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50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (Coccyzus americanus); Proposed Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FWS–R8–ES–2013–0104; 4500030113]

RIN 1018–AY53

Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (Coccyzus americanus)

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list the yellow-billed cuckoo in the western portions of the United States, Canada, and Mexico (western yellow-billed cuckoo) as a threatened distinct vertebrate population segment under the Endangered Species Act of 1973, as amended (Act). If we finalize this rule as proposed, it would extend the Act's protections to the western yellow-billed cuckoo. The effect of this regulation would be to add the western yellow-billed cuckoo to the List of Endangered and Threatened Wildlife under the Act.

DATES: We will accept comments received or postmarked on or before December 2, 2013. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES** section, below) must be received by 11:59 p.m. Eastern Time on the closing date. We must receive requests for public hearings, in writing, at the address shown in the **ADDRESSES** section by November 18, 2013.

ADDRESSES: You may submit comments by one of the following methods:

(1) *Electronically:* Go to the Federal eRulemaking Portal: *http://www.regulations.gov.* In the Search box, enter FWS–R8–ES–2013–0104, which is the docket number for this rulemaking. You may submit a comment by clicking on ''Comment Now!''

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: Docket No. FWS–R8–ES–2013–0104; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

We request that you send comments only by the methods described above. We will post all comments on *http://www.regulations.gov.* This generally means that we will post any personal information you provide us (see the Information Requested section below for more information).

FOR FURTHER INFORMATION CONTACT: Jennifer Norris, Field Supervisor, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, 2800 Cottage Way, Room W–2605, Sacramento, California 95825, by telephone 916–414–6600 or by facsimile 916–414–6712. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule? Under the Act, if a species is determined to be an endangered or threatened species throughout all or a significant portion of its range, we are required to promptly publish a proposal in the **Federal Register** and make a determination on our proposal within 1 year. Listing a species as an endangered or threatened species can only be completed by issuing a rule.

This rule proposes the listing of the yellow-billed cuckoo as a threatened species in western North America as a distinct vertebrate population segment (DPS) under the Act and our policy regarding the recognition of DPSs (61 FR 4721; February 7, 1996).

What does this rule consist of and what is the potential outcome of this rule making? This document consists of a proposed rule to list populations of the yellow-billed cuckoo in the western United States, Canada, and Mexico as a threatened species. This rule, if finalized, will add the western yellow-billed cuckoo to the list of endangered or threatened species.

What is the basis for our action? Under the Act and Service policy, we can determine that a species (or a distinct population segment of a vertebrate species) is an endangered or threatened species based on any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We reviewed all available scientific and commercial information pertaining to the five threat factors in our evaluation of each species.

We have determined that the western yellow-billed cuckoo is threatened by two of these five factors (A and E). We consider Factors A and E to be the main threats to the species.

Factor A threats result from habitat destruction, modification, and degradation from dam construction and operations; water diversions; riverflow management; stream channelization and stabilization; conversion to agricultural uses, such as crops and livestock grazing; urban and transportation infrastructure; and increased incidence of wildfire. These factors also contribute to fragmentation and promote conversion to nonnative plant species, particularly tamarisk. The threats affecting western yellow-billed cuckoo habitat are ongoing. Such a loss of riparian habitat leads not only to a direct reduction in yellow-billed cuckoo numbers but also leaves a highly fragmented landscape, which can reduce breeding success through increased predation rates and barriers to dispersal by juvenile and adult yellow-billed cuckoos.

Factor E threats, including habitat rarity and small, isolated populations of the western yellow-billed cuckoo, cause the remaining populations in western North America to be increasingly susceptible to further declines through lack of immigration, chance weather events, fluctuating availability of prey populations, pesticides, collisions with tall vertical structures during migration, spread of the introduced tamarisk leaf beetle as a biocontrol agent in the Southwest, and climate change. The ongoing threat of small overall population size leads to an increased chance of local extinctions through random events.

We will seek peer review. We are seeking comments and soliciting information from knowledgeable individuals with scientific expertise to review our analysis of the best available scientific and commercial data and application of that information to improve this proposed rule. Because we will consider all comments and information received during the comment period, our final determinations may differ from this proposal.

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from the public, other concerned governmental agencies, Native American tribes, the scientific community, industry, or any other interested parties concerning this proposed rule. We particularly seek comments concerning:

(1) The western yellow-billed cuckoo's biology, range, and population trends, including:

(a) Habitat requirements for feeding, breeding, and sheltering;

(b) Genetics and taxonomy;

(c) Historical and current range including distribution patterns;

(d) Historical and current population levels, and current and projected trends;

(e) Past and ongoing conservation measures for the DPS, its habitat, or both;

(f) Locations of any additional populations of western yellow-billed cuckoo;

(g) Breeding season data in the mountain ranges of southeastern Arizona and southwestern New Mexico;

(h) Breeding season data north and south of the United States in Canada and Mexico; and

(i) Additional morphological and genetic data on yellow-billed cuckoos along the DPS boundary in New Mexico and Texas.

(2) The factors that are the basis for making a listing determination for a species under section 4(a) of the Act, which are:

(a) The present or threatened destruction, modification, or curtailment of its habitat or range;

(b) Overutilization for commercial, recreational, scientific, or educational purposes;

(c) Disease or predation;

(d) The inadequacy of existing regulatory mechanisms; or

(e) Other natural or manmade factors affecting its continued existence.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to the western yellow-billed cuckoo, and regulations that may be addressing those threats.

(4) Any information on the biological or ecological requirements, and ongoing conservation measures for the western yellow-billed cuckoo and its habitat including but not limited to any changes in dam operations that may benefit the species or its habitat.

(5) Current or planned activities in the areas occupied by the western yellow-billed cuckoo, and possible impacts of these activities on the species or its habitat.

(6) Information on the projected and reasonably likely impacts of climate change on the western yellow-billed cuckoo and its habitat.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is a threatened or endangered species must be made ''solely on the basis of the best scientific and commercial data available.''

You may submit your comments and materials concerning this proposed rule by one of the methods listed in the **ADDRESSES** section. We request that you send comments only by the methods described in the **ADDRESSES** section.

If you submit information via *http://www.regulations.gov,* your entire submission—including any personal identifying information—will be posted on the Web site. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov.*

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov,* or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Previous Federal Actions

On February 9, 1998, we received a petition from the Southwest Center for Biological Diversity (Center for Biological Diversity) on behalf of 22 groups to list the yellow-billed cuckoo under the Act. The petitioners stated that they believe the yellow-billed cuckoo ''is endangered in a significant portion of its range (the western United States).'' The petitioners also stated they ''believe this range of endangerment is coterminous with a valid subspecies, the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*),'' and that they would concur with a decision to list this taxon. Petitioners also requested that critical habitat be designated for the yellow-billed cuckoo concurrent with the listing, pursuant to 50 CFR 424.12 and the Administrative Procedure Act (5 U.S.C. 553). The petition included supporting information on the species relating to taxonomy, ecology, adequacy of existing regulatory mechanisms, historical and present distribution, current status, and threats in the western United States.

On February 17, 2000, we announced a 90-day petition finding in the **Federal Register** (65 FR 8104) concluding that the petition presented substantial scientific or commercial information to indicate that further investigation, through a status review, was required to determine the taxonomic validity of a western subspecies, and to determine if listing the western population of the yellow-billed cuckoo as a DPS may be warranted. In our finding, we noted that the petition did not present sufficient information to indicate that listing of the species as a whole may be warranted.

On July 25, 2001, we published a 12-month petition finding in the **Federal Register** (66 FR 38611) concluding that the yellow-billed cuckoo populations west of the Continental Divide constituted a valid DPS and that the DPS was warranted for listing; however, this action was precluded by higher priority listing actions, and the DPS was placed on our candidate species list. The range of the DPS was identified to include at least portions of 12 western States west of the crest of the Rocky Mountains, with the Canadian and Mexican borders constituting the northern and southern boundaries respectively. On October 30, 2001, a list of new candidate species included the yellow-billed cuckoo, western continental United States DPS, giving it a listing priority number of 6 based on non-imminent threats of high magnitude (66 FR 54810, 54818) as defined by our policy on determining listing priorities (48 FR 43098; September 21, 1983). In the 2005 candidate notice of review document (70 FR 24875; May 11, 2005), the listing priority number was upgraded from 6 to 3 based on reassessing the nature of the threats as imminent and of a high magnitude. The 2011 notice indicated that preparation of a listing rule was under way (76 FR 66391; October 26, 2011).

On July 12, 2011, a court settlement, *Center for Biological Diversity* v. *Salazar,* 10–cv–0230 required the Service to submit to the **Federal Register** for publication either a proposed rule or a not-warranted finding for the western yellow-billed cuckoo on or before September 30, 2013.

Background

In this section of the proposed rule, it is our intent to discuss only those topics directly relevant to the proposed listing of the yellow-billed cuckoo in the western portions of the United States, Canada, and Mexico as a threatened DPS.

