

Banks (1988) in his review of the validity of the western subspecies, concluded that there were no significant differences between eastern and western cuckoos for wing and bill measurements and as a result, the western subspecies should be suppressed. His statistical analysis was subsequently shown to be invalid (Banks 1990; Franzreb and Laymon 1993) and the differences were shown to be highly significant. Despite this, he continued to say that the western subspecies was not valid (Banks 1990; Banks 1999). Despite his insistence that the western subspecies was not valid, Banks (1999) encouraged Fish and Wildlife Service to list the western Cuckoo as either a subspecies or a distinct population segment.

Other researchers have accepted the western subspecies of the Yellow-billed Cuckoo. Oberholser (1974) in his definitive work on the Birds of Texas, describes *C. a. occidentalis*, the western race of the Yellow-billed Cuckoo, as similar to *C. a. americanus* but decidedly larger, particularly bill and wing (Table 7). He also comments on the earlier spring arrival of the eastern subspecies. He lists the range of the western subspecies in Texas as El Paso, Hudspeth, Culberson, and Presidio counties and calls them fairly common (Oberholser 1974).

The most recent checklist of the American Ornithologists Union, which deals with subspecies (AOU 1957), presents the western subspecies as a valid subspecies and defines its breeding range in North America.

Franzreb and Laymon (1993) detail the differences between the behavior and ecology of the eastern and western subspecies. They developed a regression equation using wing length, tail length, bill length, and maxilla depth to differentiate eastern and western Yellow-billed Cuckoos (males and females separately). Using this formula they were able to correctly predict origin of 89.6% of eastern females, 85.8% of western females, 83.8% of eastern males, and 74.6% of western males (Franzreb and Laymon 1993). This equation has been used successfully by other researchers (Hughes 2000), and has been recommended for use in separating eastern and western cuckoos while banding birds (Pyle 1997).

In recent correspondence with Dr. Janice Hughes (2000), author of the Birds of North America Yellow-billed Cuckoo account (Hughes 1999), she stated that she does not believe that the size difference between eastern and western cuckoo subspecies is clinal. "From what I've read and measured, there seems to be too abrupt a change in size across the purported subspecies boundaries somewhere in west Texas" (Hughes 2000). She continues "...perhaps the most compelling evidence for me, and the one that most challenges the suggestion that the east-west difference is clinal, regards the cuckoo's migration and wintering behavior. First, the timing of migration is significantly different between the two. Western birds arrive on the breeding grounds 4-8 weeks later and leave 2-3 weeks earlier than eastern birds breeding at the same latitude. I don't believe this difference has anything to do with environmental constraints on the system. These

behaviors must have evolved independently for some time. Hence, eastern and western cuckoos are, by definition, different taxa; probably subspecies (Hughes 2000).”

Table 7. Measurement of eastern and western Yellow-billed Cuckoos in Texas. Measurements in mm. Sample size not given. Data from Oberholser (1974).

	<i>C. a. occidentalis</i>		<i>C.a. americanus</i>	
	Average	Range	Average	Range
<b>Male</b>				
Wing	149.9	143.5-154.4	143.8	135.1-153.9
Tail	147.3	140.0-154.9	140.7	133.6-150.1
Bill (exposed culmen)	28.7	26.9- 29.9	26.2	23.9- 28.9
Tarsus	26.7	24.9- 28.9	25.1	23.1- 26.9
Middle (outer anterior) toe	19.3	18.5- 20.1	18.3	17.0- 20.1
<b>Female</b>				
Wing	150.4	144.0-156.4	146.3	138.4-151.1
Tail	147.3	133.1-155.9	145.8	138.9-151.1
Bill (exposed culmen)	28.2	25.9- 28.9	26.9	24.9- 29.4
Tarsus	26.7	24.9- 28.4	25.1	23.9- 26.9
Middle (outer anterior) toe	19.3	18.0- 20.1	18.5	17.5- 19.6

Several statements in the 90-day finding do not appear to be true. On page 8106 of the finding, the statement is made that the AOU does not have a current position on the validity of the Yellow-billed Cuckoo. The last document published by the AOU, which deals with subspecies, accepts two subspecies, *C. a. americanus* and *C. a. occidentalis* (AOU 1957). This is the currently acceptable taxonomy until the AOU publishes another document that deals with subspecies. Other researchers can publish recommendation, but at some point the AOU taxonomy committee will have to vote and either continue or reject the western subspecies. At that time, the AOU will have a new position on the subspecies.

In addition, the preface of the most recent AOU checklist is used as a citation for the following statement in the 90-day finding. “The AOU does not have a current position on the validity of the Yellow-billed Cuckoo subspecies and has stated the need to evaluate the taxonomic standing of the subspecies of North American birds.” The actual citation in the AOU checklist (AOU 1998) states “The Committee’s endorsement of subspecies as entities worthy of scientific inquiry carries with it our realization that an uncertain number of currently recognized subspecies, especially those formally named early in this century, probably cannot be validated by rigorous modern techniques. The opposite is also true; after careful study an unknown number of present subspecies probably will be unmasked as cryptic biological species.” This statement is not specifically referring to the cuckoo as is suggested in the 90-day finding, but rather is a

generic statement regarding subspecies. It could just as easily be construed that the western Yellow-billed Cuckoo is actually a cryptic species.

As recommended in my previous paper on the subspecies issue (Franzreb and Laymon 1993), a complete and modern study of geographic variation of the Yellow-billed Cuckoo should be conducted prior to consideration of the abandonment of the western subspecies of the Yellow-billed Cuckoo. This study should include all standard morphometric measurements (15-19 measurements is standard rather than the 3-4 used by Banks 1988 and Franzreb and Laymon 1993), an objective measure of bill and plumage color, vocalizations, and genetic markers. After this study is completed, and even if it shows that geographic variation is below the accepted subspecies level, the differences in migration timing, nesting timing, habitat use, food habits, and winter range detailed in Franzreb and Laymon (1993) and below, are more than enough to consider the western subspecies/population of Yellow-billed Cuckoos a distinct population segment.

#### **IV. Distinct Population Segment:**

The 90-day finding questions whether the western population of the Yellow-billed Cuckoo is a distinct population segment. One of the prime references used in this regard is Hamilton and Hamilton (1965). The finding states "This study questioned whether eastern and western cuckoos were distinct, based on observation of ecology, adaptation to the physical environment, and timing and duration of breeding season." I and Dr. Pamela Williams have recently read Hamilton and Hamilton (1965) and cannot find any reference to questioning whether the eastern and western subspecies are distinct on any of these grounds. It is our belief that this reference, which is the only reference cited in this regard, was misused.

