

# CAN THE WESTERN SUBSPECIES OF THE YELLOW-BILLED CUCKOO BE SAVED FROM EXTINCTION?

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Historically, the California Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) was considered common in river bottoms throughout western United States and southern British Columbia (Gaines and Laymon 1984). It began a drastic decline in numbers as the riparian forests on which it depended were removed for fuel and to make way for agriculture and grazing. Along with local declines, there was an overall range contraction; the last known breeding birds were in British Columbia in the 1920s, in Washington in the 1930s, in Oregon in the 1940s, and in California north of the Sacramento Valley in the 1950s (Roberson 1980, Gaines and Laymon 1984, Figure 1).

Clearing for agriculture, flood control, and urbanization has resulted in the loss of hundreds of thousands of hectares of riparian habitat throughout the West. Examples of this massive habitat destruction include (1) the Los Angeles basin, which supported hundreds of cuckoos prior to 1900, no longer supports any riparian habitat (Gaines and Laymon 1984); (2) the Buena Vista Lake area of Kern County, where ornithologists collected 17 cuckoos in three weeks in 1921, has been converted to a seemingly endless sea of cotton fields (Gaines and Laymon 1984); and (3) the Sacramento Valley, where the species was once common, now has less than 1% of the original habitat and supports fewer than 50 pairs of breeding cuckoos (Gaines and Laymon 1984).

Remnant fragments of riparian habitat throughout the West are still endangered by degradation, clearing, and inundation. For these reasons the future of the California Yellow-billed Cuckoos appears uncertain. In this paper we present the results of field surveys from California that further document this species' decline. We also discuss causes for these recent declines and prospects for the future.

## METHODS

Our conclusions are based on research done on the Sacramento River, Butte and Tehama counties, during 1978 and 1979; along the South Fork Kern River, Kern County, during 1985 and 1986; and throughout southern California in 1986. Methods included field surveys, nest monitoring, foraging observations, radiotelemetry, and measuring eggshell thickness. Our standard survey method involved stopping every 200 m in suitable habitat and playing a tape-recorded Yellow-billed Cuckoos call 10 times, or until a response was elicited. The tape recording could be heard to approximately 300 m under field conditions. Unmated cuckoos were distinguished from paired ones by their cooing or cawing vocalizations and their high level of interest in the tape-recorded calls. While surveying and locating nests, we recorded data, including tree

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species and foraging height, on the cuckoos' foraging activity. Radio-telemetry data were gathered on two female cuckoos at the Kern River site and included both constant monitoring of foraging behavior and delineation of home range.

### RESULTS

Gaines (1974) defined Yellow-billed Cuckoo habitat as willow (*Salix* spp.)-cottonwood (*Populus fremontii*) forests below 1300 m elevation, > 10 ha in extent, and wider than 100 m. Using radio-telemetry and intensive observation we refined this definition of the species' habitat. We determined that cuckoos used larger areas, averaging 17 ha, and foraged predominantly in cottonwoods rather than willows, as expected from previous observations. Nests were placed almost entirely in willows, making a mix of cottonwoods and willows essential (for more data see Laymon and Halterman 1985). We defined a tract of riparian woodland as suitable for cuckoos if it was larger than 15 ha and included a minimum of 3 ha of closed-canopy, broad-leafed forest. We defined as unsuitable tracts smaller than 4 ha and all tracts containing no closed-canopy, broad-leafed forest, regardless of their extent.

In 1986 we surveyed all habitat meeting this definition of suitability in southern California from Inyo and Kern counties south to the Mexican border and in Arizona along the Colorado River. The only population (defined as more than 5 pairs) found in California was 9 pairs on the South Fork of the Kern River. In the Prado Flood Control Basin on the Santa Ana River, Riverside County, we found one breeding pair and two additional adults; a third adult was found by R.L. Zembal (pers. comm.). The single birds may also represent mated birds, giving a total of 4 pairs for the Prado area. The only other pair away from the Colorado River was on the Amargosa River near Tecopa, Inyo County. Single unmated birds were found in the Owens Valley and on the Mojave River. Seemingly suitable habitat for several pairs is present on the Mojave, Santa Clara, and Owens rivers, but no cuckoos were found there. We located 2 pairs of cuckoos on the California side of the Colorado River, 3 pairs on the Arizona side, and an additional 3 unmated birds, 2 in California and one in Arizona. We estimate the total population for the Colorado River from Davis Dam to the Mexican border to be 5-10 pairs, representing a 92-96% decline from the 122 pairs estimated in 1977 (Gaines and Laymon 1984).

