

**Petition to list the yellow-billed cuckoo *Coccyzus americanus*
as a Federally Endangered Species**

Center for Biological Diversity

Endangered Species Report No. 36

February 2, 1998

Mr. Bruce Babbitt
Secretary of the Interior
Department of the Interior
18th and "C" Street, N.W.
Washington, D.C. 20240

Kieran Suckling, Noah Greenwald, the Center for Biological Diversity, Maricopa Audubon Society (AZ), Tucson Audubon Society (AZ), Huachuca Audubon Society (AZ), White Mountain Audubon Society (AZ), White Mountain Conservation League (AZ), Wildlife Damage Review (AZ), Sky Island Alliance (AZ), the San Pedro 100 (AZ), the Zane Grey Chapter of Trout Unlimited (AZ), T & E Inc.(NM), the Biodiversity Legal Foundation (CO), the Environmental Protection Information Center (CA), the Sierra Nevada Alliance (CA), Wetlands Action Network (CA), Rangewatch (CA), the Oregon Natural Desert Association (OR), the Oregon Natural Resources Center (OR), the Klamath-Siskiyou Wildlands Center (OR), the Southern Utah Wilderness Alliance (UT), the Wild Utah Forest Campaign (UT), Friends of Nevada Wilderness (NV), and The Toiyabe Chapter of the Sierra Club (NV) hereby formally petition to list the yellow-billed cuckoo (*Coccyzus americanus*) as endangered pursuant to the Endangered Species Act, 16 U.S.C. 1531 et seq. (hereafter referred to as "ESA") because it is endangered in a significant portion of its range (i.e. the western United States). We believe this range of endangerment is coterminous with a valid subspecies the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*). Therefore if the Service chooses to list the subspecies in whole, rather than the species in part, the petitioners would concur. This petition is filed under 5 U.S.C. 553 (e) and 50 CFR 424.14 (1990), which grants interested parties the right to petition for issue of a rule from the Assistant Secretary of the Interior.

Petitioners also request that Critical Habitat be designated for the yellow-billed cuckoo concurrent with the listing, pursuant to 50 CFR 424.12, and pursuant to the Administrative Procedures Act (5 U.S.C. 553).

Due to the fact that very few yellow-billed cuckoos remain in the west, that the cuckoo has suffered precipitous declines in recent years, and that habitat destruction is ongoing and impending, we appeal for emergency listing and emergency critical habitat pursuant to ESA 4 (b)7 and 50 CFR 424.20 in order to sustain the subspecies in the very immediate future.

Petitioners understand that this petition action sets in motion a specific process placing definite response requirements on the U.S. Fish and Wildlife Service and very specific time constraints on those responses.

Petitioners

Kieran Suckling is a Doctoral Candidate and executive director of the Southwest Center for Biological Diversity. He has written numerous petitions to list endangered species that inhabit riparian areas.

Noah Greenwald received an M.S. in ecology from the University of Washington and is currently a conservation ecologist with the Southwest Center For Biological Diversity. His master's research focused on riparian forest ecology. He has also spent several years studying the ecology of endangered birds in the field.

Maricopa Audubon Society is an organization of volunteers dedicated to the enjoyment of birds and other wildlife with a primary focus on the protection and restoration of the habitat of the Southwest.

Tucson Audubon Society is dedicated to improving the quality of the environment by providing education, conservation, and recreation programs as well as environmental leadership and information. TAS is a non-profit volunteer organization of people with a common interest in birding and natural history.

Sky Island Alliance is a coalition of scientists and conservationists dedicated to the preservation and restoration of native biological diversity in the Sky Islands of the Southwestern United States and and Northwestern Mexico.

T & E, Inc. is a 501c3 organization dedicated to the preservation of native flora and

fauna in the southwestern part of the United States and northern Mexico. Our primary thrust is to support education and research on rare and endangered species, species of concern and their habitat. This is done mostly through funding or partial funding of research projects proposed by students seeking advanced degrees in the fields of conservation biology, biology, or wildlife science.

The Biodiversity Legal Foundation is a non-profit public interest organization dedicated to the preservation of all native wild plants and animals, communities of species, and naturally functioning ecosystems in this country. Through visionary educational,

administrative, and legal actions, the BLF endeavors to encourage improved public attitudes and policies for all living things.

The Environmental Protection Information Center (EPIC) works to protect the ancient forests and endangered species of northern California through a combination of public education, grassroots advocacy and strategic litigation. Since 1977, EPIC has actively pursued forestry reform and strong enforcement of laws protecting the public trust and our natural heritage.

The Sierra Nevada Alliance is a regional coalition of 43 grassroots and regional groups working in the Sierra to protect and restore the natural and community values of California's most cherished mountain range.

Rangewatch is an organization that works to reduce the economic, commercial and ecological costs of grazing on public lands.

Oregon Natural Desert Association is a small grassroots conservation organization dedicated to the protection and restoration of the species and ecosystems of the High Desert of the Great Basin. It was formally incorporated in 1989, and now has approximately 1000 members. ONDA members hike, fish, bird-watch, and recreate in eastern Oregon ecosystems formally inhabited by the yellow-billed cuckoo.

The Oregon Natural Resources Council is a twenty-five year old, Oregon-based non-profit

environmental organization with 3,500 members. ONRC has long been involved in forest, desert and species protection efforts.

The Klamath Siskiyou Wildlands Center is dedicated to the conservation and enhancement of biological diversity in southwestern Oregon. Our main focus is on resource extraction from public lands, as well as road density reduction and endangered species protection.

The Southern Utah Wilderness Alliance is a 20,000 member organization dedicated to the preservation of wild places in southern Utah.

The Wild Utah Forest Campaign (WUFC) works to protect and restore the native ecological richness, diversity, and integrity of Utah's forest ecosystems. WUFC operates as a project of the Western Ancient Forest Campaign and serves other local grassroots organizations in Utah.

Friends of Nevada Wilderness is a statewide wilderness and public lands conservation group in Nevada. With over 250 members, its primary focus is wilderness designation and biodiversity protection.

The Toiyabe Chapter of the Sierra Club represents Sierra Club members all over Nevada and eastern California. The Sierra Club is the premier public lands conservation organization in the nation.

EXECUTIVE SUMMARY

The yellow-billed cuckoo belongs to a group of seven riparian obligate, migratory birds which breed during mid-summer in the American Southwest and northern Mexico in open-cup nests. Six of the seven- yellow-billed cuckoo, willow flycatcher (*Empidonax traillii*), summer tanager (*Piranga rubra*), yellow warbler (*Dendroica petechia*), Bell's vireo (*Vireo bellii*), and yellow-breasted Chat (*Icteria virens*)- are declining (Hunter et al. 1987), two are already Federally listed as Endangered. All are broadleaf obligates or near obligates at lower elevations and show a distinct preference for broadleaf habitats at higher elevations as well. Of these, the yellow-billed cuckoo has undoubtedly seen the most decline in a large portion of its range, so much so that Gaines and Laymon (1984) conclude:

"The yellow-billed cuckoo is at a critically low population level, not only in California, but in the northern Rocky Mountains, the Great Basin, and the Pacific Northwest as well."

The yellow-billed cuckoo is rapidly approaching extinction in the western states- it was last known to breed in British Columbia in the 1920's, in Washington in the 1930's and in Oregon in the 1940's. The yellow-billed cuckoo has also been extirpated from Idaho, Nevada and Utah.

In California the yellow-billed cuckoo has declined from a "fairly common breeding species" throughout most of the state to a current population of less than 50 pairs (Gaines and Laymon 1984; Laymon and Halterman 1991).

In Arizona, cuckoos have been eliminated from numerous stretches of river where they were once common, including along the lower and middle Gila, the lower Salt and the lower Colorado. Similarly, extensive habitat destruction in New Mexico has likely resulted in sharp declines in the cuckoo's population. This is supported by the only study of cuckoo's in New Mexico, which concluded that:

"As a species that is closely tied to riparian woodlands, it follows that continued loss or alteration of such habitat would be a threat. As an insectivorous species, pesticide contamination could also be a threat." (Howe 1986)

Extensive destruction of the cuckoo's primary habitat, cottonwood-willow riparian forests, is clearly the most severe threat to the survival of the cuckoo, Gaines and Laymon (1984) conclude:

"Loss of habitat is the most important cause of decline. By the late 1800s, large tracts of floodplain forest had already been cut or cleared for fuel or agriculture. Probably the

density of cuckoos was even greater than the early literature suggests. Reclamation, flood control, and irrigation projects accelerated this loss over the past 80 years, leading to only remnant riparian habitat in 1988"

The cuckoo is likely even more sensitive to habitat loss than other riparian obligate species, such as the willow flycatcher, because it is dependent on the combination of a dense willow understory for nesting, a cottonwood overstory for foraging and large patches of habitat in excess of 20 ha. (Laymon and Halterman 1991). It is also not known to utilize non-native vegetation in the majority of its range (Hunter et al. 1984).

Extensive grazing, dams, flood control, and urban and agricultural development have all had an immense impact on riparian forests. Over 80% of all riparian habitat in the United States has been lost and much of the remaining habitat has been severely degraded (Ohmart and Anderson 1986). Loss of riparian habitat has been particularly severe in California and Arizona where up to 98% of all wetlands have been decimated (Warner 1979). This has had a devastating effect on numerous species. Over 100 state and federally listed species in New Mexico and Arizona are riparian dependent (Johnson 1989). Of 161 bird species which nest in the Southwest's lowlands, a full 69% have suffered declines due to riparian habitat loss (Johnson et al. 1987).

Habitat destruction is ongoing- inundation of riparian habitat behind Isabella Dam in California has degraded as much as 1,100 acres of prime native habitat and caused cuckoos to decline from 24 to 5 pairs.

The yellow-billed cuckoo is listed as endangered in the state of California, sensitive in Nevada, Washington and Oregon, and as a "species of special concern" in Arizona. It has no listing status in New Mexico. The U.S. Forest Service classifies the yellow-billed cuckoo as "Sensitive" in Region Three (1988). The cuckoo was listed as a candidate endangered species (C2) in 1986, but currently has no federal standing.

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I. CLASSIFICATION AND NOMENCLATURE

Ridgeway (1887) identified two sub-species of yellow-billed cuckoos. The California Cuckoo (*Coccyzus americanus occidentalis*) and the yellow-billed cuckoo (*Coccyzus americanus americanus*). The former was distinguished as being slightly larger, grayer and having a stouter bill. Its range extended from the upper three-fourths of the Rio Grande River, west to the California Coast, and north to southwestern British Columbia (Figure 1). In the southern and western parts of its range it bred in mesquite and cottonwood-willow stands, and in the north it used willow scrub and cottonwood. The eastern subspecies occurs widely in deciduous forests east of the Rocky Mountains (Halterman 1991).

Based on similar observations, several authors have since reaffirmed the existence of two separate sub-species (e.g. Peters 1940 and Oberholser 1974), including the American Ornithological Union (1957). Others have subsequently challenged the division (Todd and Carriker (1922), Van Tyne and Sutton 1937), but provided no data to support their claims.