Distinct population segments are based on substantial geographic isolation, morphological differences below the subspecies threshold, genetic isolation, and ecological separation. The western Yellow-billed Cuckoo displays all of the above traits when compared to eastern Yellow-billed Cuckoo.

**Substantial Geographic Isolation** - The range of the Yellow-billed Cuckoo in the west historically was 2250 miles in length from southern British Columbia, Canada, to Zacatecas, Mexico. The range of the cuckoo in the east was about 2100 miles in length from Minnesota to southern Tamaulipas, Mexico. The ranges of the eastern and western subspecies/populations of the Yellow-billed Cuckoo are well separated and meet in only one area, along the Rio Grande River in the vicinity of Presidio, Texas, at approximate latitude 30 degrees. Moving north to latitude 31 degrees (a distance of about 70 miles) the separation expands to 100 miles, at latitude 33 degrees the separation is 150 miles, at 35 degrees the separation is 280 miles, at latitude 38 degrees the separation is 300 miles, at latitude 40 degrees the separation is 350 miles, at latitude 43 degrees the separation is 450 miles, at latitude 45 degrees the separation is 550 miles, and at latitude 48 degrees (along the Canadian Border) the separation is 850 miles. Moving south into Mexico from latitude 30 degrees to latitude 29 degrees (a distance of about 70 miles) the separation expands rapidly to 300 miles, at latitude 27 degrees the separation is 300 miles, at latitude

25 degrees the separation is 400 degrees, and at the southern edge of the species' range at latitude 23 degrees the separation is 350 miles (Figure 2). (Range map derived from Hughes 1999, AOU 1957, and many state and regional publication summarized in Section VI.)

The eastern and western population is separated by the Rocky Mountains in Canada and the United States and by the central plateau in Mexico. By any definition, the ranges of these two subspecies/forms/populations are well separated. A joining/touching of the two ranges in one small area, which represents less than 1% of the north-south extent of the ranges, is insignificant when the entire range is taken into account. (Based on range as listed in AOU 1957, Howell and Webb 1995, and numerous state and regional books listed below).

**Morphological Differences** – See Franzreb and Laymon (1993). There are highly significant differences in all measured morphometric parameters. A vast majority of individuals of known sex can be told apart east from west using a combination of four variables and a regression equation present in Franzreb and Laymon (1993) and presented again by Pyle (1997) for use in distinguishing eastern from western cuckoos. Bill color of juveniles is also a very important differentiation east from west, with western young having all black bills, while eastern young have yellow lower mandibles from a very young age (Franzreb and Laymon 1993; Oberholser 1974). In addition, adult western Yellow-billed Cuckoos have a much more orange lower mandible when compared to the more lemon yellow lower mandibles of eastern birds. This is a character that is evident in both individual cuckoos in the field and from photographs. Every time I look at a photograph of a cuckoo in a book or magazine, prior to seeing where the photo was taken, I guess whether it was east or west. After 20 or more attempts I have yet to get one wrong.

**Genetic Isolation** – Differences in size, bill color, and migration timing all have genetic components that have developed through natural selection over a long period of time. Genetic isolation is the most logical way that these differences can develop. Unfortunately, funding has not been available over the past 10 years to look for geographic variation of Yellow-billed Cuckoos at the genetic level. Hopefully the studies that are just now getting underway will support the differentiation of eastern from western cuckoos. A lack of genetic differences found on the few loci that are examined in of study of cuckoo genetics will not negate the genetics based differences mentioned above.

**Ecological Separation** – This topic is covered below in a separate section. The main topics that I present there are migration timing, nest timing, habitat use, breeding behavior, food habits, and winter range (See next section for details).

## **V. Behavioral and Ecological Differences between the Eastern and Western Cuckoos**

Ecologically, the eastern and western populations of Yellow-billed Cuckoos differ significantly (Ehrlich et al. 1992). The differences in migration timing, nest timing, food habits, habitat use, breeding behavior, and winter range are sharply divided between the Pecos and Rio Grande River in western Texas (Franzreb and Laymon 1993). Until more is known, the dividing line between subspecies/distinct population segments should be made between west of the Pecos River and east of the Rio Grande as it enters New Mexico.

**Migration Timing** – Migration timing is one of the most important behavioral characteristics that separates the eastern and western subspecies/ distinct population segments of the Yellow-billed Cuckoo. In the West, from western New Mexico, Arizona, Oregon, and California the cuckoo arrives on its breeding grounds from early to mid-June, with a few of the earliest arrivals in late May. In the Kern River Valley for the past eight years, the average first arrival date for cuckoos has been 2 June with a range of first arrival dates from 17 May in 1997 to 17 June in 1993 (S.A. Laymon, unpublished data). This is the best data set on arrival for the species in California. The earliest spring arrival record for California is 23 April in Sacramento Co., and this is the only April record for the state (Gaines and Laymon 1984). The next earliest arrival date is 1 May, twice, once in Yuba and once in Sutter counties (Gaines and Laymon 1984). An average of 17 first arrival dates for Northern California was 31 May, while the average of 18 first arrival dates for Southern California was 29 May (data from Gaines and Laymon 1984). At the Kern River, several weeks can elapse after the first arrival before other cuckoos arrive. In most years, more cuckoos have arrived between 15 June and 20 June, but cuckoos are still arriving in early July.

In Arizona, the migration timing is very similar to that of California. To quote Phillips et al. (1964) “The amazing thing about the cuckoo is that its principal spring flight in the west seems to occur at the end of June!” [! Is theirs] They go on to say that the cuckoo is a fairly common summer resident in Arizona from the first week of June through September. They state that the cuckoo nests during the summer rainy season when caterpillars are most abundant.

Yellow-billed Cuckoos arrive in the southern tier of states (Florida, South Carolina, Georgia, Alabama, Mississippi, Louisiana, and Texas) between the middle of March (12 March) and mid-April (16 April) (Bent 1964). The average first arrival date for these states is 6 April (calculated from Bent 1964). In the next tier of states to the north (North Carolina, Virginia, Kentucky, Tennessee, Arkansas, Oklahoma, and Maryland) the cuckoo’s early arrival is between mid April (10 April) and early May (3 May) with an average first arrival date of 24 April (data from Bent 1964). This is an average of 2.5 weeks later than in the southern states. In the next tier of states to the north (Colorado, Kansas, Missouri, Illinois, Indiana, Ohio, Iowa, and Nebraska) cuckoo’s early arrival is between late April (25 April) and early May (7 May) with an average first arrival date of 3 May (data from Bent 1964). This is 1.5 weeks later than the next tier of

states to the south and a month later than the southern states. In the northern most tier of states, early cuckoos arrive between early April (7 April) and mid-May (17 May) with an average first arrival date of 8 May (data from Bent 1964). This average arrival date is more than a month later than the average arrival date in the southern states.