The only area where we found a substantial population of cuckoos was on the Bill Williams River between Lake Havasu and Planet Ranch, Mohave and La Paz counties, Arizona. At this site we found paired cuckoos at 17 locations and an additional 4 unmated birds. We estimated that 25-30 pairs were breeding there in 1986, a decline from an estimated 57 pairs in 1977 (Gaines and Laymon 1984).

In 1979 we collected two eggs and analyzed them for pesticides. The eggs contained an average of only 0.1 parts per million of DDE, suggesting that chlorinated hydrocarbons are present in low concentrations (Laymon 1980). However, in 1985 we collected from three nests on the South Fork of the Kern River eggshell fragments that averaged 0.115 mm thick, an average of

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19% and range of 17 to 24% thinner than eggshells (average thickness 0.143 mm) collected before the DDT era.

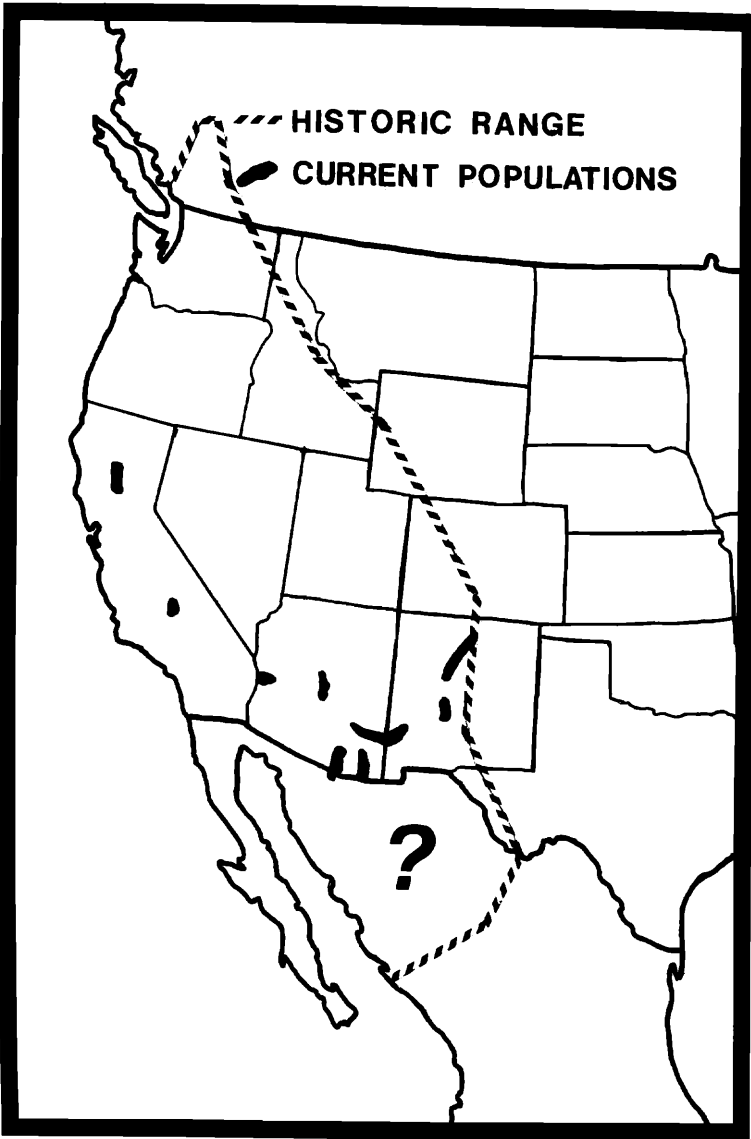


Figure 1. Historic and current range of the California Yellow-billed Cuckoo.