Spurred by a 1987 petition to list the western subspecies in a portion of its range, the U.S. Fish and Wildlife Service contracted a taxonomic study. Using a Student's t-test Banks (1988) compared wing length, culmen length, and mandible depth of western and eastern birds and found no significant difference for any of these characteristics. As a result, he concluded that there was no evidence to support splitting the species. The study was accepted and the petition found not warranted, even though four separate ornithologists, two of them under contract with the U.S. Fish and Wildlife Service, determined that the study's conclusion was based upon mathematical errors, Spiller (1988) states:

"The reanalyses by both our office and Dr. Groschupf indicated that there was a substantial error in the use of the Student's t-test which dramatically changed the interpretation of the morphological data...Dr. Banks reported that all tests between western and eastern birds (sexes analyzed separately) were not significant ($P > 0.05$); that is, the populations were not distinguishable. Reanalysis however, determined that differences were actually highly significant (all $P < 0.001$), indicating that the western and eastern populations were distinct for all three morphological characters for both sexes.

These significance levels translate into conducting this type of test well over 1000 times before an error would be made by chance alone; the chances of making an error in any of the six tests conducted here are infinitely small...The discrepancies between Dr. Banks' original analysis and the reanalyzes are not easily explained...We believe Dr. Banks' conclusion is not warranted...We bring this information to your attention because we suspect yellow-billed cuckoo populations in Region 2 will continue to decline, as have populations in Regions 1 and 6, and we may have to reconsider this species for listing in the near future".

Banks (1990) later acknowledged the statistical errors, concluding there was, in fact, a statistically significant difference in wing length, but refused to rescind claims that no division of the species was warranted. To support this claim, Banks argues that the Student's t-test, which he previously used to justify his original argument, is imprecise and that the size differences, in his opinion, are too small to justify a split in the species:

"Despite the statistical differences in mean values between grouped eastern and western populations of yellow-billed cuckoos, or between some of those in the western group, my interpretation of data on the more than 700 specimens examined-that the species should be considered monotypic- remains unchanged" (Banks 1990).

This interpretation is based on arbitrary criteria, such as visual examination of graphed data and thresholds for size difference that are left unsupported by reference or methodology. In summary, Bank's interpretations are based solely on opinion with no rigorous scientific criteria and, as a result, there is no data in support of monotypic status for the yellow-billed cuckoo. In fact, his own t-test displayed significant difference.

Using the same samples as Banks, Franzreb and Laymon (1993) used both a Student's t-test and discriminant analysis to quantify size differences between eastern and western birds. In addition to wing length, culmen length, and mandible depth, they also measured tail length, which showed the largest differences, western males having tails ca. 5 mm longer and western females having tails ca. 6 mm longer. Banks (1988) omitted tail length measurements, reportedly because wear and tear makes measurement difficult. All size measurements comparing western and eastern birds were significantly different ($p < .05$) using the Student's t-test (Banks 1990, Franzreb and Laymon 1993).

Significant differences were also found using discriminant analysis. This technique calculates a function to describe differences between pre-classified groups of samples, in this case western and eastern populations of the yellow-billed cuckoo, and then uses the function to score each sample. This score is then used to reclassify, either correctly or incorrectly, which group the individual sample should go in. One advantage of this method is that it evaluates morphological differences in combination, rather than individually. Discriminant analysis correctly classified 83.8% of eastern males, 89.6% of eastern females, 74.6% of western males and 85.8% of western females, and discriminant scores were found to be significant ($p < .001$) using a Wilk's lambda test (Franzreb and Laymon 1993).

Banks' opinion notwithstanding, all existing scientific *data* supports the AOU's conclusion that the western yellow-billed cuckoo is a valid sub-species. This sub species is in danger of extinction and should be listed under the Endangered Species Act. Should the Service not concur with the sub-species designation, it should list the monotypic genus as endangered, since the western states constitute a significant portion of the species range.

II. DESCRIPTION

The yellow-billed cuckoo (*Coccyzus americanus*) is one of eight North American and 129 world-wide species belonging to the family Cuculidae and the order Cuculiformes. Cuculiformes have two forward and two backward pointing toes on each foot. The yellow-billed cuckoo is the only *Cuculiforme* to breed in the western United States (Figure 1).

It is a medium sized bird weighing about 60 gm and being about 27-30 cm in length. Its profile is long and slim. Its legs are short and bluish-gray. Its long tail is gray-brown above and black below with three striking pairs of large white dots visible in flight. Its body is brown above with white underparts. The underside of its pointed wings are rufous. Adult birds have a long curved bill which is blue-black above and yellow at the base of the mandibles. Juveniles have a completely blue-black bill.

Males have a slightly larger and oranger bill. The female bill is more yellow. The white tale spots on male are smaller and more oval. On the female they tend to be irregular and are more likely to connect.

Unmated males have a coo-coo-coo-coo call while the kowlp call of mated males is a wooden *kakakakakakaka ka ka ka ka ka kow kow kow kow kow kow kow*, slowing down and slurring at the end. Females also give the first half of the kowlp song, called the knocker call.

III. DISTRIBUTION

The current range of the yellow-billed cuckoo in the western United States is substantially diminished from its known former range. The cuckoo was once common in riparian habitat throughout the western United States, but in the past 70 years has suffered a range contraction (Figure 1). The cuckoo was last known to breed in British Columbia in the 1920's, in Washington in the 1930's, in Oregon in the 1940's and in Northern California in the 1950's (Laymon and Halterman 1987). It has also been extirpated from Idaho, Nevada and Utah. Though still breeding in southern and central California, Arizona and New Mexico, the cuckoo's range has been severely reduced in these states as well, having been nearly or completely extirpated from numerous river systems, such as the Los Angeles, Little Colorado and Zuni Rivers. As a result, the current distribution of the yellow-billed cuckoo is comprised of highly isolated population groups that because of systemic and stochastic pressures are at severe risk of extirpation.

IV. LIFE HISTORY

Migration. The yellow-billed cuckoo winters in South America (Deschauensee 1970) and typically arrives on its western United States breeding ground in late June or early July (Phillips et. al. 1964, Ryser 1985) though it may arrive in mid or early June (Shelton 1911, Laymon 1980, Hunter 1986). There do not appear to be regional differences in western arrival times.

Fall migration begins in August. By October, Yellow-billed cuckoos are no longer on their breeding grounds.

Reproduction. Males begin their coo-coo-coo upon arrival on their breeding grounds and will continue all season if they are unsuccessful in attracting a mate. They use many times the home range size of mated pairs.

Newly-formed pairs travel for several days in search of a suitable nest site, frequently giving the kowlp and knocking call. The male will chase other males during this period (Halterman 1991).

Figure 1. Historic and present range of the western population of the yellow-billed cuckoo from Halterman (1991).

Ryser (1985) describes the yellow-billed cuckoo as a poor nest builder. Its open-cup nests are "small, flat, shallow, flimsy structures of twigs, vines and rootlets." Willow twigs, and possibly cottonwood leaves, are favored nest building materials (Laymon 1980). Nests on the Sacramento River are usually between 6 and 20 ft from ground but on occasion can reach heights of 40 ft (Dillinger 1989). Nest sites have been correlated with large and relatively large willow-cottonwood patches, dense understories, high local humidity, low local temperature, and proximity to slow or standing water (see section V.). Once a nest site has been chosen, males no longer behave aggressively and do not defend a territory (Laymon 1980, Halterman 1991).

Yellow-billed cuckoos in Indiana time their nesting to coincide with periodic cicada outbreaks when they occur, and with annual cicada emergence dates when they do not (Nolan and Thompson 1975). In the Southwest as well, its "entire breeding cycle is geared to taking advantage of short term abundance of food. This holds true for everything from food induced laying, short incubation period and rapid development of young" (Laymon 1980). Laying dates may vary even within a very small area. Four birds at a 109 ha site on the Sacramento River laid their first eggs on June 12, July 5, July 12, and July 28 (Laymon 1980). There was no overlap in egg dates between any of the four nests.

Between one and five relatively large blue eggs are laid at intervals of one to three days. As incubation commences with laying, hatching dates are asynchronous. All 14 eggs tracked by Laymon (1984) on the Sacramento River hatched 10 days after being laid,

affirming observations from the Great Basin states (Ryser 1985). Up to 30% of the incubation may be done by male cuckoos which will also occasionally bring food to incubating females.

Eggs of *Coccyzus* cuckoos are among the heaviest of any nidicolous bird (Lack 1968). Energy cost of egg production, therefore, is high- up to 30% of the female's daily intake. Though initially costly, such eggs facilitate rapid development of both embryos and nestlings (Schifferli 1973). Yellow-billed cuckoos, in fact, have the shortest combined incubation/nestling period of any bird species (Hamilton and Hamilton 1965, Skutch 1976). Young are fledged seven to eight days after hatching producing a combined incubation/nestling period of 17-18 days.

Though unable to fly, fledged young are adept crawlers and may travel up to 50 m on their first day out of the nest (Haltermann 1991). They are fed for 3-4 weeks by their parents before beginning their migration to South America.

Brood Parasitism. About fifty species of cuckoos around the world are obligate brood parasites but none of these breed in North America. The yellow-billed cuckoo is an "incipient brood parasite," its eggs have been found in the nests of black-billed cuckoos, American robins, black-throated sparrows, mourning doves, house finches and red-winged blackbirds (Ryser 1985). Black-billed cuckoos have also been known to occasionally parasitize yellow-billed cuckoos.

Nesting Success. Based on limited information, nesting success appears very high for yellow-billed cuckoos in California. All four nests observed by Laymon (1980) in 1979 on the Sacramento River were successful, as were all five nests observed by Laymon and Haltermann (1990) in 1990. This is unusual, especially for open-cup nesters which typically have nesting success rates of 46% (Nice 1957). This may be a function of the yellow-billed cuckoo's asynchronous hatching strategy. Since young hatch several days apart and mature very rapidly, they achieve their highest energy-demand stage at different times. This keeps the total food needs of the clutch at a steady level, preventing the kind of energy demand peaks that can starve an entire clutch. Also, the relatively great imbalance in nestling ages ensures that runts will starve in lean times, reducing the total clutch energy consumption thereby improving the survival odds for the older nestling(s). They will also remove runts from the nest during difficult times (Ryser 1985, Laymon 1980).

Asynchronous hatching strategies are associated with difficulties in obtaining sufficient food for young as is the ability to vary clutch sizes (Hanna 1937, Bent 1940, Nolan and Thompson 1975). Indeed, Ryser (1985) has noted that yellow-billed cuckoos have "considerable difficulty" in procuring enough food to maintain themselves and a brood, and Laymon and Haltermann (1990) have observed one bird travel 0.5 mi in search of prey. Since incubation/nestling time is so short, however, yellow-billed cuckoos can wait and take advantage of brief periods of prey abundance. They can also vary the number of eggs they lay in accordance with prey abundance.

Foraging Techniques. Based on observation of four nesting pairs on the Sacramento River, Laymon (1980) determined that yellow-billed cuckoos perch on branches from 5 seconds to 10 minutes waiting for prey to reveal themselves. Accordingly, they may forage actively or passively. On rare occasions, he observed them hop along the ground in a walnut orchard looking for grasshoppers, snap up small flies while in the nest, catch flying insects in the manner of a flycatcher, and attempt to flush prey by brushing leaves with its wings on the fly. There was a marked preference for foliage below 3 m as a foraging substrate. Since the patchwork orchard/grassland/riparian study area was chosen for its accessibility and viewpoints, and because observations were not possible in the willow thickets or cottonwood trees, care must be made in generalizing these results. Laymon suggests that the taking of grasshoppers may be a matter of abundance rather than preference since the cuckoos spent more time in cottonwood trees looking for caterpillars and katydids. This is consonant with later studies which found cottonwoods to be the predominant foraging substrate (Laymon and Halterman 1985) and caterpillars the predominant food source.