Species Information

The yellow-billed cuckoo (*Coccyzus americanus*) is a member of the avian family Cuculidae and is a Neotropical migrant bird that winters in South

America and breeds in North America. Yellow-billed cuckoos spend the winter in South America, east of the Andes, primarily south of the Amazon Basin in southern Brazil, Paraguay, Uruguay, eastern Bolivia, and northern Argentina (Ehrlich *et al.* 1992, pp. 129–130; AOU 1998, p. 247; Johnson *et al.* 2008b, pp. 18–29). The breeding range of the entire species formerly included most of North America from southeastern and western Canada (southern Ontario and Quebec and southwestern British Columbia) to the Greater Antilles and northern Mexico (AOU 1957, pp. 269–270; AOU 1983, p. 284; AOU 1998, p. 247).

Adult yellow-billed cuckoos have moderate to heavy bills, somewhat elongated bodies, and a narrow yellow ring of colored bare skin around the eye. The plumage is loose and grayish-brown above and white below, with reddish primary flight feathers. The tail feathers are boldly patterned with black and white below. They are a medium-sized bird about 12 inches (in) (30 centimeters (cm)) in length, and about 2 ounces (oz) (60 grams (g)) in weight. The species has a slender, long-tailed profile, with a fairly stout and slightly down-curved bill, which is blue-black with yellow on the basal half of the lower mandible. The legs are short and bluish-gray. Yellow-billed cuckoos have a zygodactyl foot, in which two toes point forwards and two toes point backwards. Juveniles resemble adults, except the tail patterning is less distinct and the lower bill has little or no yellow. Males and females differ slightly; the males have a slightly smaller body size, smaller bill, and the white portions of the tail tend to form distinct oval spots. In females the white spots are less distinct and tend to be connected (Hughes 1999, pp. 2–3).

Typically a secretive and hard-to-detect bird, mated yellow-billed cuckoos have a distinctive ''kowlp'' call, which is a loud, nonmusical series of notes that slows down and slurs toward the end. Unmated yellow-billed cuckoos advertise for a mate using a series of soft ''cooing'' notes. Both members of a pair use the ''knocker'' call, a series of soft notes given as a contact or warning call near the nest (Hughes 1999, pp. 8–9).

Little information exists on lifespan for yellow-billed cuckoos, which is a result of the scarcity of banded yellow-billed cuckoos and a very low recovery rate (0.4 percent) (Hughes 1999, p. 18). The longest known lifespan of a banded yellow-billed cuckoo is 5 years (U.S. Geological Survey (USGS) Patuxent Wildlife Research Center 2012, p. 1).

Taxonomy

The separation of yellow-billed cuckoos into subspecies was first discussed by Ridgway (1887, p. 273) who separated the yellow-billed cuckoo into an eastern (*Coccyzus americanus americanus*) and western (*C. a. occidentalis*) subspecies, based on western birds being ''larger, with proportionately larger and stouter bill.'' Ridgway's western subspecies included birds from western Texas through the Great Basin portions of Colorado and Wyoming, west and north to the Pacific coast and southwestern British Columbia. Historically the western subspecies was known as the California cuckoo (Ridgway 1887, p. 273; Belding 1890, p. 57) or California yellow-billed cuckoo (Grinnell and Miller 1944, pp. 186–187). Recently, in the literature, it has been called the western yellow-billed cuckoo, a name we are using in this document to refer to the DPS. Wetmore (1968, pp. 325–326) added that western yellow-billed cuckoos are slightly grayer above, and eastern yellow-billed cuckoos are browner. Oberholser and Kincaid (1974, pp. 434–435) concurred with Ridgway and split the subspecies' range in western Texas between the Rio Grande and the Pecos Rivers, west of Big Bend. The two subspecies were generally included in ornithological treatments through the 1970s (for example, American Ornithologists' Union (AOU) 1957, pp. 269–270; Oberholser and Kincaid 1974, pp. 434–435).

Some ornithologists have questioned the separation of the yellow-billed cuckoo into two subspecies (Todd and Carriker 1922, pp. 209–213; Swarth 1929, pp. 297–298; Van Tyne and Sutton 1937, p. 35; Bent 1940, p. 67), citing the small magnitude and inconsistency of differences and broad overlap in size between eastern and western birds. These questions, however, were not based on systematic analysis of geographical variation as it pertains to resolving the yellow-billed cuckoo subspecies question. Since 1957, AOU checklists, the recognized authority for taxonomy of North American birds, have not listed subspecies, stating practical grounds (for example, space limitations), and that the validity (in the sense of their distinguishability) of many described avian subspecies still needs to be evaluated, as does the potential for unrecognized subspecies (AOU 1983, p. 284; AOU 1998, pp. 1–19). The most recent checklist (AOU 1998, pp. 1–19) refers readers to the 1957 checklist (AOU 1957, pp. 269–270) for subspecies taxonomy, which presents the yellow-billed cuckoo as comprising two separate subspecies.

In response to a 1986 petition (52 FR 2239; January 21, 1987) to list the yellow-billed cuckoo in the States of California, Washington, Oregon, Idaho, and Nevada, we requested that Dr. Richard C. Banks, an avian taxonomist and Fish and Wildlife Service employee at the National Museum of Natural History, evaluate the validity of the subspecies. Dr. Banks compared three morphological characteristics (bill length, depth of upper mandible, and wing length) of almost 700 specimens of adult yellow-billed cuckoos from throughout the species' range and visually examined the colors of specimens. He found: (1) No pattern of geographical variation in color; (2) substantial overlap between eastern and western birds in wing length, bill length, and mandible depth; and (3) no statistically significant differences for these three characteristics. He concluded that the data did not justify the separation into eastern and western subspecies (Banks 1988, pp. 473–477). Subsequently, statistical errors were discovered in Banks' study (Spiller 1988, pp. 1–3), and a reanalysis of the same data yielded statistically significant differences ($p<0.001$) between eastern and western yellow-billed cuckoos for the three characteristics measured by Banks. Dr. Banks published a correction to his earlier paper (Banks 1990, p. 538), acknowledging the computational error and stating that the ''statistical difference cannot be equated to a biological or practical difference.'' In support of this, he cited the small differences between mean measurements, the large degree of overlap between eastern and western birds in the ranges of measurements for the three characteristics he measured, and the sensitivity of the statistical procedure to detect very small differences as ''significant,'' given the large sample sizes. His conclusion that the species was monotypic remained unchanged (Banks 1990, p. 538).

Dr. Banks later provided his data to two avian ecologists (Franzreb and Laymon 1993, pp. 17–28), who analyzed the same data set, supplemented by measurements from an additional 41 specimens of western birds and the inclusion of a fourth characteristic, tail length. Franzreb and Laymon (1993, pp. 17–28), noting statistical errors by Banks (1988, pp. 473–477), found that western birds are larger than eastern birds. They developed a discriminant function analysis (DFA) equation that correctly predicted origin for 83.8 percent of eastern male and 74.6 percent of

western male yellow-billed cuckoos, and for 89.6 percent of eastern and 85.8 percent of western female yellow-billed cuckoos. These predictive DFA equations have been accepted as a useful tool to separate the eastern and western populations by several researchers (Pyle 1997, pp. 56–57; Hughes 1999, p. 23; and Pruett *et al.* 2001, p. 229). Franzreb and Laymon (1993, pp. 17–28) also analyzed behavioral and ecological differences between western and eastern birds, and found differences in the timing of migration and breeding, with western birds arriving on breeding grounds later and laying eggs later than eastern birds at the same latitude. They concluded that: (1) The recognition of subspecies on the basis of measurements of existing specimens is equivocal; (2) the study of geographical variation in vocalizations, bill color, and genetics was needed; (3) the two subspecies should be retained pending the above studies; and (4) ''because the western yellow-billed cuckoo is so critically endangered . . . changes in its taxonomic classification should be made only after the best possible study.''

In 2001, two separate research labs conducted studies on the genetic differences between eastern and western yellow-billed cuckoos (Fleischer 2001, pp. 14–16; Pruett *et al.* 2001, pp. 228–231), reaching different conclusions regarding the taxonomic status of yellow-billed cuckoos from the two regions. Fleischer examined two neutral regions of the mitochondrial DNA (Control Region and ATPase subunit 8 regions) and found no genetic structure that separated eastern from western yellow-billed cuckoos, or supported subspecies or evolutionarily significant unit (for example, a species, a subspecies, or a distinct population) status for the species. He did suggest that an examination of markers with higher mutation rates (for example, microsatellites) might reveal significant genetic structure and suggested that microsatellite studies be conducted.

Pruett *et al.* (2001, p. 229) examined a different region of the mitochondrial DNA (cytochrome b), and came to a different conclusion from Fleischer. They found substantial differences between the two subspecies, and concluded that they were genetically distinct and had diverged 205,000 to 465,000 years ago. They concluded that the western yellow-billed cuckoo was an evolutionarily significant unit, probably at the subspecies level, and that these results were particularly significant because the differences were found on a gene that codes for a protein important in cell respiration, not a neutral zone, meaning that the differences were derived through selective evolutionary pressure rather than chance events. However, their study was done with a very small sample of specimens that did not cover the range of either the eastern or western yellow-billed cuckoo.