## DISCUSSION

What relationship do drastic population declines, restrictive habitat requirements, and possible pesticide contamination have on the western subspecies of the Yellow-billed Cuckoos? There has, of course, been massive riparian loss throughout the West. Since cuckoos need large expanses of closed-canopy cottonwood-willow riparian forest, their numbers have dropped as habitat has been removed and degraded. The recent decline of 92-96% along the Colorado River between 1977 and 1986 is cause for great concern; this area was the stronghold of the species in the northwestern 70% of its original range (Figure 1).

Although there has been some clearing for agriculture along the Colorado River since 1977, most of the habitat loss since that time was due to unusually high water flows from May 1983 to the present. Heavy precipitation and the filling of Glen Canyon Dam have resulted in extensive floods that immersed the roots of willows and cottonwoods for prolonged periods of time, drowning as much as 99% of the existing habitat (B.W. Anderson pers. comm.).

Areas occupied by several pairs of cuckoos in 1977 are now monotypic stands of salt cedar (*Tamarix pentandra*) and uninhabited by cuckoos. For example, above Laguna Dam in 1977 at least 3 pairs of cuckoos occupied a 12-ha site that was approximately 40% willow (Gaines and Laymon 1984). The dominant vegetation is now salt cedar and less than 1% willow cover remains; our 1986 survey revealed no cuckoos at this site. Another example is the vicinity of Picacho State Recreation Area, where in 1977 21 pairs of cuckoos were breeding in 120 ha of 70-m wide willow forest (Gaines and Laymon 1984). Salt cedar and aquatic vegetation now dominate this site and in 1986 we found no cuckoos in the 5 ha of scattered willow-cottonwood habitat that remains. The sites on the Colorado River where we did locate cuckoos cannot be considered suitable habitat for the species. They are marginal locations at best, lacking sufficient extent, breadth, and structural diversity.

Habitat for several pairs on the Amargosa River at Tecopa was eradicated by flash floods in 1983 that scoured out the river bed (J. Tarble pers. comm.). Only one pair remains at this site where four were found in 1977.

We also noted declines in areas where habitat has remained constant or improved. Gaines and Laymon (1984) found 3 pairs in the Owens Valley where we found only a single unmated female. The habitat was unchanged at this site. Unoccupied habitat was also found on the Santa Clara, Mojave, Amargosa, and Sants Ana rivers. The Amargosa site is especially interesting since it has been surveyed yearly since 1977 (J. Tarble pers. comm.). Since 1977, when 4 pairs were found at the site, cuckoos have nested only in 1979 (1 pair), 1982 (2 pairs), and 1986 (1 pair), illustrating a very unstable population. A possible explanation is that with the population decline along the Colorado River, fewer recruits are available to colonize and sustain outlying areas. With small populations, under 25 pairs, stochastic events could cause chance extinctions (Soule and Wilcox 1980). At this time we do not know if any population in California is safe from these effects.

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Comparison with early ornithological records shows that the western subspecies of the Yellow-billed Cuckoo now uses a narrower range of habitats than it did historically. Yellow-billed Cuckoos once bred in spruce bogs in Washington, along city streets in Sacramento, and in prune orchards in Marysville, all non-riparian habitats (Gaines and Laymon 1984). Two hypotheses that might explain these differences include (1) cuckoos were forced into marginal areas by saturation of suitable habitat and (2) cuckoos actually had a wider range of suitable habitats then they do today. If the latter is correct, this narrowing of habitat preference could have come from a physical inability to reproduce in the more open, arid habitats because of moisture loss caused by eggshell thinning induced by pesticides. Water loss in eggs is caused by a relationship between the thickness and porosity of the eggshell and environmental factors such as temperature and humidity. Higher temperature, lower humidity, and thinner eggs all could cause excess water loss and reduced hatchability (Rahn and Ar 1974). Arizona cuckoos breed in dry, open salt cedar habitats at elevations above 500 m, but are confined to moist willow-cottonwood habitats below 500 m (Hunter et al. 1987). Summer rains in eastern Arizona and lower temperatures at the higher elevations could mitigate the effects of eggshell thinning.

Since DDT was banned in the United States in the mid-1970s, birds are exposed to persistent pesticides primarily on their wintering grounds and in migration. The wintering grounds of the western subspecies are unknown but suspected to be in South America, where the eastern subspecies winters.