Prey Base. While they have been known to take beetles, cicadas, bugs, wasps, flies, katydids, dragonflies, damselflies, praying mantids, lacewings, mosquito hawks, cankerworms, fall webworms (*Platyrepia virginalis*), and even tree frogs (Beal 1898, Green 1978, Laymon 1980, Ryser 1985, Dillinger 1989), more than three fourths of the yellow-billed cuckoo diet is made up of grasshoppers and caterpillars (Beal 1898). By May and June, tent caterpillars (*Malacosoma spp.*) comprise one half of their diet.

The yellow-billed cuckoo is unique among birds, in its ability to eat toxic hairy and spiny caterpillars. The tent caterpillar, another insect too hairy for most palates, is commonly taken in Arizona (Phillips et al. 1964). They also prey upon caterpillars of the io and gypsy moths in the Great Basin (Ryser 1985) and upon sphinx-moth caterpillars in California (Dillinger 1989). The cuckoo's dependence on these insects indicates a highly specialized evolution. They sometimes shear the spines or hair off caterpillars before swallowing them, but not always. Specimen stomachs are often lined with a carpet of caterpillar hairs and intestines are often pierced by numerous spines (Ryser 1985).

The presence, absence or abundance of caterpillars is an important factor in nest site selection and timing. The absence of cuckoos in 1985 from eastern Colorado, for example, corresponded with a simultaneous absence of tent caterpillars (American Birds 39:943). Similarly, Littlefield (1988) correlated cuckoo "invasions" of eastern Oregon during the 1970s and 1980s with outbreaks of tent caterpillars and satin moths (*Stilpnotia salicis*) and noted that an extensive 1988 survey which located no cuckoos in eastern Oregon or Klamath County, also turned up few caterpillars.

Yellow-billed cuckoo densities naturally fluctuate from year to year and place to place depending upon the abundance of caterpillars and other large insects (Clay 1929, Forbush 1927, Nolan and Thompson 1975). They may even wander over potential breeding areas appraising insect abundances prior to establishing territories and laying eggs (Hamilton and Hamilton 1965). Laymon and Halterman (1987) believe a decline in cuckoo populations on the South Fork of the Kern River, CA was due in part to an increase in

caterpillar populations on the lower Colorado River. Cuckoos may have chosen to cluster more densely there than travel another ca. 300 mi to the Kern.

Cuckoos may stay at southerly locations such as the Colorado River if prey are abundant, reducing the size of more northern populations such as the Kern River. Laymon and Halterman (1990) have determined that sex ratios are skewed toward males on the Sacramento and Kern rivers but not on the Colorado and Bill Williams rivers, while the number of males is more stable than the number of females on the Sacramento and Kern rivers. This suggests that site tenacious males will pass over abundant prey sources in the south to return to northerly sites, while females are more likely to select southerly sites if prey are abundant.

Predation. Predation has not been identified as a significant factor affecting Yellow-billed cuckoo populations in the West. Laymon and Halterman (1990) observed a Red-shouldered Hawk (*Buteo lineatus*) take one fledgling and note that an "unknown predator" took two others. They have also seen cuckoos drive Scrub Jays (*Aphelocoma coerulescens*) and Loggerhead Shrikes (*Lanius ludovicianus*) away from nests. The former, however, are more commonly found in dry, climax riparian oak communities, invading willow-cottonwood areas only during drought years. Coopers Hawks (*Accipiter cooperi*) may take a large number of migrating cuckoos in the Caribbean islands (Richard Spight in Laymon and Halterman 1990).

V. HABITAT REQUIREMENTS

Elevation. The former breeding center of the yellow-billed cuckoos in the western United States and northern Mexico, appears to have been floodplain riparian forests below 1,500 ft. It has been extirpated from most of these areas.

Vegetative Community. Though they will occupy a variety of marginal habitats, particularly at the edges of their range, yellow-billed cuckoos in the West are overwhelmingly associated with relatively expansive stands of mature cottonwood-willow forests. Numerous historical records contain brief site descriptions, but no systematic habitat use and requirements studies were conducted until the mid-1970's.

Systematic Accounts. The first systematic study of yellow-billed cuckoo habitat in California (Gaines 1974a, 1974b), reaffirmed that they are found where a dense understory of willow thickets (*Salix* spp.) is combined with mature cottonwoods (*Populus fremontii*.) and generally within 100 meters of slow or standing water. A later, more extensive study (Gaines 1977, Gaines and Laymon 1984) suggested that height and dispersion of trees was less important than foliage density, especially within 10 m of the ground. Forests with taller trees, however, tend to have well-developed, leafy understories. Of 57 sightings in the Sacramento Valley, 68% were in willows, 26% were in cottonwoods, 4% in English Walnuts, and 2% in Box Elders (*Acer negundo*) (Gaines and Laymon 1984). Canopy height ranged from 5-25 m, canopy cover from 20-90%, and understory cover from 30-90%. Willows and open water existed at all sites while habitat varied from dense willow-cottonwood forests to marshy bottomlands with scattered

willow thickets. Of 15 observations on the South Fork of the Kern River, 13 were in willows and 2 were in cottonwoods (Gaines and Laymon 1984). Canopy height ranged from 10 to 18 m, canopy cover from 10-70%, and understory cover from 50-80%. Water was present at 3 of 5 sites. The 2 dry sites had surface water prior to the survey, but not during because of drought.

Yellow-billed cuckoos in California have distinct patterns of habitat use which distinguish nesting and foraging substrates. Four pairs on the Sacramento River foraged primarily in cottonwoods but also used box elder and white alder lined banks (Laymon 1980). Although three of the four nested in walnut orchards, the orchards were not used as heavily for foraging. The predominance of orchard nest sites in this small study does not reflect typical Sacramento River nest placement. The study plot lacked suitable nest sites in the riparian area. Cuckoos require horizontal branches 3-5 m above the ground and dense understories. Homogenous groves of mature cottonwoods- a sign of channelization and disruption of seasonal flood patterns- are good foraging areas but provide neither enough understory cover nor low horizontal branches. Such a structure is more common in willow lined sloughs, backwaters, oxbows and ponds.

Laymon (1980) suggests that thicket interiors are not as suitable for nest, presumably because horizontal branches are more common where willow lean out over an opening. From this he concludes that "(n)ecessary nest site conditions would usually be met at edges." The requirement of large, closed-canopied habitat patches would seem to contradict this, however (see below).

Cuckoos on the South Fork of the Kern River predominantly use cottonwoods for foraging while nesting almost exclusively in willows (Laymon and Halterman 1985). Nineteen of 20 nests found in six years of studies on the Kern were in willows and two radio-tagged nesting adults were found to forage primarily in cottonwoods even though willows were the predominant plant species (Laymon and Halterman 1990). A mix then, of mature cottonwoods and early to mid-successional willows satisfy both the foraging and nesting requirements of the yellow-billed cuckoo. This diversity is typical of healthy, seasonally flooded, unchannelized, undammed, ungrazed waterways.

Within California and western Arizona, the lower Colorado River and the Bill Williams River, are the only places where habitats other than willow-cottonwood are used in significant proportions. Cottonwood-willow remains the predominant and preferred habitat, but very tall screwbean-honey mesquite stands are also used. Salt cedar is not used at all on these rivers, nor does it use saltcedar on the lower Gila (Hunter 1986). Rea (1983) reports use of willow stands on the lower Salt, noting that it does not occur in any other habitats. Yellow-billed cuckoos have been observed using tamarisk, however, in the eastern portion of its range on the middle Pecos and on the Rio Grande near Presidio, TX (Hunter et al 1988).

Breadth Requirements. Yellow-billed cuckoos are very rare in forest patches of less than 24 ha in New Jersey (Galli et al. 1976). The first systematic study of yellow-billed cuckoo habitat size requirements in the West (Gaines 1974a, 1974b), showed that birds

were present only when suitable habitat on the Sacramento River exceeded 100 m in width and 300 m in length with a total area of at least 10 ha. A more extensive survey of the river in 1977 found most cuckoos were in larger habitat patches. Most of 57 sightings were in patches of suitable habitat at least 100 m in width and 25 ha in surface. Smaller patches were usually close to more extensive patches (Gaines and Laymon 1984). Densities were very low. Single birds or pairs were found in all sites save three: one 50 ha site supported 5 individuals, a 600 ha site supported 6 individuals, and a 550 ha site supported 9 individuals. Occupancy rates were also fairly low- only 50% of sites meeting the habitat requirements described by Gaines (1974b) were occupied.

The minimum foraging area used by four pairs of nesting birds ranged from 10.8 to 28.3 ha (Laymon 1980). Two radio-tagged nesting birds on the South Fork of the Kern River had minimum home range sizes of 20 ha in 1985, and pairs observed from 1986 to 1989 used home ranges of over 30 ha (Laymon and Halterman 1990). It is likely that pairs occupying marginal sites require a larger home range area. One such pair on the Kern used 40 ha (Laymon and Halterman 1985).

With the exception of the Colorado River (to be discussed later), Laymon and Halterman (1989) found a significant relationship between the size of a habitat patch and the likelihood of its being occupied in California. Of 21 sites 20-40 ha in extent, only 2 were occupied (9.5%); of 17 sites 41-80 ha in extent, 10 were occupied (58.8%); of 7 sites larger than 80 ha, all (100%) were occupied.⁽¹⁾ Combining this with analyzes of preferred vegetational communities, Laymon and Halterman (1989) developed a new graded definition of suitable habitat in California based on three functions:

Table 1. Suitability of habitat for Yellow-billed cuckoos in California (from Layman and Halterman 1989).

<u>Habitat Suitability</u>	<u>Habitat Type</u>	<u>Area (ha)</u>	<u>Width (m)</u>
Optimum	Willow-Cottonwood	>80	>600
Suitable	Willow-Cottonwood	41-80	>200
Marginal	Willow-Cottonwood	20-40	100-200
Marginal	Mesquite	>20	>200
Unsuitable	Willow-Cottonwood	<15	<100
Unsuitable	Mesquite	<20	+
Unsuitable	Salt Cedar	*	+

+ Unsuitable regardless of habitat width if area is not met.

* Unsuitable regardless of area.

Based on four years of studies on the South Fork of the Kern River, Halterman (1991) determined that patch size, extent of riparian habitat in an 8 km river segment, and presence of low woody vegetation explained 47% of the variance in a multiple regression model using habitat parameters as the independent variable and pairs of cuckoos as the dependent variable. Habitat type (cottonwood-willow or mixed riparian), distance

between sites, surrounding land use, and presence of point bars were not significant predictors. It should be noted in regard to habitat type, however, that vegetation on the South Fork of the Kern River from above Lake Isabella to the center of Onyx Ranch is predominately broadleaf riparian cottonwood-willow.

That the amount of habitat available on an 8 km river stretch is an important variable in predicting occupancy, indicates that habitat fragmentation is probably a very important factor in yellow-billed cuckoo declines. Laymon and Halterman (1989) and Halterman (1991) have shown that the total area of patches is a significant factor in habitat usability. Their conclusions are in concordance with research showing that nesting success is lower in small patches. Open-cup nesters on the edges of large habitat fragments and within smaller habitat fragments are more susceptible to predation (Chasko and Gates 1982, Gates and Gysel 1978). Such predation can reach as far as 600 m into forest interiors (Wilcove 1985). Greater circularity of patch shape decreases the patch-to-edge ratio, creating more interior habitat and making nests less susceptible to edge effects such as predation, heat, and dryness (Diamond 1975, Temple 1986).