Although mitochondrial analyses are routinely used in phylogenetic studies, they have well-known limitations, sometimes lumping taxa that are different or separating taxa that are the same (Funk and Omland 2003, p. 403). Farrell (2006, pp. 9–32) reexamined the subspecies status of western yellow-billed cuckoo mitochondrial DNA with a larger geographic distribution of samples representative of overall species range with focused sampling effort on the zones of contact between the eastern and western populations. Farrell's (2006, pp. 33–44) results revealed only limited genetic divergence between eastern and western populations of yellow-billed cuckoo and concluded that the sequences used were not sufficiently variable to detect genetic differentiation within this species. Genetic markers such as microsatellites in nuclear DNA are ideal for population studies and preferable over mitochondrial DNA sequence analysis due to their higher mutation rates and additional information content. These studies, when conducted, may provide a better understanding of genetics and geography variation in yellow-billed cuckoo populations (Hailer *et al.* 2012, pp. 346–347).

However, Hughes (1999, pp. 1–27) concluded that size alone was sufficient to separate the subspecies, and that the discriminant function analysis equations developed by Franzreb and Laymon (1993, pp. 17–28), and used by Pyle (1997, pp. 56–57), worked to identify individuals to subspecies level. She also concluded that: (1) The size differences between the subspecies in western Texas and southern New Mexico, the closest distance between eastern and western yellow-billed cuckoos, were not gradual east to west and the change in size was too abrupt to be clinal; (2) the difference in timing of migration and breeding ''must have evolved independently for some time;'' and (3) the eastern and western yellow-billed cuckoos were different taxa, probably at the subspecies level (Hughes 2000, pp. 1–2).

In summary, the available genetic data regarding the distinguishability of the western subspecies of the yellow-billed cuckoo is conflicting. Since 2001, three genetic studies have been completed on the yellow-billed cuckoo using mitochondrial DNA. Two of the studies did not and one study did find significant differences between eastern and western populations of the species. The reason for the inconsistency is not known. It is possible that future research using microsatellite markers that have higher mutation rates rather than the slowly evolving mitochondrial DNA would better determine more subtle genetic differences. Because of these inconsistencies the available genetic data are not considered sufficient to distinguish the subspecies. However, a large majority of yellow-billed cuckoo individuals can be grouped into separate population segments along an east-west divide by comparing morphological data. Similarly, genetically controlled behavior, especially migration timing, also appears to separate the species into two populations segments along an east-west divide.

Thus, our review of the best scientific and commercial data available indicates that some information suggests that the western population segment described in the scientific literature as the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is distinguishable at the subspecific level; however, there is enough equivocality in the literature to conclude for the purposes of this proposed rule that recognition of the subspecies is not justified at this time. In the 12-month finding (66 FR 38611), we determined that the population segment of the yellow-billed cuckoo that nests in the portion of the United States west of the Continental Divide is a DPS under the Act per our 1996 DPS Policy. Because it has been more than a decade since we conducted that analysis, it is appropriate to reevaluate the available data, including any new information, to determine whether the population segment of yellow-billed cuckoos that nest in western North America is a DPS under the Act. This evaluation is presented below.

Distinct Vertebrate Population Segment Analysis

Under the Act, we must consider for listing any species, subspecies, or, for vertebrates, any DPS of these taxa if there is sufficient information to indicate that such action may be warranted. To implement the measures prescribed by the Act and its Congressional guidance, we (along with the National Marine Fisheries Service) developed policy that addresses the recognition of DPSs for potential listing actions (61 FR 4721; February 7, 1996). The policy allows for more refined application of the Act that better reflects

the biological needs of the taxon being considered, and avoids the inclusion of entities that do not require its protective measures.

Before we can evaluate whether a given population segment is a DPS under the Act, we must first determine if any population segments exist for the vertebrate species. As discussed in the Taxonomy section above, much of the available scientific information supports considering the yellow-billed cuckoos that nest in western and eastern North America as biologically separate population segments.

To establish the range of the population segment under consideration, we used the area occupied by the western yellow-billed cuckoo (the subspecies) originally defined by Ridgway (1887, p. 273) and later refined by other researchers (AOU 1957, pp. 269–270; Oberholser and Kincaid 1974, pp. 434–435; Hughes 1999, Figure 1). After careful consideration of other possible population segment configurations, we determined that the Continental Divide (generally the crest of the Rocky Mountains based on watershed boundaries), the watershed divide between the Rio Grande and Pecos River, and the Chihuahuan Desert in Mexico was the best division between eastern and western populations. The area that we are considering occupied by the potential DPS for the yellow-billed cuckoo is closely aligned with the traditionally defined range of the western yellow-billed cuckoo subspecies as partially described in the July 25, 2001, 12-month finding (66 FR 38611). Our goal is to determine if this western population meets the criteria of a distinct population segment and, if so, whether the range boundaries identified in the literature are appropriate for the boundary of the DPS. This DPS analysis is based solely on the range during the breeding season because the migration route and winter range of western yellow-billed cuckoos are poorly known.

The geographical breeding range of the yellow-billed cuckoo in western North America includes suitable habitat within the low- to moderate-elevation areas west of the crest of the Rocky Mountains in Canada and the United States including the upper and middle Rio Grande, the Colorado River Basin, the Sacramento and San Joaquin River systems, the Columbia River system, and the Fraser River. In Mexico the range includes the Cape Region of Baja California Sur, and river systems in the Mexican States of Sonora, Sinaloa, western Chihuahua, and northwestern Durango. Eastern yellow-billed cuckoos (*Coccyzus americanus americanus*) breed east of the Rocky Mountains, north to North Dakota and southern Ontario, Canada, and south to eastern Mexico, and the islands of the Caribbean (AOU 1957, pp. 269–270) (Figure 1).

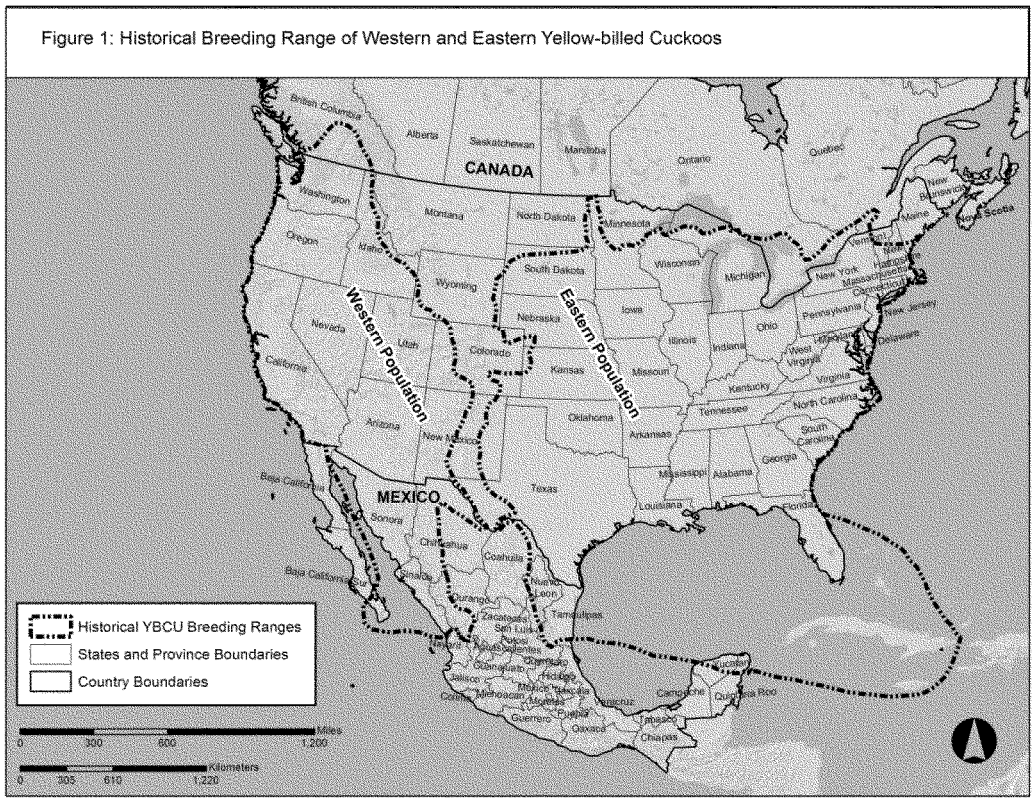

Figure 1. Historical Breeding Range of Eastern and Western Yellow-billed Cuckoos based on American Ornithological Union's 1957 Checklist.

Under our DPS policy, three elements are considered in a decision regarding the status of a possible DPS as endangered or threatened under the Act. The elements are: (1) Discreteness of the population segment in relation to the remainder of the species to which it belongs; (2) the significance of the population segment to the species to

which it belongs; and (3) the population segment's conservation status in relation to the Act's standards for listing. In other words, if we determine that a population segment of a vertebrate species being considered for listing is both discrete and significant, we would conclude that it represents a DPS, and thus a ''species'' under section 3(16) of the Act, whereupon we would evaluate the level of threat to the DPS based on the five listing factors established under section 4(a)(1) of the Act to determine whether listing the DPS as an ''endangered species'' or a ''threatened species'' is warranted.

Below, we evaluate under our DPS policy whether the population segment of yellow-billed cuckoos that occurs in the western United States, northwestern Mexico, and southwestern Canada qualifies as a DPS under the Act.