Exposure to other pesticides and agricultural chemicals can be either direct or indirect. We observed direct exposure in the Sacramento Valley when active nests in walnut orchards were sprayed with Zolone, causing sub-lethal poisoning of the young (Laymon 1980). Cuckoos could be exposed indirectly when a favored food, such as the Pacific tree frog (*Hyla regilla*), occurs in pesticide-laden runoff from adjoining agricultural lands. Sphinx moth larvae (Sphingidae), another favored prey, could be poisoned by pesticides, thus reducing the prey population. This reduction of prey would be another indirect effect on cuckoos.

The western Yellow-billed Cuckoo has declined dramatically in geographic range as well as number. Eastern Arizona, New Mexico, western Texas, and Sonora and Chihuahua in Mexico are currently the only areas where cuckoos are believed still to have populations of which extinction is not an immediate concern. Even in these areas, much riparian habitat has been removed for agriculture or river channelization, displaced by salt cedar, and degraded by grazing. No surveys of cuckoos have been done in these areas so the current populations there are unknown. However, on the basis of estimates of current habitat (Hunter et al. 1987), the numbers of the subspecies must be very low. In California, 50-75 pairs of cuckoos probably still breed (Gaines and Laymon 1984). It is likely that fewer than 200 pairs breed in Arizona, 100-200 pairs breed in New Mexico, and 100-200 pairs breed in western Texas. Numbers in Mexico are unknown, but are believed to be low because of habitat degradation in at least the northern two-thirds of Sonora (S. Howell pers. comm.). These estimates yield a total of 475-675 pairs in North America north of Mexico; the Mexican population is unknown, but probably does not exceed this figure. The U.S. Fish and Wildlife Service lists as endangered

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species and subspecies of birds that have larger populations than that of the California Yellow-billed Cuckoo (e.g., Red-cockaded Woodpecker *Picoides borealis*).

The California Yellow-billed Cuckoo's range is approximately 30% of its historical extent. Wilcove and Terborgh (1984) categorized the patterns by which birds decline; the Yellow-billed Cuckoo most closely fits a pattern of retraction from the peripheral parts of its range combined with retraction from marginal habitats. This pattern characterizes the northwestern 70% of the historic range. Wilcove and Terborgh (1984) cited no examples of this pattern and listed it only as a theoretical possibility.

### MANAGEMENT CONSIDERATIONS

What can be done to ensure the future of the California Yellow-billed Cuckoo? The first priority is a survey to determine numbers and locations of cuckoos, especially in the center of the remaining population's range. Such information would permit management agencies to direct efforts at habitat preservation and restoration to the areas where they would best benefit the cuckoos. Acquisition and improvement of both actual and potential cuckoo habitat should be the primary aim of efforts to save the western subspecies. One step to improve areas for cuckoos is removal of grazing to allow natural regeneration and encourage increased density of willows and cottonwoods. In treeless areas that have been severely overgrazed for a long time, or where natural flooding does not occur, other steps need to be taken. The most effective way to reforest an area is through sapling plantings. This has been done, with varying degrees of success, on the Colorado River over the past 15 years (B.W. Anderson pers. comm.). The Nature Conservancy at the Kern River Preserve has initiated reforestation at suitable sites by using California Department of Fish and Game tax check-off funds. In 1986 11 ha of willow and cottonwood forest were replanted to replace the original forest that had been removed in the late 1800s to fuel a local flour mill. The success on this site is phenomenal, with some trees reaching a height of 3 m during the first growing season (B.W. Anderson pers. comm.). This area will be a valuable addition to the existing 120 ha of forest currently on the preserve. In 1987 two additional sites totaling 27 ha are scheduled to be replanted.

Captive propagation and reintroduction into areas, such as the Willamette Valley of Oregon, where much seemingly suitable habitat persists but cuckoos have been extirpated, is also a management tool that merits investigation. Studies should be initiated to determine the habitat and food resource base of potential reintroduction sites and the feasibility of captive breeding of cuckoos.

Further research is needed to determine effective population size and site tenacity in the cuckoo. In addition, almost all life-history variables such as mortality and longevity are still poorly known. The location of the wintering grounds has not yet been located; this needs to be determined before threats to wintering cuckoos can be addressed.

We feel that the western subspecies of the Yellow-billed Cuckoos can be saved from extinction, but not without the concerted efforts of researchers, resource management agencies, and conservation organizations.

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Sketch by Narca Moore-Craig