This is a typical spring migration arrival pattern for bird species with a wide latitudinal breeding range in North America. This would be described as earlier arrival in the south and later arrival in the north with a compression of arrival times as the northern edge of the range is reached.

The spring arrival pattern of Yellow-billed Cuckoos in the west (west of the Pecos River) is completely different. There is no north-south differentiation in migration timing, with cuckoos arriving in southern Sonora, Mexico at the same time that they arrive in southern Arizona, southern California, northern California, and the Pacific Northwest (prior to extirpation in that region). Throughout this entire latitudinal range, they arrive in extremely late May with an average arrival date of the first week in June, most cuckoos arriving in the last half of June and spring arrivals continuing into early July. This is a very different migratory strategy between the eastern and western subspecies/populations. This difference is not triggered by any local short-term abundance in food as indicated in the FWS's 90-day finding, but has evolved as a result of long-term east-west differences in food availability. In other words, this difference in migration timing is a product of natural selection and therefore is genetically based. Birds in each population that arrive at times other than the "best time" have been weeded from the population over time. This has resulted in a difference in migration timing that is genetically based. This factor alone is irrefutable evidence of a distinct population segment between eastern and western Yellow-billed Cuckoos, with the separation occurring along the Rio Grande River in western Texas, west of the Pecos River.

**Nest Timing** – The differences in nest timing between eastern and western cuckoos have been well covered in Franzreb and Laymon (1993) and Hughes (1999). The 90-day finding states that "observed differences [in nest timing] could also represent the interaction between individuals of a relatively uniform but flexible species and local environmental factors." It is true that cuckoos can delay nesting if they arrive on the breeding grounds and sufficient food for breeding is not yet available. On the South Fork Kern River, in California I have seen cuckoos arrive on the breeding grounds in mid-June and delay initiation of nesting for up to one month. This however does not account for the differences in nest timing found between eastern and western cuckoos. In all eastern states egg laying starts in the south in late March (Texas) to late April (Florida) and the breeding season is well underway by early May. In fact, Bent (1964) lists 16 April to 16 May as the height of the breeding season for Florida and 6 May to 5 June as the height of the breeding season for Texas.

In the more northern states, nesting is in full sway in mid to late May. Only Maine lists June as an early date of nesting. Bent (1964) lists 4 to 26 June as the height



of the breeding season for Illinois and 4 to 11 June as the height of the breeding season in New York.

In California, based on egg sets, the earliest nesting records for Yellow-billed Cuckoos are 15 and 16 May and the third earliest date is 15 June (Gaines and Laymon 1984). Most egg sets were collected in July (Gaines and Laymon 1984). Bent (1964) lists the height of the breeding season as 17 June to 10 July. In 15 years of nest searching and based on 94 nests at the South Fork Kern River, Kern Co., California, the earliest first egg date (not complete clutch as in egg sets) is 6 June and only 4 additional nests were started prior to 16 June (Laymon unpubl. data). The average first egg date for all nests (n=94) is 7 July and the average first egg date of known first clutches (n=65) is 3 July.

While as stated above, it is possible for cuckoos to delay nesting if food conditions are not right, it is not possible for cuckoos to lay eggs in the west if they have not yet arrived on the breeding grounds. An average early June spring arrival date in Sonora, Arizona, and California precludes the cuckoos from laying any earlier and negates the argument against nest timing as a reaction to available food rather than as evidence for the western cuckoos being a distinct population segment. In addition, the difference in migration and nest timing can prevent interbreeding of the two subspecies/distinct population segments in the zone of overlap, leading to further genetic isolation.

**Habitat Use** – Yellow-billed Cuckoos in the west, west of the Pecos River and the Rocky Mountains, are strictly tied to riparian habitat, particularly cottonwood-willow habitat (Gaines and Laymon 1984; Laymon and Halterman 1987; Franzreb and Laymon 1993; Hughes 1999). Research at the South Fork Kern River, Kern County, California, from 1985 to 1996 showed a profound preference for willows for nest trees (98.9%, n=95). In addition, sites with cuckoo nests had a greater proportion of willows than cottonwoods (87.3%) when compared with random sites in the old forest (53.1%) (Laymon et al. 1997). In a recent study in Arkansas, 18 species of trees were found in the study area and all but three tree species were used for nesting by cuckoos (Wilson 1999). This is a significant difference in nest site selection.

Another difference in nest site selection is the direction from the trunk that the nest is placed. Cuckoos at the South Fork Kern River tend to place their nest on the east side of the tree and the average direction for 97 nests is 134.0 degrees (95% confidence interval 115.3 – 152.7 degrees). In the recent Arkansas study, nests are placed more to the south with an average direction of 181.6 (n=270; 95% confidence interval 168.9 – 194.3 degrees; calculated from data in thesis) (Wilson 1999). These nest placement directions are significantly different.

These are two examples of significant differences in nesting habitat use between western and eastern Yellow-billed Cuckoos. Certainly these are not the only differences

between sites. Both of these differences could have a genetic base (i.e. they could have evolved through natural selection).

**Breeding Behavior** – Differences in breeding behavior between eastern and western Yellow-billed Cuckoos is pronounced. An unbalanced sex ratio, with more males than females, is common throughout the west. Sex ratios of up to nine males to each female have been observed on the South Fork Kern River (Laymon unpublished. data). In all years from 1985 to 1999 I have found more males than females in this population. Usually the ratio is between 1.5 males to 1.0 female and 2.0 males to 1.0 female. After a thorough literature review, I have found no mention of this unbalanced sex ratio in the east.

Approximately 30% of nesting pairs of Yellow-billed Cuckoos at the South Fork Kern River over the past 15 years have had helpers at the nest. The helper has always been an apparently unrelated younger male. These helpers bring up to 50% of the food resource to the nestlings and can contribute greatly to the nesting effort, thus allowing the dominant parents to start a second brood. This behavior appears to greatly aid the western cuckoo to successfully double and even triple brood (proven with banded individuals) even though their stay on the breeding grounds is compressed by two months or more when compared to eastern cuckoos. After a thorough literature review, I have found no mention of these behaviors in Yellow-billed Cuckoos in the east.