Discreteness

Under our DPS Policy, a population segment of a vertebrate species may be considered discrete if it satisfies either of the following two conditions: (1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors (quantitative measures of genetic or morphological discontinuity may provide evidence of this separation); or (2) it is delimited by international governmental boundaries within which significant differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

The analysis of the population segment of the yellow-billed cuckoo in western North America is based on the first of those two conditions, the marked separation from other populations. From southwest British Columbia along the Canadian border to the southern end of the Sangre de Cristo Mountains in northern New Mexico, nesting yellow-billed cuckoos in western North America are separated from nesting yellow-billed cuckoos in eastern North America by the high-elevation zone of the Rocky Mountains. Yellow-billed cuckoos breed both east and west of the crest of the Rocky Mountains, where suitable habitat occurs (Johnsgard 1986, p. 201) (we define the crest of the Rocky Mountains and Continental Divide as the high elevation zone between the drainages flowing west and east in the U.S., Canada, and Mexico). The division between the western and eastern population segments spans a distance of about 2,200 miles (mi) (3,540 kilometers (km)) from southwest British Columbia near the Canadian border along the crest of the Rocky Mountains based on watershed boundaries, south along the Rio Grande-Pecos Rivers watershed divide to the United States-Mexico border in the Big Bend area of Texas, then into Mexico along the eastern and southern boundaries of the State of Chihuahua south to the southern border of the State of Durango and to the Pacific Ocean along the southern border of the State of Sinaloa. The distance of separation between breeding yellow-billed cuckoos in the east and west varies along this division from 160 mi (257 km) to more than 400 mi (644 km), and consists entirely of areas of unoccupied, unsuitable habitat for breeding yellow-billed cuckoos. The one exception to this distance of separation is along the Rio Grande in southwestern Texas in Brewster County, where eastern yellow-billed cuckoos breed as far west as Rio Grande Village and western yellow-billed cuckoos are found upstream along the river approximately 50 mi (80 km) to the west.

Yellow-billed cuckoos historically bred at the southern tip of Vancouver Island and in the Fraser River valley north to Kamloops in southwestern British Columbia, Canada (Bent 1940, p. 64; Campbell *et al.* 1990, p. 481). The species was apparently never common, with 23 records (18 specimen and 5 sight records) between 1881 and 1927. Two of these observations were of pairs believed to be nesting but not confirmed. Since the 1920s, the species has been recorded five times in British Columbia, with four of those records occurring since 1990 from the eastern half of the Province in areas not considered breeding habitat (Campbell *et al.* 1990, p. 481; Siddle 1992, p. 1169; Cornell Lab of Ornithology 2012). Today, the species is considered extirpated as a breeder from the Province, but adult, nonbreeding individuals still occur irregularly (British Columbia Conservation Data Centre 2013).

In the northern Rocky Mountains and northern Great Plains—from the Canada border south through Colorado—the yellow-billed cuckoo is ''extremely rare and local'' as a breeding bird both east and west of the Rocky Mountains (Hughes 1999, p. 3). While the species breeds locally in river valleys in southern Idaho, southwestern Wyoming, western Colorado, and in Utah (Hughes 1999, pp. 1–3), it is quite rare or absent within the higher Rocky Mountains (Johnsgard 1986, p. 201). An examination of the distributional records for the Rocky Mountain region indicates that the area has had few records of yellow-billed cuckoos and the species is even scarcer at elevations above approximately 6,000 feet (ft) (1,850 meters (m)), and almost never breeds above 7,000 ft (2,154 m) (Bailey 1928, pp. 307–309; Phillips *et al.* 1964, p. 45; Bailey and Niedrach 1965, pp. 404–406; Johnsgard 1986, p. 201; Corman and Magill 2000, pp. 10, 15; Howe and Hanberg 2000, p. 1–20). Exceptions to the elevational limit do occur and recent records of yellow-billed cuckoos have been confirmed above 6,000 ft (1,850 m) in the areas of Lower Green River Basin from the Seedskadee National Wildlife Refuge (NWR) to the Flaming Gorge Reservoir and west to the Bear River Drainage in Wyoming; along the Yampa River near Craig in northwest Colorado, and the Rio Grande River near Del Norte, and San Luis Valley of south-central Colorado; and the Henry's Fork River in Utah and Wyoming. Nevertheless, most of the crest of the Rocky Mountains includes a wide region of higher elevation where habitat for the species does not occur. In Colorado and Wyoming the region above 6,000 ft (1,850 m) is typically more than 150 mi (240 km) wide on an east-west axis (Oxford 1995, p. 82).

The separation of the yellow-billed cuckoo western population segment from yellow-billed cuckoos in the eastern population segment continues south along the crest of the Rockies into southern Colorado and northern New Mexico, then the Rocky Mountains end and the separation is along the watershed boundary between the Rio Grande and the Pecos Rivers in central New Mexico (Sangre de Cristo Mountains), and southwest Texas, terminating at the Rio Grande in the Big Bend National Park. In this region, the eastern and western yellow-billed cuckoo populations are separated by arid basins and isolated mountain ranges that emerge from a high desert plateau. These mountain ranges from north to south include the Sangre de Cristo Mountains and Sacramento Mountains in central and southern New Mexico, the Guadalupe Mountains and Delaware Mountains on the Texas-New Mexico border, and the Davis Mountains, Del Norte Mountains, and Santiago Mountains in western Texas south to the Chisos Mountains in the Big Bend National Park on the border with Mexico.

In southern New Mexico and western Texas where western yellow-billed cuckoos nest along the Rio Grande and eastern yellow-billed cuckoos nest along the Pecos River, the geographical separation is as little as 160 mi (257 km) and even closer along the Rio Grande (50 mi; 80 km). The closer proximity of western and eastern yellow-billed

cuckoos in this region may be caused in part by the lower height of the mountain range being a less effective barrier (Hubbard 1978, p. 32; Howe 1986, p. 2). Historically, this gap was wider, because the banks of the Pecos River did not have riparian woodland and the area was not used by the species. Today, the riverine habitat along the Pecos River consists primarily of introduced tamarisk (*Tamarix* spp.), and it is thought that yellow-billed cuckoos from eastern North America have colonized the Pecos River system. Much of the area between the Pecos River and the Rio Grande in New Mexico and Texas consists of internal ephemeral drainages that are not connected to any major river systems and have no riparian habitat. Considering these factors along with the information on physical factors, we have included Texas west of the Rio Grande–Pecos River watershed boundary within the range of the western population. This physical division coincides with behavioral differences between eastern and western yellow-billed cuckoos, as discussed below.

South of the United States-Mexico border, yellow-billed cuckoos are separated by extensive areas of desert that lack suitable nesting and foraging habitat. In Mexico, the Chihuahuan Desert widens to 350 mi (563 km), and includes nearly all of the States of Chihuahua and Coahuila. There are very few records of yellow-billed cuckoos for this region, and we are not aware of any nesting records for either State. Suitable breeding habitat or connective riparian corridors are also lacking. Published range maps for the species do not include the eastern three-quarters of Chihuahua or the western three-quarters of Coahuila as part of the species' breeding range (Howell and Webb 1995, p. 347; Hughes 1999, p. 1). There are only 12 records of yellow-billed cuckoos from Chihuahua: 11 specimens from the 1940s to 1960 and a sight observation in 2003. There are only nine records of the species from Coahuila: six specimen and three sight records (1958, 1988, and 2011). Three of the specimens from Coahuila were identified as eastern yellow-billed cuckoos on their museum records, and the remainder were not identified to subspecies. Seven specimens from Chihuahua were identified to subspecies and six of these were considered the western subspecies. It is likely that many, if not most, of the records from this region are of migrating yellow-billed cuckoos, as 16 are from May to mid-June or from late September, and only 5 are from late June or July, the primary breeding season.

From this information we concluded that the Chihuahua-Coahuila border was the most biologically reasonable boundary for the population segment. The boundary then follows the southern border of Chihuahua west to the Continental Divide, then south along the divide through the State of Durango and west along the southern border of Durango and Sinaloa. There are no breeding season records for yellow-billed cuckoos from the State of Nayarit or Jalisco or farther south along the Pacific coast of Mexico. The species has occurred sporadically in the State of Zacatecas, but the records are from east of the Continental Divide.

Eastern and western yellow-billed cuckoos are highly migratory and the two populations may spend winters in overlapping regions in South America. However, we do not have information to indicate that there is anything more than an extremely low level of interchange (if any at all) between the two populations during the breeding season. This conclusion is supported by differences in habitat use and morphology, which are genetically controlled traits, as discussed in the following sections.

Although the Rocky Mountains and the Chihuahuan Desert may not wholly prevent movement of yellow-billed cuckoos between the east and west, especially in a migratory species that winters far to the south, and moves thousands of miles between its wintering and breeding grounds, the available information indicates that this mountain range and desert substantially separates yellow-billed cuckoo populations during the breeding season thereby effectively separating them into discrete populations. The separation between yellow-billed cuckoo population segments in the east and west is a physical one that is maintained by their behavioral differences, which we discuss below.

Behavioral Discreteness

Data collected from publications and other sources demonstrate the existence of behavioral differences between yellow-billed cuckoos in the east and west.