Habitat breadth requirements in Arizona and New Mexico have not been as intensively studied. Densities there vary from 1-5 birds per 100 acres. They are highest on the upper Gila in New Mexico and lowest in salt cedar and mesquite habitats at lower elevations in western Arizona (Scott Mills, from Telephone Conversation Record, USFWS, Regional Office - Region 2, 5/8/87). On the basis of nine transects in the best willow-cottonwood and mesquite habitat on the upper San Pedro River, it was determined that densities vary between 1-10 birds per 100 acres, averaging 2.7 birds per 100 acres (from Telephone Conversation Record, USFWS, Regional Office - Region 2, 5/8/87).

Local Humidity. Not only are yellow-billed cuckoos in the west limited to areas with surface water, they typically are found in areas of very high local humidity: sloughs, creek mouths, oxbow lakes and marshes. Seventy four percent of the sites discovered by Gaines and Laymon (1984) fit this description. High humidity is a crucial factor in nest site selection. An analysis of 5 nest sites on the South Fork of the Kern River and 5 on the Sacramento River, revealed that temperatures were lower and humidity was higher than surrounding forest patch edges and open areas near forest patch edges. Hamilton and Hamilton (1965) suggest that the yellow-billed cuckoo's careful habitat selection enables it to nest in mid-summer in the heat and dryness of the western United States.

VI. CAUSES OF DECLINE

Habitat Loss.

"In general, most states have lost as much as 90-95 percent of their original riparian forests to agriculture, urban expansion and various flood control practices" (U.S. Fish and Wildlife Service 1984).

"Loss of habitat is undoubtedly the most important" factor in the decline of the yellow-billed cuckoo (Gaines 1977).

Riparian ecosystems are the richest bird habitats in North America, particularly in the arid West where an astounding array of species depend upon these thin ribbons of lush vegetation. High temperatures produce greater respiration, photosynthesis, and evapotranspiration rates (Van Hylckama 1980), while abundant soil moisture promotes growth of deciduous trees and shrubs. The result is high primary productivity, dense insect populations, and correspondingly dense insectivorous bird populations. The lower the elevation, the greater the densities and diversity of birds (Carothers et al. 1974, Beidleman 1978, Knopf 1985).

Among riparian communities, the willow-cottonwood association is the most productive. Its combination of dense under and overstories, tremendous vertical diversity, high insect populations, relatively low interior temperatures, and relatively high humidity, combine to make it the richest bird habitat in the Southwest (Rosenberg et al. 1991). The highest population densities of non-colonial nesting birds in North America, in fact, are in the cottonwood forests of central Arizona (Johnson 1971, Carothers et al. 1974).

The most astounding fact about North American riparian ecosystems, however, is the degree to which they are endangered- 70 to 90% of the natural riparian ecosystems in the United States have been destroyed by human activities (Ohmart and Anderson 1986). Not just degraded but destroyed. As much as 80% of the remaining fragments are dominated by human use and are in unsatisfactory condition (Almand and Krohn 1978)

These numbers represent averages for the entire nation- the actual situation in the Southwest is extreme. Riparian ecosystem losses in California and Arizona have been estimated to be in excess of 95% (Warner 1979). According to Katibah (1983), 1,851,750 ac of riparian habitat existed in California prior to the 1849 gold rush but fewer than 37,035 ac remain today. That's a 98% loss in the last 140 years. The Arizona State Park Commission (1988) estimates riparian losses in Arizona and New Mexico to be on the order of 90%. It is no wonder that the Arizona Nature Conservancy (1987) rates the cottonwood-willow community as North America's rarest forest type.

The effect on wildlife has been astounding. Over 100 state and federally listed species in New Mexico and Arizona are riparian dependent (Johnson 1989). Of 161 bird species which nest in the Southwest's lowlands, a full 69% have suffered declines due to riparian habitat loss (Johnson et al. 1987). Nearly every obligate riparian bird species which breeds in the arid portions of the West, particularly in the lowlands, is deserving of federal protection. These include the yellow-billed cuckoo, the Southwestern willow flycatcher, the vermilion flycatcher, Bell's vireo, the yellow warbler, the summer tanager, the common black hawk, Cooper's hawk, Harris' hawk and the cactus ferruginous pygmy owl. Only the Southwestern willow flycatcher and the pygmy owl and Bell's vireo have been listed thus far.

The situation along the yellow-billed cuckoo's migration corridor and on its South American wintering grounds is hardly better. The neo-tropics are suffering a "massive and near universal scale of deforestation" (Terborgh 1980). Over 50% of its forest canopy cover is already gone (Myers 1980). This effect is magnified because bird concentrations

are much higher on undefended wintering grounds: the "clearing of 1 ha of forest in Mexico is equivalent to expanding urban sprawl by 5-8 ha" in the United States (Terborgh 1980). Using deforestation figures from the Food and Agriculture Organization, Terborgh concludes that even a conservative estimate must agree that if the situation in Central America and the Greater Antilles does not improve dramatically, "suitable habitat will no longer be available for many migrant species by the end of the century." It should be noted that deforestation by and for cattle production is the major cause of forest habitat loss in the neotropics.

In addition to outright destruction of riparian habitat in the western United States, the small size of existing fragments and the great distances between them decrease their ability to support healthy distributions, abundances and diversities of bird species (MacArthur and Wilson 1967, Burgess and Sharpe 1981). This is equally true of Central and South American wintering grounds and migration corridors.

The yellow-billed cuckoo, like the majority of neotropical migrants, is intolerant of forest fragmentation. Numerous studies have found that such species will occupy only medium-to-large habitat patches that are considerably more extensive than their minimum home range (Whitcomb et al. 1981, Lynch and Whigham 1984, Temple 1986). This is true of the yellow-billed cuckoo (Gaines and Laymon 1984; Laymon and Halterman 1987, 1990; Halterman 1991). The yellow-billed cuckoo meets the four characteristics described by Anderson and Robbins (1981) as belonging to most interior dwelling bird species:

1. They are neotropical migrants.
2. They build nests in the open rather than in cavities.
3. They have comparatively small clutch sizes.
4. They raise only a single brood of young.

To these general characteristics, which are factors in forest interior selection, it should be added that species such as the Western yellow-billed cuckoo, the Southwestern willow flycatcher, the yellow warbler and the summer tanager nest in the midst of the summer heat in the driest, hottest part of the country.

Overgrazing. Cattle grazing is perhaps the most significant threat to the yellow-billed cuckoo range wide. Hundreds of additional rivers would support cuckoo habitat within 10 years but for direct and indirect degradation and/or elimination of riparian habitat through cattle grazing. Foraging cattle reduce the density of willow and other shrubs, and eliminate cottonwood and willow reproduction both by feeding on seedlings and by modifying habitat through soil compaction or other means (Klebenow and Oakleaf 1984, Ohmart 1994, Reichenbacher 1984, Taylor and Littlefield 1986). This has resulted in decadent stands where old cottonwood trees in the overstory are dying with no new recruitment to replace them (Klebenow and Oakleaf 1984, Ohmart 1983, Reichenbacher 1984, Stromberg 1993, Taylor and Littlefield 1986). As a result, the vast majority of grazed western riparian areas are deficient in willow understory and nearly devoid of overstory cottonwood.

Cattle degrade watershed conditions by compacting soil, increasing surface runoff, reducing water infiltration, lowering the water table and reducing bank stability (Bock et al. 1992, Klebenow and Oakleaf 1984, Ohmart 1983, Reichenbacher 1984, Stromberg 1993, Taylor and Littlefield 1986). In combination, these impacts reduce the ability of the land to support riparian vegetation, reducing vegetation density or eliminating it all together.

Cattle impacts are often most severe in riparian areas because available water, shade and forage causes cattle to congregate in riparian areas. Skovlin (1984) estimated that cattle spend 5-30 times longer in riparian habitats than adjacent uplands based on areal extent.

Removal of cattle grazing has been correlated with dramatic increases in dense willow thickets, necessary for cuckoos and other riparian species (e.g. Cannon and Knopf 1984, Klebenow and Oakleaf 1984, Ohmart 1983, Taylor 1986, Taylor and Littlefield 1986). Taylor (1986) documented a strong negative correlation between grazing intensity and bird diversity on the Blitzen River in Oregon. On the Truckee River, Nevada, Klebenow and Oakleaf (1984) conducted bird surveys in the 1970s and compared them to a survey in 1877 and noted that cuckoos, observed in the early survey, were now absent. They attributed this to habitat degradation caused by cattle grazing, characterizing current riparian habitat on the Truckee as:

severely overgrazed, resulting in the elimination of cottonwood reproduction and most of the deciduous shrub understory.

In contrast, R. Ridgeway, who conducted the 1877 survey, described the Truckee this way:

Along the bank of the river and surrounding the sloughs connected with the stream, were exceedingly dense willow-jungles, the sloughs themselves being filled with rushes, flags and other aquatic plants; but most of the valley consisted of meadowlands, interspersed with velvety swards of "salt-grass" and acres of beautiful sun-flowers (Helianthus giganteus), studded with fine large cottonwood trees".

Grazing, by degrading or eliminating riparian habitat, is one of the main causes of cuckoo declines.

Tamarisk Invasion. In the late sixties, Zimmerman (1969) warned that "the prospect of widespread elimination of indigenous woody vegetation along our waterways is staggering in the magnitude of the destruction to bird life that it would entail." He was particularly concerned about the invasion of noxious tamarisk, an exotic plant introduced in the early nineteen hundreds as an ornamental and erosion break. A little over a decade later, one researcher concluded:

"Along most major river systems, exotic tamarisk has replaced willows and cottonwoods as the dominant riparian tree" (Hunter et al. 1988).

Yellow-billed cuckoo never nest in tamarisk over substantial portions of their range in the western United States (Hunter et al. 1988). The replacement of its preferred, native willow-cottonwood breeding sites with tamarisk generally means extirpation.

Tamarisk invasion is a secondary threat in that it does not displace native phreatophytes under undisturbed conditions- willows and cottonwoods must first be cleared out. Firewood cutting, riparian vegetation removal (for the purposes of reducing water use), flooding and grazing are all associated with tamarisk invasion (Hunter et al. 1988, Rosenberg et al. 1991, Behle and Higgins 1959, Hink and Ohmart 1984). Tamarisk invaded the Pecos River Basin in 1912 and spread to 31,200 ha by 1967. Even after 21,850 ha were cleared by 1971, by 1980 there were 11,295 ha. The lower Colorado had 14,353 ha in 1980 and the lower Rio Grande had 5,600 ha. Cottonwood-willow vegetation in the same areas is now minimal: 834 ha on the Pecos, 3,354 ha on the Colorado and 60 ha on the Rio Grande (Hunter et al. 1988).

We quote at length from Rosenberg et al. (1991) on the tragic mechanics of tamarisk invasion on lower Colorado River:

"An exotic species of tree, saltcedar (tamarisk) spread into the valley from the Gila River (around 1920). Saltcedar, which has little value to native wildlife, found ecological conditions optimal for its spread and eventual dominance. In 1894, Mearns (1907) estimated that about 160,000-180,000 ha of alluvial bottomland between Fort Mohave and Fort Yuma were covered by riparian vegetation. As of 1986, total riparian vegetation comprised only about 40,000 ha, approximately 25% of the available bottomland estimated by Mearns (Anderson and Ohmar 1984; Younker and Andersen 1986). Roughly 40% of the area remaining in 1986 was covered by pure saltcedar; an additional 43% consisted of native plants mixed with saltcedar; 16.3% was covered by honey mesquite and/or native shrubs; and only 0.7% (307 ha) could be considered mature cottonwood or willow habitat (Ohmart et al. 1988).