At approximately 20% of the nests observed at the South Fork Kern River over the past 15 years I have noted intentional brood reduction involving the removal of live young from the nest. In nearly all of these cases, the nests have gone on to successfully fledge at least one young cuckoo. In all the cases that have been observed, the removal was carried out by the dominant male and in each case the young that was removed was the youngest in the nest. Removal has been done within 60 hours after the youngest chick hatched. In one case a young that had been removed from a nest was deposited alive in the nest of another cuckoo and was raised successfully by the adoptive parents. Other nests have been subject to “unintentional brood reduction” which occurs when cuckoos stop incubation of unhatched eggs so they can provide adequate food for the already hatched nestlings. After a thorough literature review, I have found no mention of any of these behaviors in Yellow-billed Cuckoos in the east.

All of these nesting behaviors have likely evolved in the west as a way of taking advantage of local food conditions. Until it has been shown that these behaviors are also common in the east, I would assume that they are indications of behaviors in a distinct population segment of the Yellow-billed Cuckoo.

**Food Habits** – Yellow-billed Cuckoos in eastern North America are closely tied to outbreaks of tent caterpillars and fall web worms as evidenced by numerous state and regional publications listed below in section VI. Cuckoos in the east apparently move into areas with outbreaks of these caterpillar species and eat little else during the outbreaks. In the three populations where I have observed foraging cuckoos in the west,

tent caterpillars are not used to a great extent even when available. In over 100 observed foraging bouts on the Sacramento River in the 1980s I only once saw a Yellow-billed Cuckoo eat tent caterpillars even though the caterpillars were common in my study areas. I watched cuckoos on many occasions forage past active tent caterpillar webs and completely ignore them while hunting for sphinx moth larvae (hornworms) and katydids and even grasshoppers and beetles. They were definitely not a preferred food.

On the South Fork Kern River, where tent caterpillars are much less common, I have never seen one brought to a nest and fed to a nestling or eaten by an adult cuckoo. This is from a sample of over 2000 food items (Laymon unpublished data).

Preferred food for cuckoos on the Sacramento River, South Fork Kern River, and Bill Williams River in western Arizona has been sphinx moth larvae. Food habits based on observations at over 20 nests indicate that the cuckoo's reproductive success is keyed to a healthy population of the preferred food, sphinx moth larvae scattered over the territory, and an abundant, but less nutritious, "fast food" near the nest (e.g. tree frogs, grasshoppers, cicadas, or katydids). Cuckoos forage selectively for the sphinx moth larvae, but if they fail to find one within an hour they return to the nest, check the hunger status of the young, and feed "fast food" to completely satiate the young before returning to forage for the preferred food (Laymon unpublished data). After a thorough literature review, I have found no mention of any of these foraging behaviors in Yellow-billed Cuckoos in the east, where tent caterpillars appear to be the key prey species.

The above information indicates foraging behaviors and strategies, which have evolved from two entirely different types of preferred prey. In the east, cuckoos have evolved to take advantage of small, colonial caterpillars whose populations are cyclical, tightly clumped and of fairly short duration. In the west, cuckoos have evolved to take advantage of very large, loosely clumped or solitary prey, which is much less cyclical in nature. These two foraging scenarios have led to distinct populations with very different social behavior (see nesting behavior above), (i.e. two distinct population segments). It is very likely that even the difference in bill size, with the western cuckoos having the larger bill, has evolved to take advantage of the larger prey, the sphinx moth larvae.

**Winter Range** – It is very likely that eastern and western Yellow-billed Cuckoos, in addition to having separate breeding ranges also have separate winter ranges. In many migratory bird species, eastern population winter farther east and south than do their western counterparts. An example of this is the Baltimore and Bullock's Orioles, with the Baltimore Oriole wintering in southern Mexico and central America, while the Bullock's winters in western Mexico. The likely arrangement for the Yellow-billed Cuckoo is for the Western subspecies/population wintering in north-west Costa Rica, southern Panama, the west slope of the Andes in Columbia, Ecuador, and possibly northern Peru; while the Eastern subspecies/population winters east of the Andes and north of the Amazon Basin in Venezuela, Guyana, and Surinam and south of the Amazon Basin in southern Brazil, Paraguay, Uruguay, and northern Argentina. In addition, the cuckoos that bred farthest north in western north America would winter the farthest south.

The likely migration route for the western cuckoos is through western Mexico, and down the west slope of Central America. Eastern Cuckoos have more migration options with some, probably those that go farthest south, moving south through the Caribbean islands to northeastern South America and on south of the Amazon Basin. Others move south along the east coast of Texas, Mexico and Central America into eastern Columbia and northern Venezuela.

Based on this analysis, I would expect cuckoos in the western portion of Columbia, Ecuador and Peru (west of the Andes) to have declined greatly over the past 50 years, as the cuckoos in western United States and Canada have done. Based on the north-south breeding-wintering pattern mentioned above, I would also expect the cuckoos farthest south on the west side of the Andes in Ecuador and northern Peru to have declined the most, as cuckoos in British Columbia, Washington and Oregon were extirpated. This is exactly the pattern of decline that we find. According to Dr. Robert Ridgely, of the Academy of Natural Sciences in Philadelphia and author of many books on Central and South American Birds, cuckoos have declined greatly in Ecuador over the past 50 years (Ridgely 2000). The most recent specimen collected was in 1960 and there are only a couple of site records and some of these few may have been confused with the resident Pearly-breasted Cuckoo (*Coccyzus euleri*), which is a sibling species to the Yellow-billed Cuckoo. There are not a lot of specimens from the country, but given how few are found today, with as many birders in the country as there are, he feels that it is amazing that any were ever collected in the “old days”. His conclusion is that they must have been more common and that they may have been of the declining western subspecies.

Dr. Janice Hughes, author of the Yellow-billed Cuckoo account for “Birds of North America” recently said the following regarding this issue. “Also, western birds appear to follow different migration routes than eastern birds. Evidence indicates that they winter in northwestern South America (some west of the Andes), whereas, eastern birds go much further south (east of the Andes) to northern Argentina. Since many individuals from both subspecies travel through southern Central America during migration, the differing wintering locations can't merely be a reflection of one place being easier to get to than the other. These behaviors must have evolved independently for some time.” (Hughes 2000).

In summary, western Yellow-billed Cuckoos have different migration timing, different nest timing, different habitat use, different nesting behaviors, different food habits, different winter range, and different migration routes. All said, they are a very different taxa, most likely a valid subspecies, but if not subspecies, they certainly have every characteristic of distinct populations segments.