Yellow-billed cuckoo populations in the east and west differ in the timing of arrival on the breeding grounds in the spring. Yellow-billed cuckoos in western North America arrive on the breeding grounds 4 to 8 weeks later than eastern yellow-billed cuckoos at similar latitude (Franzreb and Laymon 1993, pp. 24–25; Hughes 1999, pp. 5–6, 12–13; Laymon 2000, *in. litt.,* pp. 15–16). Timing of spring migration and arrival on the breeding grounds has been determined to be the result of an evolved response under genetic control, and is likely caused by east-west climatic, habitat, and food availability differences (Cresswell *et al.* 2011, pp. 13–15). The watershed boundary between the Rio Grande and the Pecos Rivers also appears to separate yellow-billed cuckoos that arrive in spring migration earlier on the Pecos River and those that arrive later on the Rio Grande in addition to separating morphological differences.

Information, including timing of migration, indicates that yellow-billed cuckoos from Texas west of the Pecos River (from the Rio Grande upstream of Big Bend) and from northwestern Mexico (Chihuahua, Sonora, Sinaloa, Durango, Baja California Sur) exhibit greater similarity to yellow-billed cuckoos in western North America, and those on the Pecos River in Texas and eastern Mexico (Coahuila, Nuevo Leon, Tamaulipas, San Luis Potosi) are more similar to yellow-billed cuckoos in the east (Wauer 1971, p. 96; Oberholser and Kincaid 1974, pp. 434–435; Franzreb and Laymon 1993, pp. 17–28; Hughes 2000, pp. 1–2, 26; Sproul 2001, *in litt.,* pp. 1–5). Based on the best available science, the watershed boundary between the Rio Grande and Pecos Rivers is the optimum dividing line between eastern and western yellow-billed cuckoo in this area.

Based on migration timing, yellow-billed cuckoos split into two populations. This split occurs along the line that corresponds with the traditional subspecies boundary (see Figure 1).

Discreteness Conclusion

The available information indicates that the yellow-billed cuckoo population segment that occurs west of the Continental Divide in the United States, in southwestern Canada, and in northwestern Mexico is markedly separated from the eastern population segment of yellow-billed cuckoo, including those that nest in eastern North America, eastern Mexico, certain Caribbean Islands, and the Yucatan Peninsula. The distribution of the western populations is markedly separated physically (geographically) during the breeding season from the distribution of other yellow-billed cuckoo populations by high mountains, extensive desert, or nonhabitat areas with the shortest geographical separation occurring across 160 mi (257 km) of desert between the Pecos River and Rio Grande in southern New Mexico and western Texas. Evidence

that this geographical separation between populations has been consistent through time may be found in the differences in the two populations' biology and morphology. Even in this area of closest proximity, genetically controlled behavior available in the scientific literature provides evidence of a biological separation between the western populations and eastern populations.

Under our DPS policy, the standard for discreteness does not require absolute separation because this can rarely be demonstrated for any population of organism. The standard for discreteness is simply a mechanism for the entity being considered for a DPS to be defined and described. For the yellow-billed cuckoo populations in western North America, we have met this standard, and, therefore, we consider the western population segment of the yellow-billed cuckoo from southern British Columbia, Canada south along the Continental Divide in the United States into Mexico, and ending at the coast in the State of Sinaloa, Mexico, to be discrete per our DPS policy. We conclude that the western population segment of the yellow-billed cuckoo is discrete from the remainder of the species because the yellow-billed cuckoo population segment that nests west of the Continental Divide and in northwestern Mexico is markedly separated geographically and behaviorally from all other populations of yellow-billed cuckoo, including those that nest in eastern North America.

Significance

Under our DPS policy, once we have determined that a population segment is discrete, we consider its biological and ecological significance to the larger taxon to which it belongs. Our DPS policy provides several potential considerations that may demonstrate the significance of a population segment to the remainder of its taxon, including: (1) Evidence of the persistence of the discrete population segment in an ecological setting unusual or unique for the taxon, (2) evidence that loss of the discrete population segment would result in a significant gap in the range of the taxon, (3) evidence that the population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range, or (4) evidence that the discrete population segment differs markedly from the remainder of the species in its genetic characteristics.

We have found substantial evidence that two of these four significance criteria (numbers 2 and 4) are met by the discrete population segment of yellow-billed cuckoos that occurs west of the Continental Divide. We address these significance factors below as they relate to the population segment of yellow-billed cuckoos that nests west of the Continental Divide and in northwestern Mexico. We focus on whether the loss of this population segment would result in a significant gap in the range of the taxon and evidence that the discrete population segment differs from other population segments in its genetic characteristics in demonstrating significance of the DPS.

Evidence indicates that loss of the discrete population segment would result in a significant gap in the range of the taxon. An extensive area would be without yellow-billed cuckoos if the western population segment were lost. Seven entire states and substantial portions of five additional states in the United States, and six states in Mexico, that are currently occupied would have no breeding populations of the species. Bird migration experts divide the North American continent into four migratory flyways: the Atlantic, Mississippi, Central, and Pacific. The range of the yellow-billed cuckoo west of the Rocky Mountains covers the entire Pacific flyway and half of the Central flyway. Additionally, the range of the yellow-billed cuckoo west of the Rocky Mountains covers 1,350,000 square (sq) mi (3,496,500 sq km), or approximately 40 percent of the lower 48 states. Even though the actual area occupied by the species in western North America is less than the total area identified above, the potential loss of the western population of the yellow-billed cuckoo would constitute a significant gap in the range of the species in North America.

Evidence That the Discrete Population Segment Differs Markedly From Other Populations of the Species in Its Genetic Characteristics

Data collected from publications and other sources demonstrate the existence of morphological and physiological differences between yellow-billed cuckoos in the east and west. Morphologically, the yellow-billed cuckoos in western North America are generally larger, with significantly longer wings, longer tails, and longer and deeper bills (Franzreb and Laymon 1993, p. 25). Banks, in a review of the species taxonomic status (1988, pp. 473–477) grouped yellow-billed cuckoo specimens into 19 regional groups, 7 in the western United States and western Mexico, 10 in the eastern United States and eastern Mexico, 1 in New Mexico, and 1 in the Caribbean. He found yellow-billed cuckoos in the east to be uniform in measurement throughout their range and yellow-billed cuckoos in the west to be uniform in measurements throughout their range (Banks 1988, p. 475). Banks stated that the change from smaller to larger yellow-billed cuckoos appeared to take place in extreme western New Mexico or extreme eastern Arizona (Banks 1988 p. 476). A subsequent analysis, based on available specimens from New Mexico and western Texas, showed the watershed boundary between the Pecos River and the Rio Grande as the apparent boundary between the smaller eastern and larger western birds, with a majority of yellow-billed cuckoos on the Rio Grande above Big Bend being larger western birds (63 percent, n=19) and the majority of yellow-billed cuckoos on the Pecos River being smaller eastern birds (82 percent, n=11) (Franzreb and Laymon 1993, p. 25). This is the only area where the ranges of the western and eastern population segments are in close proximity; elsewhere the two populations are separated by wide expanses of unsuitable, unoccupied habitat (Figure 1).

Other physical and morphological differences exist between yellow-billed cuckoos in the east and west, and provide additional evidence of ecological significance. These include:

- Yellow-billed cuckoos in western North America produce larger eggs (1.2 percent longer, 0.6 percent wider, and 3.2 percent heavier) with thicker eggshells (7.1 percent thicker) (Hughes 1999, p. 14), which is an evolved trait that would help yellow-billed cuckoos in the west to cope with potential higher egg water loss in the hotter, drier conditions of western North America (Hamilton and Hamilton 1965, pp. 426–430; Ar *et al.* 1974, pp. 153–158; Rahn and Ar 1974, pp. 147–152).
- Juvenile yellow-billed cuckoos in the east have yellow bills (Oberholser and Kincaid 1974, pp. 434–435), while juvenile yellow-billed cuckoos in the west have all-black bills (Franzreb and Laymon 1993, p. 26).
- Adult yellow-billed cuckoos in the west have a lower mandible that is orange-yellow, while yellow-billed cuckoos in the east have lower mandibles that are bright yellow (Franzreb and Laymon 1993, p. 26; Laymon 2000, *in litt.,* p. 14).
- As noted previously, adult yellow-billed cuckoos in the west are larger and heavier, on average, than adult yellow-billed cuckoos in the east. More than 80 percent of individuals can be assigned to east or west based on morphological measurements. These differences are discussed above in the ''Taxonomy''

section (Oberholser and Kincaid 1974, pp. 434–435; Banks 1988, pp. 473–477; 1990, p. 538; Franzreb and Laymon 1993, pp. 17–28).

Information, including morphology, indicates that yellow-billed cuckoos from Texas west of the Pecos River (from the Rio Grande upstream of Big Bend) and from northwestern Mexico (Chihuahua, Sonora, Sinaloa, Durango, Baja California Sur) exhibit greater similarity to yellow-billed cuckoos in western North America, and those on the Pecos River in Texas and eastern Mexico (Coahuila, Nuevo Leon, Tamaulipas, San Luis Potosi) are more similar to yellow-billed cuckoos in the east (Wauer 1971, p. 96; Oberholser and Kincaid 1974, pp. 434–435; Franzreb and Laymon 1993, pp. 17–28; Hughes 2000, pp. 1–2, 26; Sproul 2001, *in litt.,* pp. 1–5). Based on the best available science, the watershed boundary between the Rio Grande and Pecos Rivers is the optimum dividing line between eastern and western yellow-billed cuckoo in this area.