The successful spread of saltcedar is an example of how an introduced species can optimally exploit an environment disturbed by man, to the detriment of native vegetation. Initially, it became established in areas where native vegetation had been cleared and the land left fallow (Ohmart et al. 1977). Saltcedar has a high rate of seed production, with as many as 600,000 seeds per plant produced from April through October (Robinson 1965). This long period of seed production allows it to germinate well into fall, when most native trees are no longer producing viable seeds. Saltcedar has become dominant along the lower Colorado River by also being salt-, fire-, and flood-tolerant.

Where channelization and river-flow management have resulted in very little native plant regeneration, senescent stands of mesquite or willow have been replaced by saltcedar. In addition, soil and water salinity levels have risen dramatically in association with irrigation practices and evaporation from reservoirs. Native plants, except saltbush and quail bush, exhibit a low tolerance to saline soils. In contrast, saltcedar thrives under highly saline conditions.

Saltcedar is deciduous and, without floods, large amounts of leaf litter accumulate. Therefore, after 10 or more years fires almost become a certainty, especially during the hot and dry summer months. After a fire, saltcedar and arrowweed quickly regenerate, whereas cottonwood and quail bush usually fail to return. Thus, saltcedar will be the first to regenerate in stands of mixed vegetation, and through successive fires this species eventually displaces most native species...

To summarize...a floodplain that was once filled from end to end with expansive and impenetrable forests of cottonwood, willow, and mesquite has been converted, in little more than a century, to a largely treeless valley...The relatively little remaining riparian vegetation exists in fragmented strips, most being saltcedar. Sadly and ironically, some of the worst destruction, including the virtual elimination of cottonwood-willow habitats from the entire valley, came only in the last decade, a period during which our nation's commitment to conservation and research should have been strongest. The information was at hand, the consequences were obvious, but admonitions went unheeded."

Cattle do not browse tamarisk leaves as they do willow and cottonwood, creating a situation where tamarisks, which survive trampling, eventually displace more heavily abused native species. Once established, tamarisk grows rapidly, spreading by both seed and cuttings. It is a much heavier water user than native phreatophytes and sinks deeper roots, eventually lowering water tables and out-competing natives. Tamarisk especially thrives in preferred yellow-billed cuckoo sites along ditches, reservoirs, ponds, marshes and backflows.

River Management.

"Western water law is predicated on first rights and beneficial use. Riparian habitats have generally been viewed as a nuisance, therefore, little or no concern was ever given to their needs." (Ohmart 1994)

Water projects in the west, including major and minor dams, channelization, ground water pumping and diversion have resulted in the loss of extensive tracts of riparian habitat necessary for the cuckoo. The damming of western rivers for flood control, storage and hydro-electric power has had an immense impact on the cuckoo and riparian systems in general. Ohmart (1994) describes the impact of dams on birds as:

"Dams create a multitude of problems for riparian habitats and are essentially the death knell for two of the most valuable avian habitat components - cottonwoods and willows and vertical profile"

Dams impact cottonwood-willow communities primarily by eliminating and/or changing the flood regime. These communities require disturbed, moist soils produced by natural floods to regenerate and, as a result, flood-control regulated by dams has decimated riparian habitat (e.g. Brady et al. 1985, Reichenbacher 1988). When floods are released by dams, it typically involves large amounts of water over longer time periods and at different times of the year than naturally occurring floods. For example, a managed flood

on the Bill Williams River, an important breeding site for the cuckoo, lasted 2 years inundating and killing extensive native cottonwood-willow communities (Hunter 1984). Other impacts from dams on native riparian forests include: increased salinity, toxic to many native species (Ohmart 1994); lowered water table and loss of perennial flow, resulting in dessication and loss of native vegetation (Stromberg et al. 1994); increased dominance by invasive tamarisk (Sudbrock 1993, Horton 1977); and inundated and lost habitat beneath reservoirs, covering huge areas of formally productive riparian forest.

Agricultural and urban development in the floodplain is a secondary impact from impoundment of rivers that likely results in equal or greater amounts of habitat loss.

Other water management activities besides impoundment can have substantial impacts on cuckoo habitat. Flood control activities such as levee construction, channelization, and rip-rapping occupy land that otherwise could be suitable habitat and reduce reproduction of willows and cottonwoods by controlling floods. Groundwater pumping and water diversion in excess of recharge converts perennial streams to ephemeral streams, decimating riparian vegetation. Even in areas where perennial flow is maintained, groundwater pumping and diversion can lower the water table below the rooting zone for riparian vegetation. The distributions of many riparian species in the floodplain are directly related to elevation and depth to groundwater (e.g. Stromberg et al. 1994, Minckley and Clark 1984). As a result, reducing the water-table often replaces riparian vegetation with upland species or exotics, such as saltcedar.

Logging. Although there is little or no commercial logging in Yellow-billed cuckoo habitat, the bird is continually threatened by flood waters which begin with run-off from logged forest areas. Deforested logging sites collect more snow and have quicker snow melt than unlogged areas. This, combined with erosion due to heavily disturbed ground vegetation and soils, causes snowmelt and rain water to release quickly in series of damaging flood bursts, rather than as a slow, annually fluctuating water source.

Pesticides. Being insectivores, yellow-billed cuckoo's are vulnerable to agricultural insecticide programs. As their preference is for open flood plain areas such as the Imperial Valley, CA and the Gila Valley, NM, they often nest very near to, or in heavily used agricultural land.

VII. CURRENT STATUS

CALIFORNIA

The yellow-billed cuckoo was formerly a common breeder in California's once extensive floodplain riparian forests (Cooper 1870, Belding 1890, Jay 1911, Shelton 1911, Willett 1912, Hanna 1937). The U.S. Fish and Wildlife Service (1985) estimates that 15,000 pairs once inhabited 775,000 acres of riparian habitat in the state. Others believe the actual number was probably higher (Gaines and Laymon 1984, Laymon and Halterman 1987). By 1944, however, populations had declined noticeably and the species was "wanting in extensive areas where it was once found" (Grinnell and Miller 1944). In 1971

it was listed by the California Department of Fish and Game as Rare. By 1977 it had become "one of the rarest birds" in the state with an estimated 180 pairs surviving in six isolated locations including a relatively large population on the Arizona side of the Colorado River Valley (Gaines 1977, Gaines and Laymon 1984). Nine years later the entire breeding population in California had dropped to 31-42 pairs (Laymon and Halterman 1987).

Habitat loss is the overwhelming reason for the species' decline in California. Persistent pesticides causing eggshell thinning (Laymon and Halterman 1987) and short-lived pesticides causing prey population declines, exacerbate problems for a species already under stress.

In addition to systematic human threats, most of the state's populations are so small as to be in danger of stochastic extinction (Laymon and Halterman 1989).

A 1977 survey of historical sites and suitable habitat at six widely scattered rivers turned up 54 birds in the Sacramento Valley (Tehama, Putte, Glenn, Colusa, and Sutter counties), 9 on the South Fork of the Kern River near Weldon, 3 along the Santa Ana River, Riverside County, 4 in Owens Valley, Inyo County, 6 on the Armargosa River south of Tecopa, Inyo and San Bernadino County, and 65 on both sides of the Colorado River from the Nevada state line to the Mexican border (Gaines 1977). With only 141 birds found, Gaines felt the cuckoo was one of California's rarest birds.

The 1986 petition warned that the population may have sharply declined in the early 1980's because of inundation of up to 80 percent of the species' habitat on the lower Colorado River between 1982-1984. The warning was confirmed by Laymon and Halterman (1986) who documented a 90-95 percent decline on the river since 1977. The previous estimate of 100 pairs on both sides of the river (Gaines 1977), was revised downward to 5-10 pairs. Laymon and Halterman (1987) also noted a 75% decline on the Armargosa River and a 5/6 decline on the Owens River. Not only were cuckoos absent from areas where habitat had been destroyed, they were absent from places where habitat remained or even improved.

Five of the remaining eight populations in California are in immediate danger of extinction, including 2 sites in Owens Valley, the Armargosa River near Tecopa, the Mojave River and the Santa Ana River. These populations only harbor 1-2 individuals in some years and none in others, making them highly vulnerable to extirpation from both stochastic and systemic processes. Laymon and Halterman (1987) questioned whether any of the state's populations were safe from stochastic extinction at 1986 levels. They estimated at that time that less than 50 breeding pairs remained in the state.

According to the California Department of Fish and Game (1980), remnant patches of suitable habitat in sizes sufficient to support breeding yellow-billed cuckoos are scarce. They cite both the outright loss and the fragmentation of riparian forests as the primary cause of cuckoo population declines in California. The following records indicate the severity of the cuckoo's status in California.

San Diego County. The yellow-billed cuckoo is almost certainly extirpated from San Diego County (Unitt 1984). It formerly bred at Escondido (Dixon 1916, Willett 1933), Sweetwater River (Willett 1933), Pauma Valley (Unitt 1984), San Luis Rey River (Sams and Stott 1959), and Sorrento Valley (von Bloeker 1931).

The Central Valley. California's Central Valley, from the headwaters of the Sacramento River in the north, to the top of the Tulare Basin at the Kern River in the south was undoubtedly one of North America's most verdant places. The decimation of this vast ecosystem is so complete today that it is all but impossible to imagine the extent of the magnificent broadleaf riparian forests which blanketed over a 1,000 miles of waterways making their way north and south into the Sacramento Delta and eventually, the Pacific Ocean. The yellow-billed cuckoo thrived throughout the Central Valley (Gaines 1977). Today it is essentially limited to, and is declining in, a 22 mile section of the upper Sacramento River and a 6.3 mile section of the South Fork of the Kern River. The 250 miles between these populations is a biological wasteland of clearcut, pesticide laden croplands and urban centers.

Between 90 and 98% of the Central Valley's original 1,065,600 ac of riparian forest have been lost to agricultural development and draw-downs, urbanization, dam construction, flood control measures, and bank stabilization projects in the last 150 years.⁽²⁾ Pesticide contamination, altered water regimes, and invasion of noxious salt cedar (*Tamarix chinensis*) and giant reed (*Arundo donax*) also took their toll. The forests of the Central Valley, as one researcher put it, were "modified with a rapidity and completeness matched in few parts of the United States" (Thompson 1961).

South Fork of the Kern River. There are 1,050 ha of riparian habitat along 10km of river from Lake Isabella upstream to the center of Onyx Ranch. Primary land owners are the Nature Conservancy and Sequoia National Forest. Elevation ranges from 770 to 825 m. Red willow (*Salix laevigata*), yellow willow (*Salix goodingii*), and Fremont Cottonwood (*Populus Fremontii*) are the dominant tree species. Non-forested areas of mule fat (*Baccharis viminea*), stinging nettle (*Urtica holosericae*), and meadow intersperse the forest. By late may, the river is dry (Laymon and Halterman 1990).

The population has fluctuated since 1981 when annual surveys were initiated. Between 1981 and 1985 the population was fairly constant at 7-12 pairs; then declined to a low of 2 in 1990, likely because of drought (Laymon and Halterman 1990). Dry years between 1987 and 1990 caused food supply on the South Fork of the Kern river to decrease. Tree Frogs (*Hyla regilla*) declined greatly and it is likely that katydids and Sphinx-moth larvae also decreased since cuckoos captured smaller prey and took longer to do so than prior to the drought (Laymon and Halterman 1990). Drought conditions may also have lowered humidity at nest sites and also likely caused Scrub Jays (*Aphelocoma coerulescens*) to increase in the cottonwood-willow zones of the Kern. These sites would normally have been too moist for this climax riparian valley oak bird. Laymon and Halterman (1990) suggest this as a possible reason cuckoos are avoiding the Kern River. Scrub Jays are major egg and nestling predators of open-cup nesting birds.