## **VI. State and Regional Information on Yellow-billed Cuckoos**

The following is a summary of what is known in each state, province, and country within the breeding grounds of the Yellow-billed Cuckoo. The information is arranged in the following categories: migration timing, nest timing, nesting habitat, food habits, and status.

### **Alabama** – No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status –

### **Arizona** –

Migration timing – Arrives in Arizona the first week in June, but the main spring arrival flight is in late June (Phillips et. al. 1964). One record for early May (Phillips et. al. 1964).

Nest timing – Nesting timed to coincide with abundance of caterpillars during the summer rainy season [mid-June to early August](Phillips et. al. 1964). Height of nesting season in mid-July and early nesting 24 June (Groschupf 1987).

Nesting Habitat – Wooded streams of Sonoran zones, mostly in southern and central Arizona (Monson and Phillips 1981). Breeds in willow-cottonwood and dense mesquite associations (Phillips et. al. 1964).

Food Habits – Caterpillars including tent caterpillars (Phillips et. al. 1964).

Status – Common breeder (Monson and Phillips 1981). Fairly common summer resident, less common in north part of state because of lack of habitat (Phillips et. al. 1964).

### **Arkansas** –

Migration timing – Earliest arrival is 12 April and common by second week in May (James and Neal 1986).

Nest timing – Courtship has been observed as early as 6 May, and nest construction as early as 16 May (James and Neal 1986).

Nesting Habitat – Open woodlands (James and Neal 1986).

Food Habits –

Status – Common summer resident (James and Neal 1986).

### **California -**

Migration timing – In the Kern River Valley for the past eight years, the average first arrival date for cuckoos has been 2 June with a range of first arrival dates from 17 May in 1997 to 17 June in 1993 (S.A. Laymon, unpublished data). This is the best data set on arrival for the species in California. The earliest spring arrival record for California is 23 April in Sacramento Co., and this is the only April record for the state (Gaines and Laymon 1984). The next earliest arrival date is 1 May, once in Yuba and once in Sutter counties (Gaines and Laymon 1984). An average of 17 first arrival dates for Northern California was 31 May, while the average of 18 first arrival dates for Southern California was 29 May (data from Gaines and Laymon 1984). At the Kern River, several weeks can elapse after the first arrival before other cuckoos arrive. In most years, most cuckoos arrive between 15 June and 20 June, but cuckoos are still arriving up to early July.

Nest timing – Earliest nesting begins in mid-June and continues into early September (Laymon unpub. data). Based on egg sets, the earliest nesting records for Yellow-billed Cuckoos in California are 15 and 16 May and the third earliest date is 15 June (Gaines and Laymon 1984). In 15 years of nest searching and based on 94 nests at the South Fork Kern River, Kern Co., California, the earliest first egg date is 6 June and only 4 additional nests were started prior to 16 June (Laymon unpubl. data). The average first egg date for all nests (n=94) is 7 July and the average first egg date of first clutches (n=65) is 3 July.

Nesting Habitat – Restricted to riparian habitat (Gaines and Laymon 1984).

Food Habits – Food habits based on observations at nests indicate that the cuckoo's reproductive success is keyed to a healthy population of the preferred food, sphinx moth larvae scattered over the territory, and an abundant, but less nutritious, "fast food" near the nest (e.g. tree frogs, grasshoppers, cicadas, or katydids). They forage selectively for the sphinx moth larvae, but if they fail to find one within an hour they return to the nest and feed "fast food" to satiate the young before returning to forage for the preferred food (Laymon unpub. data).

Status – Critically Endangered in California, with fewer than 40 pairs at only 2 major locations

### **Colorado –**

Migration timing – Arrives in early May, with earliest record 8 May (Bailey and Niedrach 1965). Arrives in early May and most arrive by late May (Andrews and Righter 1992).

Nest timing – Little information, but nests June through September (Bailey and Niedrach 1965).

Nesting Habitat – Found in lowland riparian forest and urban areas with tall trees (Andrews and Righter 1992).

Food Habits – Caterpillars, even hairy and spiny ones (Sclater 1912).

Status – Rare in eastern plains, but at times found up to 8,000 feet elevation (Sclater 1912). Uncommon summer resident (Bailey and Niedrach 1965). Rare to uncommon summer resident in eastern plains and rare in western valleys (Andrews and Righter 1992). Appears to never have been common in western Colorado where the western subspecies/population occurs (Andrews and Righter 1992).

### **Connecticut -**

Migration timing – Earliest date, 9 May (MacKenzie 1961). Earliest spring arrival, 4-7 May (Zelanski and Baptist 1990).

Nest timing –

Nesting Habitat – Most numerous near coast (Zelanski and Baptist 1990).

Food Habits – Caterpillar infestations (Zelanski and Baptist 1990).

Status – Summer resident, but never common (MacKenzie 1961). Rare to uncommon, northward expansion noted in 1930s-1950s, recent declines (Zelanski and Baptist 1990).

### **Delaware - No information**

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

### **Florida –**

Migration timing – Early spring migrants average 2 April and range from 12 Mar. to 13 April (Sprunt 1954). Late dates in fall range from 18 Oct to 2 Nov. (Sprunt 1954).

Nest timing – Nesting begins in early May and continues through August (Sprunt 1954). Earliest nesting date 22 April (Stevenson and Anderson 1994).

Nesting Habitat – Deciduous woodlands, river swamps, and hammocks are the favored nesting habitat (Sprunt 1954). Woodlands, thickets, hammocks, swamps and fencerows (Stevenson and Anderson 1994).

Food Habits – Tent caterpillars (Sprunt 1954). Caterpillars, even hairy species usually avoided by other birds (Stevenson and Anderson 1994).

Status – Common summer resident (Sprunt 1954). Uncommon to fairly common throughout state (Stevenson and Anderson 1994).

**Georgia** - No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

**Idaho** -

Migration timing – Earliest of two records 16 May 1918 near Rupert, Minidoka Co. (Burleigh 1972). The other record was 30 July 1895 at Fort Sherman (Coeur d’Alene) Kootenai Co. (Burleigh 1972).

Nest timing – No nesting attempts noted (Reese and Melquist 1985).

Nesting Habitat – Eight of nine records in deciduous riparian habitat (Reese and Melquist 1985).

Food Habits –

Status – A rare breeder in open and riparian woodlands (Grove and Marks 1985). Most records from southern Idaho, with a total of 13 sightings of 22 individuals between 1977 and 1985 (Reese and Melquist 1985).