Based on morphological measurements, bill color of young and adults, egg size and weight, and migration timing, yellow-billed cuckoos split into two populations. This split occurs along the line that corresponds with the traditional subspecies boundary (see Figure 1). Phenotypically expressed traits do present substantial evidence that the western population segment of yellow-billed cuckoo differs markedly from other populations of the species.

However, the strongest evidence of differences between yellow-billed cuckoos in the western population segment and those of the east in genetic characteristics is the difference in timing of migrations. This difference can only have developed as an evolved trait in response to environmental factors over a long period of time, and thus is genetically linked (Cresswell *et al.* 2011, pp. 13–15). As previously discussed, the difference in size of yellow-billed cuckoos between east and west, as well as differences in size, weight, and shell thickness of eggs, are also evolved genetically linked traits. As stated earlier, researchers have developed methods using these phenotypic (outwardly expressed) traits that correctly predicted separation for nearly 90 percent of yellow-billed cuckoos that were eastern, and up to approximately 86 percent that were western (Franzreb and Laymon 1993, pp. 17–28). Thus, based on the phenotypic traits, there is indirect evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

Significance Conclusion

The best available information indicates that the discrete yellow-billed cuckoo population segment that nests west of the Continental Divide and in northwestern Mexico is important to the taxon to which it belongs because: (1) Loss of the population segment would leave a significant gap in the species' range (more than one third of the species' range would be vacant); and (2) it differs markedly from other yellow-billed cuckoo populations in morphology (western yellow-billed cuckoos are larger) Therefore, we conclude that the western population segment of the yellow-billed cuckoo is *significant* per our DPS Policy.

DPS Conclusion

Based on the best scientific and commercial data available on distribution as well as behavioral and morphological characteristics of the species, we have determined that the western population segment of the yellow-billed cuckoo is both discrete and significant per our DPS policy. Therefore, we conclude that the western population segment of the yellow-billed cuckoo is a DPS, and thus a ''species'' under section 3(16) of the Act. We believe that we used the DPS authority appropriately in our determination of biological and ecological significance because we chose a population segment with a geographical distribution that is biologically meaningful and at an appropriate scope and scale to respond to the petitioners' request.

The term ''distinct population segment'' is not commonly used in scientific discourse. As such, and in contrast to taxonomically defined species and subspecies, there is no established name for the western distinct population segment of the yellow-billed cuckoo in the available literature; we will refer to this ''species'' (DPS) as the western yellow-billed cuckoo. The range of the western yellow-billed cuckoo in Canada includes the area of Vancouver Island and along the Fraser River system upstream to Kamloops to the Rocky Mountains west of the Continental Divide. In the United States the DPS includes the area west of the Continental Divide, south through Montana, Wyoming, Colorado, and along the watershed divide between the upper and middle Rio Grande and Pecos Rivers in New Mexico and Texas, south to Big Bend in southwestern Texas, and extending to the states of the west coast. In Mexico, the DPS is the area west of the eastern and southern border of the State of Chihuahua, west of the Continental Divide in the State of Durango, and the southern border of the State of Sinaloa (Figure 2).

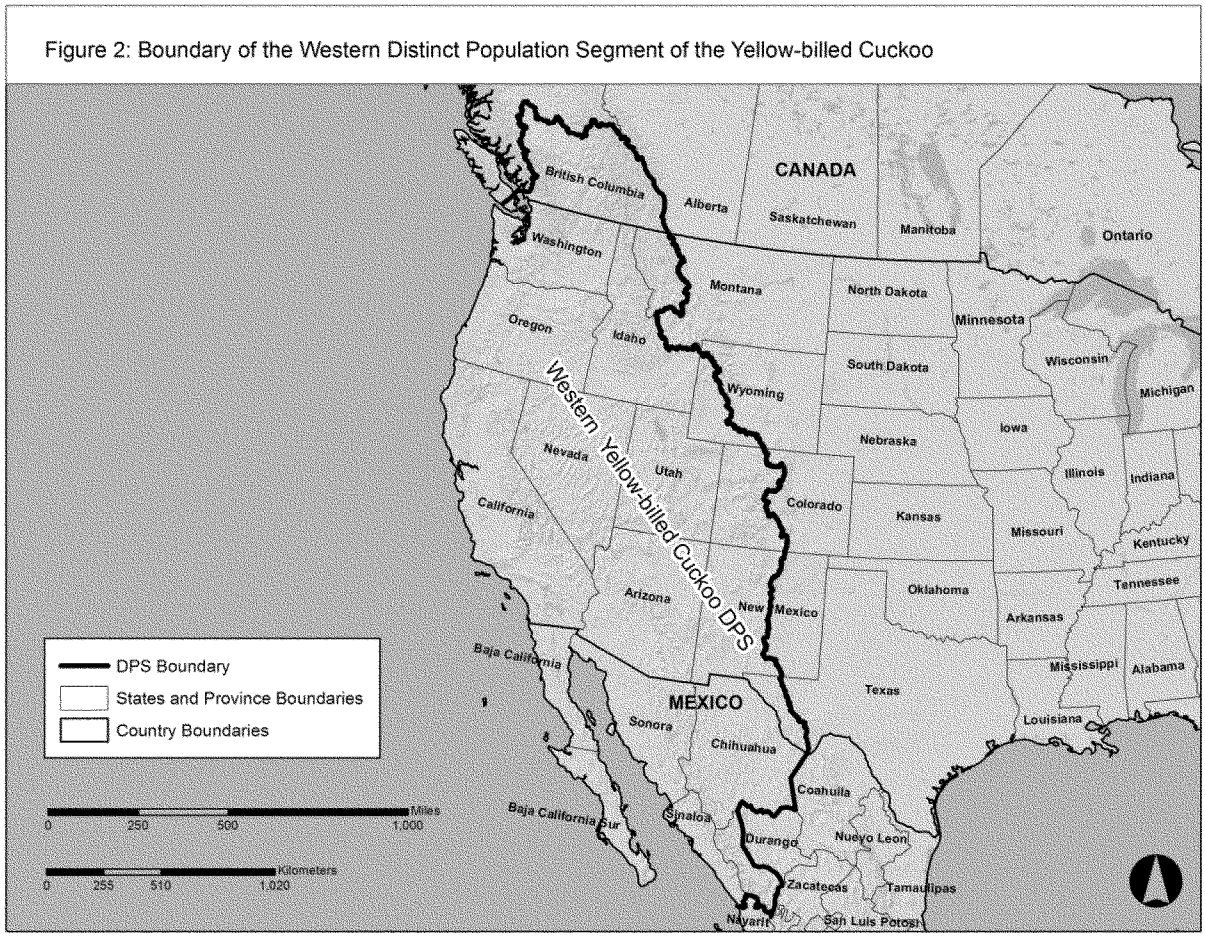

Figure 2. Western Yellow-billed Cuckoo distinct population segment boundary.

Status Assessment for the Western Yellow-bled Cuckoo

Distribution

Breeding Range

Based on historical accounts, the western yellow-billed cuckoo was widespread and locally common in California and Arizona, locally common in a few river reaches in New Mexico, locally common in portions of Oregon and Washington, generally local and uncommon in scattered drainages of the arid and semiarid portions of western Colorado, western Wyoming, Idaho, Nevada, and Utah, and probably uncommon and local in southern British Columbia, Canada (AOU 1998, p. 247; Hughes 1999, p. 3). In the past 90 years, the species' range in the western United States has contracted. The northern limit of breeding along the west coast is now in the Sacramento Valley, California, though recent surveys suggest a small, potentially breeding population exists in coastal northern California on the Eel River (AOU 1998, p. 247; Hughes 1999, p. 3; McAllister 2010, pp. 1–2). The current northern breeding limit in the western interior States is in southeastern Idaho.

Winter Range and Migration Routes

The winter range of the western yellow-billed cuckoo is poorly known. Eastern and western yellow-billed cuckoos may intermingle on the wintering grounds and in migration, or they may have separate wintering areas and migration routes. Data provided by the U.S. Geological Survey (USGS) Biological Resources Division, Bird Banding Laboratory (BBL) from bird band returns to date have been insufficient to determine wintering patterns for the western yellow-billed cuckoo (BBL 1998, *in litt.,* p. 1; USGS 2012, web search). A single western yellow-billed cuckoo from the breeding population on the middle Rio Grande River in New Mexico was recently equipped with a geolocator and recaptured a year later near where it was originally tagged. Data from the geolocator indicated that the yellow-billed cuckoo wintered in eastern Bolivia, southwestern Brazil, Paraguay, and northeastern Argentina, spending 5 months from late November through late April moving around an area 1,243 mi (2,000 km) in length, 373 mi (600 km) in width, and 463,323 sq mi (1.2 million sq km) in extent (Sechrist *et al.* 2012, pp. 2–11). The light level geolocator is a 0.05-oz (1.5-g) recording instrument used to determine flight paths of migrating birds. It records the change in light levels at different latitudes and longitudes, and stores the data. The bird must then be recaptured so the time and location data can be downloaded and analyzed. The extent to which the western yellow-billed cuckoo commingles with eastern yellow-billed cuckoos during migration or while overwintering is unknown. However, because mates are selected on the breeding grounds, commingling in migration or in the winter does not affect the DPS status of the western yellow-billed cuckoo.