With wetter years, the population jumped to 12 pairs in 1991 and then to 24 pairs in 1992, the largest population ever observed at Kern (Laymon et al. 1997). Starting in 1993, the Army Corps of Engineers began filling Lake Isabella to increase storage for Agri-business. Twenty of the twenty four pairs in 1992 were found in areas slated for flooding. The effects on the cuckoo population have been dramatic, only 5 pairs were found in 1997. In total 1,100 of 2,400 acres of riparian habitat will be flooded (USFWS 1997b).

Changes in the cuckoo population at Kern are illuminating for the status of this rare bird rangewide. The population decline caused by drought indicates the important effect of environmental stochasticity. Though the decline was brought on by what was probably a natural climate cycle, the cuckoo was nearly extirpated at Kern River because its small population provides little buffer when faced with environmental change. Human caused flooding of habitat illustrates the obvious connection between habitat loss and population decline. In combination, habitat destruction and environmental stochasticity have the potential to act synergistically and have likely caused, and will continue to cause extirpation of small populations of cuckoos. This may even be likely on the South Fork of the Kern River.

Given that very few cuckoo populations remain in the west, that existing populations are very small, and that they are separated by great distances, the loss of the South Fork Kern River population (natural or not) would be catastrophic. It could very likely precipitate the loss of the Sacramento River population (which would then be over 500 miles from the next nearest population) and the complete extirpation of the species west of the Colorado River.

The Sacramento Valley. The Sacramento River is the largest river in California. Its riparian forests once formed an almost continuous canopy 1 to 10 miles wide (average =3) from north of Red Bluff, 400 miles south to the Sacramento Delta. The entire watershed including the Feather, Yuba, and American rivers, support 800,000 ac of broad-leaf riparian habitat prior to 1850 (Smith 1977, Roberts et al. 1977). Today the river provides 35% of the all the water used in the state (Buer et al. 1990). Only 16,789 ac of riparian forest, just 2% of the original extent, remains (Osugi, 1989, The Resources Agency 1989).

There are only 73 patches of riparian habitat exceeding 10 ha in extent on the 100 mile stretch of the Sacramento between Red Bluff and Colusa (Halterman 1991). This highly fragmented area supports the only viable population of yellow-billed cuckoos in California. Pitifully, it is the most extensive tract of old-growth cottonwood-willow forest remaining in the state, most of which are in areas subject to flooding, thus not suitable for agriculture: islands, the insides of bends, and around oxbow lakes (Gaines 1977).

Laymon and Halterman (1990) compared surveys from 1987 through 1990 with surveys from the the 1970s, concluding: "it is clear that a major decline has taken place in this region." Breeding birds are no longer found on the northern periphery of the river stretch (eg. Blackberry Island, Todd Island, Woodson Bridge State Recreation Area, and the

mouth of Deer Creek) or the southern periphery (eg. Colusa State Recreation Area) where they bred regularly from 1972-1982. Twenty one of 23 pairs found in 1990 were in the 35 mile stretch between Hamilton City and Princeton (Laymon and Halterman 1990), a consistent pattern since at least 1986 (Halterman 1991). Although suitable habitat still exists both upstream and downstream, this area is the least fragmented. The contraction of species from range peripheries and from lesser quality habitats is a well studied part of the extinction process. That this has already occurred across the entire western range, and is now plaguing the very few remaining local populations is cause for serious concern.

The San Joaquin Valley. The San Joaquin River and its tributaries (the Cosumnes, Mokelumne, Stanislaus, Tuolumne, and Merced rivers) drain the Tulare Basin which is filled by the Kings, Kaweah, Tule and Kern rivers. The entire watershed was conservatively estimated to have harbored 265,600 acres of riparian forest prior to 1850.⁽³⁾ Between 90-98% of that forest no longer exists (see footnote #1 on this page). The only riparian areas of any extent left in the San Joaquin Valley are below the mouth of Stanislaus River (Gaines 1977, Laymon and Halterman 1990). Gains and Laymon (1984) surveyed the San Joaquin Valley in 1977 and located no yellow-billed cuckoos, leading them to conclude:

"If yellow-billed cuckoos still breed in the San Joaquin Valley, the population is very small. Little habitat is extant, and that which remains may be to confined or widely scattered to support a viable population".

Coastal Southern California. This used to be a stronghold of the yellow-billed cuckoo. By 1911, however, ornithologists were already warning of cuckoo declines and habitat losses (Jay 1911). During the 1920s and 30s, Hanna (1937) watched "miles of cottonwoods" go to axe lamenting:

"In contrast with the good old days...the large thickets have been replaced by farms and pastures, the trees cut down, and the evergrowing population has crowded in on the old haunts of the cuckoos to such an extent that if they come here now at all they must be exceedingly rare..."

The Los Angeles Basin which supported hundreds of yellow-billed cuckoos prior to 1900 is essentially devoid of riparian habit today (Gaines 1987).

The Santa Ana River at the Prado Flood Control Basin is one of only two extensive continuous canopy cottonwood-willow forests in southern California. It has consistently supported one or two single cuckoos in recent years.

The Colorado River. "The plight of this species (the yellow-billed cuckoo) exemplifies the history of habitat change along the lower Colorado River, as well as the struggle of all riparian dependent species to persist in the face of tremendous odds" (Rosenberg et al. 1990).

Just before the turn of the century, there were between 395,000 and 444,450 acres of riparian forest on the lower Colorado between the Nevada state line and the Mexican Border (Ibid.). Only 25% of this remained in 1986, of which 40% was pure salt cedar, 43% was a mix of native plants and salt cedar, 16.3% was honey mesquite and/or native shrubs, and 0.7% was mature cottonwood or willow habitat (Ibid.). Most of the Colorado River's remaining cottonwood-willow habitat was killed by sustained inundation during high river flows between 1983 and 1986 (Laymon and Halterman 1990). This flooding is estimated to have reduced cottonwood-willow habitat from 10,000 acres in the mid-1970s to approximately 500 acres in 1986 (Laymon and Halterman 1986). The two largest patches left are pitifully small: a dry, fairly open 70 acre experimental reforestation plot at Cibola and a 10 acre patch along the All-American Canal 5 km west of Laguna Dam (Laymon and Halterman 1990). During this time yellow-billed cuckoo populations plummeted by 93% from an estimated 242 birds in 1976 to 18 in 1986.

The Colorado was the past stronghold for the cuckoo in the western portion of its range, comprising 80% of the regional population in 1977, but now supports few pairs of cuckoos (Laymon and Halterman 1987). For example, in 1977, at least 3 pairs inhabited a 12 ha site above Laguna Dam that was 40% willow (G&L 1984). By 1986, the site was only 1% willow, the dominant species being salt cedar (*Tamarix pentandra*); cuckoos were no longer present. Similarly, 21 pairs bred in a 70 m wide, 120 ha willow forest in 1977 near the Picacho State Recreation Area (G&L 1984) but none were present in 1986; the site was by then dominated by salt cedar and aquatic vegetation with only 5 ha of scattered willows remaining (L&H 1987). Of the places where cuckoos were found in 1986, Laymon and Halterman remark, they "cannot be considered suitable habitat for the species. They are marginal locations at best, lacking sufficient extent, breadth, and structural diversity."

Habitat loss on the Colorado is ongoing, a 1,400 acre patch of native willows on the Lake Mead Delta is currently underwater because of demand for more storage for agricultural use. Yellow-billed cuckoos were observed in this patch prior to inundation (Tibbitts personal communication) and it is an important breeding site for the Southwestern willow flycatcher.

Reductions on the Colorado River leave fewer potential colonizers for the Kern River and the Sacramento River.

The Armagosa River. Enough suitable habitat for 2-3 pairs exists on the Armagosa but it supported this many birds only three times during 10 years of surveys between 1977 and 1987. It was unoccupied during six of those years. A 1983 flood scoured the riverbed eradicating cuckoo habitat (J. Tarble *in* L&H 1987) and only one bird was present during one year until surveys ended in 1987. It may be that the collapse of the Colorado River population has left few, or no recruits to populate nearby areas.

ARIZONA

The yellow-billed cuckoo was fairly common in the cottonwoods and willows of western and southern Arizona at the turn of the century (Swarth 1914) and was still "a fairly common summer resident" throughout the state in the early 1960s (Phillips et. al. 1964). Its principal range at that time, as reported by Phillips et. al. (1964), was along the major waterways of the Sonoran Zones in the southern and central parts of the state.

Today, the yellow-billed cuckoo is absent from the "majority" of areas where it once occurred along the lower and middle Gila, the lower Salt and the lower Colorado "where healthy cottonwood and/or willow habitats no longer occur" (Hunter 1986). Indeed, Arizona's lower elevation riparian forest "have all but disappeared" (Hunter 1986). Hunter feels the bird is stable except in the west and south- one third of its historical distribution. Laymon and Halterman (1987), however, note that the only areas where yellow-billed cuckoos are thought to be stable in eastern Arizona, New Mexico, west Texas, Sonora, and Mexico are those areas which have not been surveyed in recent years. Based on habitat assessments by Hunter et al. (1987), they suggest that fewer than 600 pairs breed in Arizona and many current populations are in trouble.

"Dr. Anderson and myself believe that cuckoos are now in serious trouble of extirpation from the lower Colorado River with the loss of major population centers..." (Hunter 1986).

"Lower than expected numbers of cuckoos were found along the middle and upper Gila and lower San Pedro rivers during 1985, especially in native habitats" (Hunter 1986).

Conversely, Groschupf (1987) estimated that there were as many as 846 pairs in Arizona. Though this figure is still cause for alarm, it is probably a gross exaggeration because it was not calculated using actual cuckoo population numbers, but instead by extrapolating from habitat estimates and predicted densities of cuckoos. This method has two assumptions that likely result in large error: that cuckoo densities based on limited surveys are constant, and that cuckoos occupy most or at least a substantial portion of available, quality habitat. Instead, there is likely high variability in both cuckoo density and their use of occupied habitat. At best, applying cuckoo densities, as calculated by Groschupf, to all available habitat is a high estimate of the cuckoo's population in Arizona.

The Bill Williams Delta has historically had the most concentrated western populations, with 57 pairs in 1977. According to Robert Ohmart, the backup of Lake Havasu in 1982-1984 destroyed 600-700 acres- half of the existing cuckoo habitat and, as a result only 25-30 pairs were found in 1986 on a seven mile stretch of riparian habitat from Planet Ranch down to the delta (Dillinger 1989). The habitat here is dominated by salt cedar with patches of willow, Fremont cottonwood, honey mesquite (*Prosopis juliflora*), screwbean mesquite (*Prosopis pubescens*) and palo verde (*Cercidium microphyllum*) intermixed (Laymon and Halterman 1990).

Populations are known to occur on the upper portion of the Gila River in Arizona and on the lower San Pedro River, though reliable population estimates are unavailable for either

area, there may be as many as 200 pairs on the lower San Pedro and likely less on the Gila (Krayburn personal communication).

A number of other isolated, small populations of cuckoos have been located elsewhere in Arizona. Recent surveys of the San Francisco River from the NM border to Clifton revealed four pairs (Scott Mills, from Telephone Conversation Record, USFWS, Regional Office - Region 2, 5/8/87). A small population exists on the Little Colorado River (Gale Monson, from USFWS Telephone Conversation Record, Regional Office - Region 2, 5/8/87). Cuckoos are also thought to occur on the Verde, Santa Cruz and San Pedro Rivers, but no reliable population estimates are available (Hunter, USFWS Telephone Record 5/11/87).