**Illinois** -

Migration timing – Earliest arrivals are 27-29 April, but most arrive in May (Bohlen 1989). The average date of spring arrival is 18 May in Chicago, 5 May in Urbana, and 8 May in Sangamon County (central Illinois) (Bohlen 1989).

Nest timing – Earliest nesting 21 May (Bohlen 1989).

Nesting Habitat – Found in woodlands, woodland edges, in orchards, and other open wooded situations (Bohlen 1989).



Food Habits – Caterpillars, especially fall webworms (Bohlen 1989).

Status – Common summer resident, more common in southern portion of state and decreasing in the north (Bohlen 1989). Large decline noted from 1909 to 1957 with the state population dropping from 383,000 to 92,000 (Bohlen 1989). This decline was believed caused by a decrease in area covered by orchards.

### **Indiana -**

Migration timing – Spring arrival in later half of April and becoming more numerous in May (Mumford and Keller 1984). Earliest dates of 23 March and 3 April may be in error (Mumford and Keller 1984).

Nest timing –

Nesting Habitat –

Food Habits – Tent caterpillars are commonly eaten (Mumford and Keller 1984).

Status –

### **Iowa –**

Migration timing – Early arrival 7-9 May (Dinsmore et al. 1984).

Nest timing – Nesting begins in late May (Dinsmore et al. 1984).

Nesting Habitat – Breeds in parks and farm groves, preferring secondary successional areas (Dinsmore et al. 1984).

Food Habits – Populations increase after eruptions of tent caterpillars (Dinsmore et al. 1984).

Status – Common summer resident (Dinsmore et al. 1984).

### **Kansas -**

Migration timing – Earliest record 13 April; normal arrival 4 May (Thompson and Ely, 1989).

Nest timing – Nesting starts in mid-May, with peak of egg laying in June (Thompson and Ely, 1989).

Nesting Habitat –

Food Habits – Caterpillars, including tent caterpillars (Thompson and Ely, 1989).

Status – Common summer resident (Thompson and Ely, 1989).

**Kentucky –**

Migration timing – Arrives in late April and early May, earlier at low elevations and later at higher elevations (Mengel 1965). Common in most of state by 10 May (Mengel 1965). Earliest arrival date 10 April, fairly common by late April, and common by mid-May (Monroe et al. 1988).

Nest timing – Completed clutches have been found as early as 11 May, with a peak of nest initiation between 1-10 June (Mengel 1965).

Nesting Habitat – Found in forested areas; partial to forest edges and open woodlands (Mengel 1965). Most numerous in mature woodlands and along woodland borders (Monroe et al. 1988).

Food Habits –

Status – Fairly common to common summer resident (Mengel 1965).

**Louisiana -** No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

**Maine -**

Migration timing – Arrives about 18 May (Knight 1908). Most arrive in early June, but a possible early arrival of 15 April (Palmer 1949).

Nest timing – Nest found in early June (Knight 1908).

Nesting Habitat – Usually nests in alder and willow thickets along streams or roadsides (Knight 1908).

Food Habits – Chief food is caterpillars (Knight 1908).

Status – Very rare summer resident in southeastern portion of state (Knight 1908).

**Maryland** - No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

**Massachusetts** -

Migration timing – Earliest date of spring arrival 17 April (Petersen 2000). Most spring arrivals 7-14 May, becoming common later in May (Petersen 2000).

Nest timing – Nesting from 20 May to 30 June (Petersen 2000).

Nesting Habitat –

Food Habits –

Status -

**Michigan** –

Migration timing – Arrives in early May (Brewer et al. 1991).

Nest timing – Begins nesting by mid-May (Brewer et al. 1991).

Nesting Habitat – Young northern hardwood and willow-dogwood shrub wetland were the favored habitats in the north, while these plus dry and wet deciduous habitats were occupied in the south (Brewer et al. 1991).

Food Habits – Increases in numbers appear tied to eruptions of forest tent caterpillars.

Status – Most common in southern third of lower peninsula, less common to rare in northern portion of state (Brewer et al. 1991).

**Minnesota -**

Migration timing – Early spring arrival for state is 6 May, and average arrival date 19 May in south and 20 May in north (Roberts 1932). Early May through early June, with early dates in south from 6-11 May and in north from 12-30 May (Janssen 1987)

Nest timing – Most nesting in June, but an exceptionally early nest in mid-May (Roberts 1932).

Nesting Habitat –

Food Habits –

Status -

**Mississippi -** No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

**Missouri –**

Migration timing –

Nest timing – Nests with young were found as early as 26 May (Jacobs and Wilson 1997).

Nesting Habitat – Found in forest and open woodland (Jacobs and Wilson 1997).

Food Habits –

Status – Common summer resident, with confirmed breeding in 17.6% of 1207 atlas blocks, and probable breeding in an additional 38.7% of the blocks (Jacobs and Wilson 1997).

**Montana -**

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status – Too rare to determine trends, only 8 sightings in state to 1975, only 20 sightings to 1993, confined as breeder to south-east corner of state (Flath 1993).

**Nebraska** - No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

**Nevada** -

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status – Historically found along lower Truckee River and in the Lahontan Valley (Oakleaf 1974). Only six sites were found with potential habitat and cuckoos were not detected at any of these (Oakleaf 1974).

**New Hampshire** - No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

**New Jersey** - No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

## **New Mexico –**

Migration timing – Generally arrives in first half of July, but records from mid May, and early arrivals in Roswell 27 and 30 April and Albuquerque 30 April (Howe 1986).

Nest timing – Late May (23 May) through August (Howe 1986).

Nesting Habitat – Riparian woodlands (Howe 1986). On Pecos River inhabits dense salt cedar stands which it avoids in western New Mexico and Arizona (Howe 1986).

Food Habits –

Status – Common summer resident on the Pecos River in eastern New Mexico, uncommon to rare on the Rio Grande in central New Mexico, and fairly common along the Gila River (Howe 1986). Estimate of close to 1000 pairs for the state with a majority in eastern New Mexico with in the range of the eastern subspecies. An estimated 1239 pairs had been lost through habitat clearing and prediction of further substantial losses in future (Howe 1986).

## **New York -**

Migration timing – Early dates of spring migration are 19 April, 29 April (coastal), and 2 May (inland), becoming common after mid-May (Bull 1974). Late dates in fall are 13 November (coastal) and 16 November (inland) and rare after mid-October (Bull 1974).

Nest timing – Egg dates are from 26 May to 19 August and nestlings are found from 21 June to 17 September (Bull 1974).

Nesting Habitat – Local breeder at low elevations, rare northward in state and absent from mountains (Bull 1974). “Nests in light, open, second growth woodland, fields with scattered bushes and small trees, thickets, and overgrown and abandoned orchards and farmland (Bull 1974).