Migration routes of the western yellow-billed cuckoo are also poorly known. Miller (1950, p. 83) recorded a migrating flock of yellow-billed cuckoos in the Cape region of Baja California Sur in late May or early June. A fledgling

yellow-billed cuckoo that was banded in the South Fork Kern River Valley in late July 1985 was found dead near Phoenix in early September of the same year (BBL 1998, *in litt.,* p. 2) indicating a southeastern migratory direction. The yellow-billed cuckoo equipped with a geolocator (Sechrist *et al.* 2012, pp. 2–11) traveled from the middle Rio Grande River south to southern Sonora, Mexico, in late July, then back north to the Rio Grande before migrating southeast through central Texas and eastern Mexico in August and September, and Honduras, Panama, and Columbia in October. In November, the bird traveled through the upper Amazon Basin of southern Columbia and western Brazil before flying to its wintering area later in November. During spring migration, the yellow-billed cuckoo moved north into western Brazil in early May, traveling throughout the month through Columbia, Venezuela, and the Caribbean, including Haiti and Jamaica, before arriving on the Yucatan Peninsula in Mexico on June 1. It then flew overland to the lower Rio Grande before moving to the Conchos River in Chihuahua, Mexico, in mid-June, and returned to the middle Rio Grande near its original capture point in early July (Sechrist *et al.* 2012, pp. 2–11).

Life History Parameters

Migration Timing

The western yellow-billed cuckoo generally arrives on its breeding grounds in mid-June. Available data from California, Arizona, and western New Mexico indicate a small number of arrivals in May, but most birds arrive in June and some do not arrive until early July (Gaines and Laymon 1984, pp. 53–58; Hughes 1999, p. 5; Cornell Lab of Ornithology 2012). In late summer, the birds begin their southbound migration in mid-August, and most have left the breeding grounds by mid-September (Gaines and Laymon 1984, pp. 53–58). Migration timing is similar throughout the range of the western DPS (Hughes 1999, p. 5). As mentioned previously, a yellow-billed cuckoo with a geolocator departed its breeding grounds in the middle Rio Grande on August 28, 2009, and arrived back on its breeding ground on June 14, 2010 (Sechrist *et al.* 2012, pp. 2–11).

Breeding Season

The western yellow-billed cuckoo's breeding season varies regionally with the availability of its preferred food. Nesting peaks later (mid-June through August) than in most co-occurring bird species, and may be triggered by an abundance of cicadas (*Cicadidae* sp.), katydids (*Tettigoniidae* sp.), caterpillars (*Lepidoptera* sp.), or other large prey items that form the bulk of their diet (Hamilton and Hamilton 1965, pp. 427–428; Rosenberg *et al.* 1982, p. 271). On the South Fork Kern River, the primary food items fed to young were caterpillars, tree frogs (*Pseudacris regilla*), katydids, and grasshoppers (*Caelifera* sp.) (Laymon *et al.* 1997, p. 7). In Arizona, cicadas are an important food source (Halterman 2009, p. 112).

In California and Arizona, yellow-billed cuckoos rarely begin nesting before mid-June. Nesting in western North America continues through August, and up to three broods can be raised in a season if the prey base is sufficient (Laymon *et al.* 1997, p. 11; Halterman 2009, p. 77). First egg dates for 104 nests at the South Fork Kern River from 1985 to 2001 ranged from June 6 to August 5, and the peak of the breeding season was between June 21 and July 20, with 82.5 percent of the clutches initiated during that time period (Laymon and Halterman 1985, p. 33; Laymon and Halterman 1986, p. 12; Laymon *et al.* 1987, p. 10; Laymon and Whitfield 1988, p. 6; Laymon *et al.* 1989, p. 9; Laymon 1991, p. 8; Laymon *et al.* 1993, p. 10; Laymon *et al.* 1994, p. 9; Laymon and Williams 1998, p. 6; Laymon and Williams 1999a, p. 7; Laymon and Williams 1999b, p. 7; Laymon and Williams 2001, p. 7; Laymon and Williams 2002, p. 8). Yellow-billed cuckoos may breed at multiple disjunct locations in the same year, with birds nesting in the United States and then nesting again in Sonora, Mexico (Rohwer *et al.* 2009, pp. 19050–19055).

Reproduction

Yellow-billed cuckoos exhibit a variety of reproductive strategies that are thought to increase population recruitment during years with abundant food. Long-term research at the South Fork Kern River in California shows that most pairs (approximately 70 percent) are monogamous during a breeding attempt (Laymon 1998, p. 4). There are instances of communal nesting, with two pairs laying eggs and tending young in the same nest (Laymon 1998, p. 4). In approximately 30 percent of nests, apparently unrelated helper males attend the nest. Yellow-billed cuckoos regularly nest twice during a single breeding season (double brood) and, during years of exceptionally abundant food, have successfully raised three broods in a season. While the male mate tends the young of the first nest, the female can initiate a second clutch either with the same mate or with a new male (Laymon *et al.* 1997, pp. 6–7; Halterman 2009, p. 114).

Yellow-billed cuckoos build an open cup nest with a loose saucer-shaped stick construction. Both parents build the nest, incubate, and tend the young. Clutch size varies from two to five eggs depending on the available food supply. The incubation and nestling periods are short, with the eggs hatching in 11–12 days and young fledging in 5–7 days. Incubation begins when the first egg is laid and the young hatch asynchronously, with the oldest near fledging while the youngest has just hatched (Hughes 1999, p. 15).

Nesting success is high in comparison to other open-cup nesting birds (Laymon *et al.* 1997, p. 11). On the South Fork Kern River from 1985 to 2001, of 104 nests that were monitored, 92 (88 percent) successfully produced at least one young and 76 percent of eggs laid produced fledged young (Laymon and Williams 2002, p. 8). On the Bill Williams River in western Arizona from 1993 to 2000, of 20 nests that were monitored, 16 (80 percent) successfully produced at least one young and 72 percent of the eggs laid produced fledged young (Halterman 2001, p. 26). Another study on the lower Colorado and Bill Williams Rivers from 2008 to 2011, found that, of 59 nests monitored, 73 percent were successful in fledging at least one young (Bill Williams River, 100 percent; lower Colorado River, 59 percent) (McNeil *et al.* 2012, pp. 49–54). On the San Pedro River in southeastern Arizona from 2001 to 2005, of 83 nests that were monitored, 58 (70 percent) successfully fledged at least one young (Halterman 2002, p. 11; Halterman 2003, p. 11; Halterman 2004, p. 12; Halterman 2005, p. 10; Halterman 2006, pp. 10–11).

Breeding Site Fidelity

Breeding site fidelity, whether yellow-billed cuckoos return to breed in the same area in which they hatched or nested in a previous year, is difficult to study. Banding birds with unique combination of bands is a way for researchers to track individuals through time, allowing them to determine whether an individual has returned to the same area. However, yellow-billed cuckoos often perch in dense foliage and have short legs that are often covered by body feathers, so bands are hard to see. As a result, there is a limited amount of information on site fidelity.

The available data show that adults and nestlings do return to the same or nearby nesting sites in successive years (Laymon 1998, p. 6). For example, along the San Pedro River in Arizona, Halterman (2009, p. 77) re-sighted 5 of

52 (9.6 percent) yellow-billed cuckoos banded between 2001 and 2005. On the Colorado River in California and Arizona, 4 of 14 yellow-billed cuckoos (31 percent) banded in 2009 were re-sighted in 2010, and 7 of 51 yellow-billed cuckoos (11.8 percent) banded in 2010 were re-sighted in 2011 (McNeil *et al.* 2011, p. 32; McNeil *et al.* 2012, p. 63). Banded male yellow-billed cuckoos on both the Colorado and Kern Rivers have returned to the same area to breed for three consecutive seasons (Laymon 1998, p. 6; McNeil *et al.* 2011, p. 32; McNeil *et al.* 2012, p. 63). Two female yellow-billed cuckoos dispersed 21 and 24 mi (33 and 38 km) to other sites along the same reach of the Colorado River (McNeil *et al.* 2012, p. 74). They also report a relatively high re-sight rate of 13 percent among returning yellow-billed cuckoos banded as chicks in 2010 and returning as adults in 2011 (McNeil *et al.* 2012, pp. 73–74).

Conversely, the dramatic fluctuation in breeding pairs at long-term study sites indicates that year-to-year movement between potential breeding areas also occurs. On the South Fork Kern River from 1985 to 2000, the population increased from a low of 2 pairs in 1990 to a high of 24 pairs in 1992, an increase that could not have come totally from local population growth and recruitment (Laymon and Williams 2001, p. 9). On the Bill Williams River from 1993 to 2002, the population varied from a low of 9 pairs or less in 1999 to a high of more than 28 pairs in 2001, again, an increase that unlikely came entirely from local population growth and recruitment (Halterman 2003, p. 31). In addition, geolocator data from the cuckoo on the middle Rio Grande indicates that the species can make long-distance movements during the breeding season (Sechrist *et al.* 2012, pp. 2–11). It is likely that cuckoos return to sites of previous successful breeding, but, if the conditions are not suitable that year they move to other potential breeding sites.