NEW MEXICO

As elsewhere, loss of cottonwood-willow habitat has been extensive in New Mexico. In a status review of the cuckoo in New Mexico, Howe (1986) summarizes the numerous and dramatic threats to riparian habitat in New Mexico and the Southwest:

"Riparian woodlands, already of restricted distribution, have been cleared at an alarming rate for agricultural use, fuel, housing, and flood control projects, with serious consequences for yellow-billed cuckoos and other species of riparian birds. Regeneration of riparian tree species is also being hampered through altered flow regimes and cattle grazing in most western river systems."

Though no statewide systematic surveys have been conducted for the yellow-billed cuckoo in New Mexico, Howe (1986) states that threats to riparian habitat within New Mexico have likely had a severe impact on cuckoo populations:

"As a species that is closely tied to riparian woodlands, it follows that continued loss or alteration of such habitat would be a threat. As an insectivorous species, pesticide contamination could also be a threat."

Howe (1986) summarized reported sightings and limited surveys in New Mexico, documenting the presence of cuckoos on the lower Pecos, Rio Grande, upper Gila, San Francisco, San Juan, Canadian River, Dry Cimarron and a number of other smaller drainages. Based on reported sightings since the 1950's, all known occurrences of the cuckoo are limited to observations of small and scattered population groups, reflecting the reduction of riparian habitat to isolated patches. Approximately 1,100 cuckoos have been sighted in the last 30 years or so with no population group over 25 individuals (Howe 1986). Though it is clear from these numbers that New Mexico is likely not harboring a large population of cuckoos yet to be discovered, no reliable estimates exist for the total population of cuckoos within New Mexico.

Howe (1986) used estimates of population density and available habitat to predict as many as 900 pairs of cuckoos on the Pecos and middle Rio Grande Rivers. This estimate, however, is biased by the same flawed assumptions as Groscupf (1987) discussed above

and, therefore, likely exaggerates the total population on these rivers. Despite problems in determining exact population numbers, the Pecos may be a stronghold for the cuckoo in New Mexico, and, in fact harbored the majority (587) of the 900 estimated pairs. Pecos cuckoos, however, are likely the eastern sub-species (Halterman 1991) and are utilizing tamarisk and other exotic species, differing from the western sub-species, which is exclusively restricted to cottonwood-willow habitat (Hunter et al. 1988).

Though systematic surveys are needed to determine the true status of the cuckoo, extensive habitat loss, particularly of cottonwood-willow riparian forests, has likely caused dramatic declines in New Mexico as elsewhere.

GREAT BASIN

The yellow-billed cuckoo was once a common breeder in the Great Basin. Ridgway (in Ryser 1985) wrote in the 1860's that it, "was so often seen or heard during our sojourn in the West, that we cannot regard it as a particularly rare bird in certain portions of that country." The bird has since all but disappeared from the Great Basin. Ryser (1985) blames its disappearance on "destruction and alteration of vegetation along the larger streams- the main habitat of the cuckoo was in this dense vegetation. With European settlement the riparian vegetation has been badly abused by cattle, clearing, burning, stream channelization, and flood control projects." The poor status of the yellow-billed cuckoo within the Great Basin is listed by state in the following sections.

Idaho. Most Idaho records are of isolated, non-breeding individuals (USFWS 1985). Five Yellow-billed cuckoos were heard on the South Fork of the Snake River between Blackfoot and American Falls Reservoir in the Fort Hall Indian Reservation in an ungrazed mixed-cottonwood stand; and a possible migrant was heard in southwest Idaho at Swan Falls Dam, 15 miles south of Boise (Manolis et al. 1985). A mail survey by Dr. Kerry Reese of the University of Idaho revealed only 14 records between 1970-1986, most from the southern part of the state. Records were from Canyon, Ada, Elmore Falls, Minidoka and Twin Falls counties. Several birds were reported on Lawyers Creek in Lewis County in 1979 and six were reported at Cartier Wildlife Management Area in 1980. No nesting attempts or young were observed, and, as a result, breeding populations of yellow-billed cuckoos in Idaho are believed to be extirpated (Reese and Melquist).

Nevada. The yellow-billed cuckoo has always been rare in Nevada. Ridgeway (1877) found "several" on the lower Truckee River but recent survey effort found none remaining (Klebenow and Oakleaf 1981). William Molini, Director of the Nevada Department of Wildlife explains that "Although the majority of suitable habitat for the species has been degraded in recent years, sporadic observations continue to be forwarded to the Nevada Department of Wildlife" (*in* Manolis et al. 1986). For example, yellow-billed cuckoos have been reported at Corn Creek near the town of Clark in 1991 and at Sunset Park in 1996 (Field Notes 1991, 1996). Only 288,000 acres of riparian vegetation (excluding wetlands) remain in the state, most of which may not be extensive enough to support breeding yellow-billed cuckoos (Nevada Department of Wildlife 1983).

Utah. A 1985 survey of historic and potentially suitable habitat, including sites of active breeding from at least 1979-1982, revealed no pairs at all (American Birds 39:943). Since 1990, there have been several casual observations of yellow-billed cuckoos in Utah, including documented breeding in Moab in 1991 when 1 adult was observed feeding a fledgling and observed breeding at the Pravo Airport (Field Notes 1991, 1994). In total, less than 20 individuals have been observed in Utah in the last 8 years, indicating that these breeding locations may be the last in the state.

Oregon. The yellow-billed cuckoo was formerly a rare breeder throughout Oregon, being more common on the westside of the Cascades, particularly in the willow thickets of the Willamette and Columbia rivers. Gabrielson and Jewett (1940) collected numerous specimens there between 1923 and 1925. Reports from western Oregon have since been scarce. By 1940 the species was all but extirpated from the state. There have only been 25 sightings since 1970, most from Klamath County and eastern Oregon. Littlefield (1988) suggests that caterpillar infestations may be responsible for shifting the remnant birds east. The last sighting was of a single bird in 1989 at Hart Mountain National Antelope Range (American Birds 1990). A 1988 survey of nearly all suitable riparian areas and historic sites in Klamath County and eastern Oregon revealed no pairs at all (Littlefield 1988). With the loss of even these remnants, the cuckoo may well be completely extirpated from Oregon.

Much suitable habitat still exists in the Willamette Valley (Laymon and Halterman 1987) but very few areas in Klamath County or eastern Oregon meet the definition of suitable habitat put forth by Laymon and Halterman (1987), and Littlefield (1988). Willows in northeast Oregon have largely been replaced by alders (*Alnus* spp.) and willows in Klamath County are usually associated with an understory of ponderosa pine (*Pinus ponderosa*) and quaking aspen (*Populus tremuloides*). Cottonwood-willow habitats in Harney County are confined to belts no wider than 30 m. The lower Owyhee River from Highway 201, east to the Snake River is in "excellent condition" and comes closest to suitable habitat as described in California. Good habitat may still exist on the South Fork of the John Day River, Grant County, between Prairie City and Mt. Veron.

Littlefield describes formerly occupied sites as dredged, severely overgrazed, urbanized and desiccated by agricultural draw-downs.

WASHINGTON

Yellow-billed cuckoos formerly bred on the northwest coast of Washington state (Godfrey 1966), especially around the Puget Sound area (Edson 1935). It was fairly plentiful in the swampy woodlands which once surrounded Lake Washington (Burleigh 1929). By 1934, however, it was all but absent from its breeding range (Edson 1935). Mattocks et al. (1976) summarize recent records through 1974. One seen on the Skynomish River near Sultan, Snohomish County in July and August of 1979 is one of only three recent records (Roberson 1980). This area has been resurveyed annually but with no success (Phil Mattocks in Manolis et al. 1986). More recently, one yellow-billed cuckoo was seen at Grays Harbor in 1996, reportedly the first sighting in western

Washington since 1979 (Field Notes 1997). East of the Cascades, 1 yellow billed cuckoo was observed near the town of Fields, June 1-5, 1992 (Field Notes 1992).

Citing declines in deciduous riparian habitat since the 1800s, Tom Owens, biologist with the Washington Department of Game, concluded that "Destruction of riparian thickets by overgrazing, clean farming, timber harvest, or habitat conversion practices pose a potential problem" for the yellow-billed cuckoo (*in* Manolis et al. 1986). His caveat that "much theoretically suitable habitat still remains within its historic range" is based on the erroneous assumption that the species is not particularly habitat specific. Even so, some unoccupied suitable habitat does remain in Washington. As a declining species, the yellow-billed cuckoo is likely absent from Washington because it has retracted from the periphery of its former range. It has also been suggested (Gustafson pers. comm.) that not enough stop-over habitat remains in California for the cuckoo to reach Oregon and Washington on its northward migration.

BRITISH COLUMBIA

Several records indicate that the cuckoo formerly bred in southwestern British Columbia, but there is little information on the size or distribution of past populations (Jewett et al. 1953). It is currently not found anywhere in British Columbia.

VIII. INADEQUACY OF EXISTING REGULATORY MECHANISMS

United States Fish and Wildlife Service. Listing of the Southwestern willow flycatcher (*Empidonax trailii extimus*) on February 27, 1995 should have allowed the Service an opportunity to initiate broad-scale riparian protection across much of the cuckoo's range, including New Mexico, Arizona and southern California. Though the habitat needs of the flycatcher and the cuckoo are somewhat different (the flycatcher nests and forages in dense willow thickets, whereas the cuckoo nests in willow thickets, but also requires a cottonwood overstory for foraging), had the Service initiated strong protection measures necessary for the recovery of the flycatcher, such as removing cattle from streams, restoring natural flood regimes to rivers and ceasing further destruction of riparian habitat for agriculture or urban development the cuckoo and several other species would have likely benefitted. Instead, the Service resisted listing the flycatcher as endangered until forced by court order. They then refused to designate critical habitat, again until forced by the courts and then only included slightly more than half the population. Since listing, they have allowed every project that directly takes flycatchers or habitat to go through, basically unchanged with little or no mitigation. This has resulted in loss and degradation of large expanses of riparian habitat, such as behind Lake Mead on the Colorado. If the Service had at least done the minimum and protected all areas where the flycatcher currently breeds, these areas would have likely provided some habitat for both the cuckoo and the flycatcher.

The Service has had many opportunities to protect riparian habitat and the species that depend on it, but have always failed to meet the task. This is not the first petition to list the yellow-billed cuckoo as endangered. An earlier petition was filed May 1986 by Tim

Manolis (Western Field Ornithologists), Bruce Webb (Animal Protection Institute), Richard Spotts (Defenders of Wildlife), Steven Evans (Sacramento River Preservation Trust), Betty Andrews (Friends of the River), Robert Schmidt (Davis Audubon Society), and Alta Tura (Sacramento Audubon Society). Listing was eventually denied on the grounds that the range defined by the petition did not constitute a true population and, in fact, the petition had been filed to list the yellow-billed cuckoo in California, Oregon, Washington, Idaho, and Nevada, which does not constitute the range of the recognized subspecies. There was no biological reason for excluding New Mexico, Arizona and other parts of the cuckoo's western range. The decision was political- the petitioners wanted to exclude Region 2 of the Service from the review process. They believed Region 2 would attempt to sabotage the listing, partially because Region 2 Director Michael Speer was believed to be against listing any riparian species. Their fears were based on the fact that several other riparian species had yet to receive protection under ESA in Region 2, including the Southwestern willow flycatcher, Mexican Duck, Mexican black hawk, and the least-bell's vireo.