Food Habits –

Status – Uncommon to fairly common breeder, restricted and local range in state, most below 1000 ft. elevation (Andrle and Carroll 1988). Confirmed breeding on 3.5% of 5338 5-km blocks and probable breeding on an additional 9.1% (Andrle and Carroll 1988).

## **North Carolina - No information**

Migration timing –

Nest timing –

Nesting Habitat –  
Food Habits –  
Status -

**North Dakota -**

Migration timing –  
Nest timing –  
Nesting Habitat –  
Food Habits –

Status – Essentially outside breeding range of species. There are a few records during the breeding season, but no confirmed breeding for the state (Stewart 1975).

**Ohio -**

Migration timing – Earliest records 21-23 April, but most early arrivals are during the first week of May (Peterjohn 1989). Peak of migration 20 May to 7 June (Peterjohn 1989).

Nest timing – Earliest nesting 28-30 May, but most nests found in June and July (Peterjohn 1989).

Nesting Habitat – Found in wooded corridors bordering streams and lakes, open second growth woods, and brushy margins of mature woodlands (Peterjohn and Rice 1991). They are most common near water, but also found in uplands (Peterjohn and Rice 1991).

Food Habits – Caterpillars including woolly bear caterpillars which few other birds can eat (Peterjohn 1989).

Status – Population believed to have been fairly stable from 1900 to 1989 (Peterjohn 1989). Fairly common to common in most counties, but uncommon in northeastern Ohio (Peterjohn 1989). Recorded in 87.4% of atlas blocks (Peterjohn and Rice 1991).

**Oklahoma –**

Migration timing – Earliest spring date 17 April (Sutton 1967). Early date of spring arrival is 6 April (Baumgartner and Baumgartner 1992).

Nest timing – Specimens of breeding adults found as early as 1 May, earliest nest date, 14 May (Sutton 1967).

Nesting Habitat – Inhabits open woods, shaded lawns, and shelterbelts (Baumgartner Baumgartner and 1992).

Food Habits –

Status – Judged to be fairly common to abundant in most sections, occasional to rare in west (Sutton 1967). Common in most of state, but less common in panhandle (Baumgartner and Baumgartner 1992).

### **Oregon -**

Migration timing – Earliest date 19 May (Gabrielson and Jewett 1940).

Nest timing – Earliest nests found in early June (Gabrielson and Jewett 1940).

Nesting Habitat – Dense deciduous growth along larger streams and rivers, such as riparian willow woods with thick understory of shrubbery (Larrison 1981).

Food Habits –

Status - Much less numerous than formerly west of the Cascades (Larrison 1981). Not common anywhere in Oregon, but from 1923-1925 it was fairly common along the Columbia River, where a dozen birds were observed 8 June 1923 (Gabrielson and Jewett 1940). Rare in Eastern Oregon (Gabrielson and Jewett 1940). In 1834-35 Townsend found them abundant in the Columbia River bottomlands (Marshall, 1992). None were found during a survey in eastern Oregon during 1988 (Littlefield 1988).

### **Pennsylvania -**

Migration timing –

Nest timing – Mid-June appears to be the favorite time of breeding activity (Brauning 1992).

Nesting Habitat – Wooded areas including suburban localities. Often associated with brushy areas such as moist thickets and overgrown pastures. Also orchards, roadsides, and streamside willow groves. (Brauning 1992). Generally rarer above 2000 ft. elevation (Brauning 1992).

Food Habits –

Status – Reports an increase in northern part of the state from 1900 to 1990 (Brauning 1992). Confirmed breeding in 3.9% of 4924 atlas blocks and probably breeding in 15.5% additional blocks (Brauning 1992).



**Rhode Island** - No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

**South Carolina** - No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

**South Dakota** - No information

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status -

**Tennessee** -

Migration timing – Earliest spring arrival is 25 April in eastern part of state (Stupka 1963) .

Nest timing –

Nesting Habitat –

Food Habits –

Status – Fairly common summer resident in eastern Tennessee (Stupka 1963).

**Texas** -

Migration timing – April to September (Rappole and Blacklock 1985). Arrives in North Central Texas in numbers in late April and departs in mid-October. Early arrivals by county in this region are: 31 March in Dallas Co., 17 April in Grayson Co., 13 March in Hill Co., 23 April in Kaufman Co., 3 April in Palo Pinto Co., 5 April in Tarrant Co., 3 April in Van Zandt Co., and 2 April in Wichita Co.. Average of first arrival dates for these counties is 4 April (Pulich 1988). Spring arrival in most of Texas (range of nominate subspecies *C.a. americanus*) from April to late May with early date of spring

arrival 17 March (Oberholser 1974). West of the Pecos River in the range of *C. a. occidentalis* spring arrival from May to mid-June (Oberholser 1974). Found April to September (Rappole and Blacklock 1994).

Nest timing – May to August (Rappole and Blacklock 1985). Nesting in North Central Texas May through September with a peak in June (Pulich 1988). Nesting in Texas from mid-March to mid-September, with the earliest egg date being 22 March (Oberholser 1974).

Nesting Habitat – Riparian forest, woodland, savanna, mesquite chaparral. Summer resident particularly in open woodlands as well as in dense areas (Pulich 1988). Dense foliage of open woodland especially along streams and rural roads, shade trees, seldom-sprayed orchards, and gardens (Oberholser 1974).

Food Habits – Favored food is caterpillars, even hairy ones whose spines often coat the inside of the bird's stomach (Oberholser 1974). Also eats locusts, beetles, bugs, grasshoppers, ants, wasps, frogs, and lizards (Oberholser 1974).

Status -

#### **Utah -**

Migration timing – May to September, but earliest record cited is 10 June (Hayward et al. 1976).

Nest timing – No actual nesting records, no nests found, but pairs found during breeding season (Hayward et al. 1976).

Nesting Habitat – In woodlands along streams in lower valleys (Hayward et al. 1976).

Food Habits –

Status – Uncommon (Hayward et al. 1976). Very rare in northeastern Utah (Cook 1981)

#### **Vermont -**

Migration timing –

Nest timing –

Nesting Habitat –

Food Habits –

Status – Absent from most of the state, with most recent records from lowland portion of western Vermont (Laughlin and Kibbe 1985). Breeding confirmed on only 1.6% of atlas blocks (Laughlin and Kibbe 1985).

### **Virginia -**

Migration timing – Most arrive about 25 April and depart in early October (Bailey 1913)

Nest timing – Breeding starts from 5-20 May (Bailey 1913).