Indeed, Region 2, under Speer's direction, did in fact take the lead on denying endangered status for the cuckoo. At a meeting August 3-4, 1987 in Denver "Supplemental information" was presented by cuckoo researchers indicating further population declines since a draft rule to list the cuckoo was prepared by Region 1, which had expanded consideration beyond the scope of the original petition in order to pursue a more biologically defensible population (Harlow 1987). Region 6 supports the proposal, but Region 2 does not because they have "a policy in their region against listing populations." This policy contradicts Federal Code, which clearly states that for the purposes of the Act, "Species" includes any species or subspecies...and any distinct population segment of any vertebrate species that interbreeds when mature" (N.B. 50 CFR 424.02 (k)). Region 2 recommends that the petition either be considered in its original weak form (in which case it would surely be denied), or be found "not warranted". Region 1 recommended listing the population west of the Divide, but, as a compromise, prepared a draft "Warranted but Precluded" notice for the original weak population. In the end, Region 2 won out and the petition was found to be unwarranted with the yellow-billed cuckoo actually downlisted to a 3B, despite its clearly imperiled status.

By not listing the cuckoo, the Service missed an early opportunity to protect riparian areas and perhaps could have avoided listing several other species, such as the Southwestern willow flycatcher or the least bell's vireo. To this day, the Service continues to avoid taking the compulsory steps to protect riparian areas, necessitating another petition to list the yellow-billed cuckoo.

United States Forest Service. Although the yellow-billed cuckoo was put on the Regional Forester's Sensitive Species List for Arizona and New Mexico as far back as 1988, no National Forest in Region 3 has as yet developed a management plan for the species. No Forest in the Region uses it as a riparian indicator species. No Forest in the Region has implemented Yellow-billed cuckoo inventories. No Forest in the Region mentions the subspecies either in its Forest Plan or Forest Plan Environmental Impact

Statement. No Forest even lists the yellow-billed cuckoo as a species of concern on grazing allotments where it currently and historically has occurred.

This neglect has been less than benign. Systematic overgrazing, water impoundment, and floods associated with overgrazing and logging have made the riparian cottonwood-willow association the most endangered habitat in North America. Surveying birdlife along 21 miles of the Gila River and Mogollon Creek within the Gila National Forest, Dale Zimmerman (1970) noted that:

"isolated trees and small to fairly large patches remain, but no truly mature cottonwood forest of any size now exists...In many stands, the cottonwoods appear only in the upper stratum; there are few young examples of any size. This is in most instances a reflection of browsing pressure by cattle."

Native grasses, young willows and young sycamores were almost completely absent. He did find, however, *Argemone*, an indicator of excessive cattle grazing (Kearney and Peeble, 1951) and *Verbascum*, *Tribulus* and *Salsola*, indicators of disturbed soil and ground cover. He also found that Juniper had replaced the riparian trees in many areas: "their appearance probably...coincided with increased cattle grazing and elimination of normal ground cover."

Noting that previously lush riparian areas had "been largely denuded," Zimmerman concluded:

"The riparian woodlands and shrublands are receiving a disproportionate amount of use by domestic stock and decided misuse by certain elements of the visiting public who use the valley for recreation. It is apparent that to date 'wildlife values' have been given rather little consideration compared to 'cattle values'...the present wildlife of the Gila Valley remains largely if not entirely by accident. It gets along the best it can under generally worsening conditions. For some species this clearly is not sufficient for survival...At present, mature trees are disappearing at a rate far greater than that for reproduction of the same species. Significant reduction of grazing by domestic animals in the river valley would be a major step toward improvement of habitat."

Recent initiatives to protect or restore cottonwood-willow habitat on National Forests have been limited in extent and not specifically designed to provide habitat for the yellow-billed cuckoo. The Forest Service recently proposed a "Seven Species Initiative" as part of consultation with the Fish and Wildlife Service over 7 endangered species. Habitat protection for some of the 7, including the Southwestern willow flycatcher, the Cactus Ferruginous Pygmy Owl and several fish species could potentially have provided habitat for the cuckoo, but because of the limited extent of the initiative and because of subtle differences in habitat needs between the cuckoo and these other species there will likely be little habitat gained. For example, initiatives for the flycatcher include excluding cattle from several areas, including the Salt River and Tonto Creek inflows to Roosevelt Lake, the Greer area on the Little Colorado River and "Alpine Horse Pasture" on the San Francisco River. Protection for these areas is welcome, but represents a small fraction of

all the riparian areas within National Forests that could be restored and protected to the benefit of the cuckoo and numerous other species. Moreover, none of these areas likely provide high quality habitat for the cuckoo: the Salt and Tonto are dominated by tamarisk, which is not utilized by cuckoos, and the habitat at Greer and Alpine is limited to small patches of willow that are above the elevation range of the cuckoo.

Though we applaud the fact that cows have been removed from a few important areas for the flycatcher, the status of the cuckoo warrants initiatives that are targeted towards restoring and creating habitat that meets the specific habitat needs of the cuckoo. Broad-scale protection of riparian habitat, currently not included in any National Forest plans, is necessary to reverse extensive riparian habitat loss and degradation and provide adequate protection for the cuckoo and numerous other riparian dependent species on National Forests.

Bureau of Land Management. The BLM currently has no regulations concerning the yellow-billed cuckoo, nor do they conduct surveys for the cuckoo to determine if their programs are having an impact. Yet, BLM grazing allotments are in as bad, or worse shape than Forest Service allotments and are likely impacting occupied cuckoo habitat on the Rio Grande and numerous other rivers. Because of presence of the endangered Southwestern willow flycatcher, however, the BLM was recently pressured to remove cattle from Elephant Butte Lake and Caballo Reservoirs reservoirs during the breeding season. This may incidentally benefit the cuckoo, depending on whether cattle removal alone will allow development of gallery cottonwood forests, necessary for foraging cuckoos. Thousands of other river miles in all the western states that comprise the former range of the cuckoo are being impacted by BLM grazing with no regard for the cuckoo or willow-cottonwood habitat.

Bureau of Reclamation. Bureau of Reclamation dams at Roosevelt Lake, Lake Mead, Elephant Butte Lake and numerous other reservoirs have been responsible for flooding of native cottonwood-willow habitat and the invasion of tamarisk on thousands of river miles across the range of the cuckoo. There are currently no regulations governing the fluctuation of reservoir or run-off water levels that would adequately protect habitat of the yellow-billed cuckoo and, in fact, many Bureau actions have severely impacted the cuckoo. For example, a managed flood on the Bill Williams River in the early 1980's lasted 2 years inundating and killing extensive native cottonwood-willow communities in one of the few strongholds of the cuckoo in Arizona (Hunter 1984).

The Bureau conducts no yellow-billed cuckoo surveys prior to projects impacting riparian habitat and the limited amount of conservation planning they have done has not included the cuckoo. For example, the Bureau has produced a "Multi-species Conservation Plan" for the Lower Colorado River, an important area for the cuckoo, that included no analysis of impact on this rare species. As part of this "conservation plan", the Bureau elected to flood 1,400 acres of native habitat behind Lake Mead with no surveys for or consideration of impacts on the cuckoo (USFWS 1997a). Though Bureau dams have historically resulted in significant losses of cuckoo habitat and are currently severely limiting cottonwood regeneration to the detriment of the cuckoo over large

portions of its range, the Bureau has virtually shown no regard for the cuckoo or numerous other riparian dependent species.

National Wildlife Refuges. Though National Wildlife Refuges (Cibola, Havasu) have been important breeding sites for the yellow-billed cuckoo, there have been no measures taken to protect the bird on any of the Refuges where it has been known to occur and many areas have been allowed to degrade to the point of being totally dominated by saltcedar.

Indian Nations. No Indian Nations have regulations regarding the conservation of yellow-billed cuckoos. The Bureau of Indian Affairs drained Black Rock Reservoir on the Zuni Indian Reservation to repair the dam in 1996 with no consideration of impact to the only cuckoo population on the Zuni River (USFWS 1995).

State Agencies. The Arizona Game and Fish Department currently lists the yellow-billed cuckoo as a "species of special concern", which provides no protection for the species, but is instead only informative (Corman personal communication). Numerous state run grazing allotments are negatively impacting the yellow-billed cuckoo and initiatives to protect riparian habitat for other species are few and of limited extent.

The State of New Mexico currently does not list the cuckoo under any category status and, therefore, does not protect or monitor the status of the yellow-billed cuckoo. A number of state managed riparian areas have been allowed to degrade. The La Joya State Game Refuge, for example, is over-run with saltcedar. The State Fish Hatchery in Glenwood used to be excellent riparian habitat but has been allowed to degrade. The State Game Farm Enclosure also used to be excellent riparian habitat until its water rights were transferred to Snow Lake, a recreational reservoir.

California is the only state in which broad riparian recovery and protection plans have been implemented, not on a scale large enough to prevent the degradation of limited breeding sites since 1987, however. In 1988 the yellow-billed cuckoo was listed as a state Endangered Species, but this had little impact on management of either Lake Isabella or Prado Dam. As discussed above, the Army Corps has flooded significant riparian habitat on the South Fork of the Kern River to the detriment of this important cuckoo population. They have also flooded habitat in the Prado Basin, which harbors perhaps the only known cuckoo population on the Southern Coast, in order to increase water storage behind what was supposed to be only a flood control dam. The state has also failed to adequately monitor for cuckoos, no surveys have been conducted on the Sacramento River since 1990, despite the fact that this is one of only two relatively substantial breeding areas in California. In short, the cuckoo needs federal listing in California and elsewhere to encourage adequate monitoring and to ensure protection, particularly from federal agencies, such as the Army Corps.

IX. Critical Habitat Designation Recommended

Petitioners strongly recommend the designation of critical habitat for the yellow-billed cuckoo coincident with its listing. Its demise is clearly and overwhelmingly related to the fragmentation, degradation and outright destruction of riparian habitat, especially willow-cottonwood habitat. Critical habitat should be designated in all areas where it is currently located and in key unoccupied areas where restoration is necessary for the conservation of the subspecies.

Respectfully submitted,

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Kieran Suckling and Noah Greenwald sign for the following groups who have agreed to be co-petitioners: Maricopa Audubon Society (AZ), Tucson Audubon Society (AZ), Huachuca Audubon Society (AZ), White Mountain Audubon Society (AZ), White Mountain Conservation League (AZ), Wildlife Damage Review (AZ), Sky Island Alliance (AZ), the San Pedro 100 (AZ), the Zane Grey Chapter of Trout Unlimited (AZ), T & E Inc.(NM), the Biodiversity Legal Foundation (CO), the Environmental Protection Information Center (CA), the Sierra Nevada Alliance (CA), Wetlands Action Network (CA), Rangewatch (CA), the Oregon Natural Desert Association (OR), the Oregon Natural Resources Center (OR), the Klamath-Siskiyou Wildlands Center (OR), the Southern Utah Wilderness Alliance (UT), the Wild Utah Forest Campaign (UT), Friends of Nevada Wilderness (NV), and The Toiyabe Chapter of the Sierra Club (NV)

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1. This study also demonstrates that a significant relationship exists between the size and abundance of habitat patches!

3. Calculated from Table 1 (Katibah 1983) including 30,000 "miscellaneous" acres- the other 70,000 being attributed to the Sacramento Valley in proportion to the estimated acreages of each.