Nesting Habitat – More found in sites greater than 9 ha, than in sites less than 8 ha in extent; slight preference for dense canopy forest (Mabey 1993). Found in deciduous and mixed habitats including wet bottomland hardwood forests (Mabey 1993).

Food Habits –

Status – Common to abundant breeding bird (Mabey 1993)

### **Washington –**

Migration timing – Earliest state record is 3 May (Jewett et al. 1953).

Nest timing – Earliest nest with slightly incubated eggs 1 June (Jewett et al. 1953). Other nests mid-June to mid-July (Jewett et al. 1953).

Nesting Habitat – Humid transition zone of western Washington (Jewett et al. 1953). Wooded swamps (Kitchen 1949). Dense deciduous growth along larger streams and rivers, such as riparian willow woods with thick understory of shrubbery (Larrison 1981).

Food Habits –

Status – Rare summer resident (Jewett et al. 1953). Believed to no longer breed in Washington (Kitchen 1949). Much less numerous than formerly west of the Cascades (Larrison 1981).

### **West Virginia –**

Migration timing – Arrives from late April to early May, some still arriving in early June (Hall 1983).

Nest timing –

Nesting Habitat – Found in a wide variety of forest types, but not pure coniferous forests (Hall 1983).

Food Habits – Populations follow the cyclical populations of tent caterpillars (*Malacasoma*). In years of heavy outbreaks there are large populations of cuckoos and in years with few or no caterpillars there will be few or no cuckoos (Hall 1983)

Status – Fairly common to common summer resident, with numbers at any location varying widely from year to year (Hall 1983). Difficult to tell population trends because of semi-nomadism, but believes there has been a decline, but not a great one (Hall 2000)

### **Wisconsin -**

Migration timing – Arrives from early May to early June with most first arrivals between 10 and 15 May (Robbins 1991). There are four April records, with 22 April the earliest (Robbins 1991).

Nest timing – Nests with eggs have been found as early as 18 May (Robbins 1991).

Nesting Habitat – Deciduous forest (Robbins 1991).

Food Habits –

Status – Fairly common summer resident in south, uncommon in central and rare in north (Robbins 1991).

### **Wyoming –**

Migration timing – Earliest date 6 May, with most arriving in late May. Late date 31 October (Dorn and Dorn 1990).

Nest timing –

Nesting Habitat – Deciduous woods and thickets, especially along large streams (Dorn and Dorn 1990).

Food Habits –

Status – Uncommon (Dorn and Dorn 1990).

## **Mexico –**

Migration timing – 15 June is earliest record in Baja California (Wilbur 1987). Arrives in Sonora, Mexico the first week in June with the earliest date 2 June (Russell and Monson 1998).

Nest timing – In Sonora, Mexico, the earliest nesting is 18 June (Russell and Monson 1998). In Sonora, clearly a wet season breeder (Short 1974).

Nesting Habitat – Breeds mostly in riparian habitat, sea level to 1500 m (Howell and Webb 1995). Favored habitat is willow-cottonwood woodland and large leguminous trees and shrubs along desert washes. Found in tropical deciduous forest, tropical thornscrub and locally in desert scrub, but not found in pine-oak woodland except in migration (Russell and Monson 1998). In Sonora, most numerous along watercourses, but not confined to them (Short 1974).

## **Food Habits –**

Status – In Baja California, uncommon summer resident along Rio Colorado and the Cape District, with all recent records from Cape District (Wilbur 1987). Breeds locally in northern Mexico, with western subspecies in northwest Mexico and eastern subspecies in Nuevo Leon, Tamaulipas south to mountains of Veracruz (Blake 1953). Fairly common to common but local summer resident in southern Baja California, Colorado River Delta (formerly), and from Sonora and Chihuahua locally and irregularly south to Zacatecas. Also breeds on Atlantic slope from Coahuila to Tamaulipas and northern Yucatan Peninsula (Howell and Webb 1995). Common summer resident in Sonora, with high nesting density in comparison with Arizona (Russell and Monson 1998). Common to abundant nesting species (Short 1974).

## **Canada –**

### **Migration timing –**

Nest timing – In eastern Canada near Lansdowne, Ontario, eggs with advanced incubation were collected on 23 and 29 May (Macon and Macoon 1909)

### **Nesting Habitat –**

Food Habits – Hairy caterpillars are regularly eaten (Tavener 1947)

Status – A rare summer resident in Quebec, but rather common and possibly increasing around Toronto and Ottawa (Macon and Macoon 1909). An accidental visitant elsewhere in eastern Canada (Macon and Macoon 1909). In the west, *C. a. occidentalis* was found in the vicinity of Mount Lehman on the Fraser River, at Burrard inlet, at Kamloops, near Victoria, and on Mount Tolmie. They were found to be a “tolerably common” summer resident at Chilliwack and they were becoming more abundant in the

coast region because of the invasion of forest tent caterpillars (Macon and Macoon 1909; Brooks and Swarth 1925). Breeds in southern Manitoba (rarely), southern Ontario (rarely north to Sudbury and Ottawa), extreme southwestern Quebec (rarely), and southern New Brunswick (Godfrey 1986). “The intensification of agriculture, leaving fewer hedgerows or orchards and little roadside shrubbery, has occurred in much of the rural area within the range of this species in the past few decades, with the resultant loss of much good Yellow-billed Cuckoo habitat. Abundance estimated provided by atlasers indicate that the Yellow-billed Cuckoo is uncommon or rare in most areas where it is found.” (Cadman et al. 1987).

### **West Indies -**

Migration timing – Very large concentrations pass through on migration in April and October (Raffaele 1989). Arrives in March and April in West Indies (Raffaele et al. 1998)

Nest timing – Breeds May through July in Puerto Rico (Raffaele 1989).

Nesting Habitat – Most commonly found in arid scrub land, but also found in mangrove swamps and woodlands at low elevations (Raffaele 1989). Lowland scrub and dry forests, generally not at high elevation (Raffaele et al. 1998).

Food Habits –

Status – Uncommon nesting species in Puerto Rico, has nested on St Croix in the Virgin Islands (Raffaele 1989). Rare in winter in Puerto Rico and Virgin Islands (Raffaele 1989). Uncommon breeding resident on Cuba, Hispaniola, and Puerto Rico and rarely on Jamaica and the Virgin Islands (Raffaele et al. 1998). May possibly breed in the Bahamas and has bred in the northern Lesser Antilles. Rare in winter in West Indies (Raffaele et al. 1998).

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