Habitat Use and Needs

The western yellow-billed cuckoo currently nests almost exclusively in low to moderate elevation riparian woodlands that cover 50 acres (ac) (20 hectares (ha)) or more within arid to semiarid landscapes (Hughes 1999, p. 6). Biologists have hypothesized that yellow-billed cuckoos may be restricted to these extensive, moist habitats because of humidity requirements for successful hatching and rearing of young (Hamilton and Hamilton 1965, p. 427; Gaines and Laymon 1984, pp. 75–76; Rosenberg *et al.* 1991 pp. 203–204). In California, Grinnell and Miller (1944, pp. 186–187) described the yellow-billed cuckoo habitat as ''riparian jungles of willows of fairly old growth, often mixed with Fremont cottonwoods (*Populus fremontii*), and with a tangled 'lower story' of blackberry (*Rubus* sp.), nettles (*Urtica* sp.), or wild grape (*Vitis californica*).'' In other portions of the range, narrow-leaf cottonwood (*Populus augustifolia*) and mesquite (*Prosopis* spp.) are important habitat component (Righter *et al.* 2004, p. 82; Saab 1999, pp. 136–137). Occupied habitat in Arizona may also contain box elder (*Acer negundo*), Arizona alder (*Alnus oblongifolia*), Arizona walnut (*Juglans major*), Arizona sycamore (*Platanus wrightii*), oak (*Quercus* spp.), netleaf hackberry (*Celtis reticulata*), velvet ash (*Fraxinus velutina*), Mexican elderberry (*Sambuccus mexicanus*), tamarisk (*Tamarix* spp.; also called salt cedar), and seepwillow (*Baccharis glutinosa*) (Corman and Magill 2000, p. 5). Surveys conducted by the Arizona Breeding Bird Atlas (Corman and Wise-Gervais 2005, p. 202) reported 68 percent of the yellow-billed cuckoo observations were in lowland riparian woodlands, often containing a variable combination of Fremont cottonwood, willow, velvet ash, Arizona walnut, mesquite, and tamarisk.

Throughout the western DPS range, a large majority of nests are placed in willow trees, but alder (*Alnus spp.*), cottonwood, mesquite, walnut (*Juglans spp.*), box elder, sycamore, and tamarisk are also used (Jay 1911, pp. 69–73; Hanna 1937, p. 58; Laymon 1980, p. 12; Halterman and Laymon 1995, pp. 15–16; Corman and Magill, p. 16; Holmes *et al.* 2008, p. 21). Most nests are placed on well-foliaged horizontal branches at sites with dense canopy cover above the nest (Laymon *et al.* 1997, pp. 7–8).

Western yellow-billed cuckoos require large blocks of riparian habitat for breeding. Home ranges are large, vary in size depending on seasonal food abundance, and overlap greatly both between members of a pair and between neighboring pairs. At the landscape level, the amount of cottonwood–willow-dominated vegetation cover and the width of riparian habitat influences western yellow-billed cuckoo distribution and abundance (Gaines and Laymon 1984, p.76). In California, yellow-billed cuckoos are most likely to be found in patches of willow–cottonwood riparian habitat greater than 200 ac (81 ha) in size. Yellow-billed cuckoos rarely used smaller patches of habitat, particularly when they were distantly isolated from other patches of riparian habitat (Laymon and Halterman 1989, pp. 274–275). On the Sacramento River, size of site, amount of riparian habitat in each 5-mi (8-km) river segment, and presence of young woody vegetation were the most important factors in a model explaining the distribution of yellow-billed cuckoo pairs (Halterman 1991, p. 30). On the lower Colorado River, in a comparison of occupied versus unoccupied habitat, yellow-billed cuckoos were found at sites with denser riparian vegetation and more variation in vegetation density, and less tamarisk and shrubby vegetation, compared to unoccupied sites (Johnson *et al.* 2012, pp. 15–17).

Recent radio telemetry studies on the Rio Grande in New Mexico, the San Pedro River in Arizona, and the Colorado River in Arizona and California have shown that yellow-billed cuckoos use large home ranges of 204 ac (82 ha), 125 ac (51 ha), and 95 ac (38 ha), respectively (Halterman 2009, p. 93; Sechrist *et al.* 2009, p. vii; McNeil *et al.* 2010, p. 75; McNeil *et al.* 2011, p. 37; and McNeil *et al.* 2012, p. 69). Breeding densities on the South Fork Kern River, where intensive surveys for yellow-billed cuckoos were conducted for 17 years, averaged 0.81 pairs per 100 ac (40 ha) (Laymon *et al.* 1997, p. 19; Laymon and Williams 2002, p. 5), which means they had home ranges of about 123 ac (50 ha) on average.

On the Verde River in Arizona, sites occupied by yellow-billed cuckoos were composed of deciduous riparian habitat at least 325 ft (100 m) in width, dominated by Fremont cottonwood, Goodding's willow (*Salix gooddingii*), Arizona alder, and Arizona sycamore, often adjacent to patches of mesquite (Holmes *et al.* 2008, p. 27).

In Sonora, Mexico, yellow-billed cuckoos were summer residents in willow–cottonwood riparian woodland, older mesquite woodland, tropical deciduous forest, and tropical thorn scrub habitats (Russell and Monson 1998, p. 131). In southern Sonora, Mexico, Short (1974, p. 24) found the yellow-billed cuckoos breeding in upland thorn forest, but they were more common in the riparian zone. In a study focusing on cactus ferruginous pygmy-owls (*Glaucidium brasilianum cactorum*) during late spring and summer from 2001 through 2010, Flesch (2012 *in litt.*) found yellow-billed cuckoos at 95 sites from June to September at elevations from 328 to 6,902 ft (100 to 2,104 m). The number of birds at each site ranged from 1 to 15 individuals. Flesch also confirmed breeding at four sites in thornscrub habitats and at one site in upland Sonoran Desert habitat. These records indicate a broader use of habitat by

yellow-billed cuckoos in Sonora, Mexico, possibly as a result of more humid conditions caused by increased summer rainfall.

Little information is available on the foraging habitat of the western yellow-billed cuckoos. Laymon (1980, p. 6) found that yellow-billed cuckoos nesting along the Sacramento River in English walnut orchards captured 88 percent of their food in riparian habitat, foraging primarily in cottonwoods, willows, and white alders (Laymon 1980, pp. 16–18). On the South Fork Kern River, yellow-billed cuckoos foraged primarily in cottonwood and willow woodlands with abundant leafy vegetation (high foliage volume) (Laymon and Halterman 1985, p. 11). High foliage volume of cottonwoods appeared to be an important characteristic of foraging sites, a parameter also noted by researchers studying yellow-billed cuckoos along the Colorado River (Rosenberg *et al.* 1991, pp. 203–204).

Little is known about migratory habitat for the western yellow-billed cuckoo. Yellow-billed cuckoos may be found in a variety of vegetation types during migration, including coastal scrub, secondary growth woodland, hedgerows, humid lowland forests, and forest edges from sea level to 8,125 ft (2,500 m) (Hughes 1999, pp. 6–7). Additionally, during migration they may be found in smaller riparian patches than those in which they typically nest. An account of a migrating flock of yellow-billed cuckoos from the Cape region of Baja California Sur documented them using mesquite scrub woodland (Miller 1950, p. 83). This variety of vegetation types suggests that the habitat needs of the yellow-billed cuckoo during migration are not as restricted as their habitat needs when nesting and tending young.

Wintering habitat of the western yellow-billed cuckoo is poorly known. The species as a whole winters in woody vegetation bordering fresh water in the lowlands to 1,500 m (4,921 ft), including dense scrub, deciduous broadleaf forest, gallery forest, secondary forest, subhumid and scrub forest, and arid and semiarid forest edges (Hughes 1999, p. 7).

Historical and Current Status

Populations of the western yellow-billed cuckoo are too small and isolated in inaccessible habitat patches to be effectively sampled or analyzed for trends by the USGS Breeding Bird Survey (BBS) program, which is conducted atpoint count along roads. In the eastern United States and Canada, where BBS data can be used to analyze yellow-billed populations, these populations have declined by 59 to 67 percent over the past 43 years (USGS 2012). This decline has been linked to both the North Atlantic Oscillation and the El Niño Southern Oscillation, as well as to rising local temperatures (Anders and Post 2006, pp. 221–227). For the western yellow-billed cuckoo, only information from regional and local sources is available to determine population trends.

Pacific Northwest

In the Pacific Northwest, including Oregon, Washington, and British Columbia, Canada, the western yellow-billed cuckoo was formerly fairly common locally in cottonwood and willow bottoms along the Willamette and lower Columbia Rivers in Oregon and Washington, and in the Puget Sound lowlands of Washington (Jewett *et al.* 1953, pp. 342–343; Gabrielson and Jewett 1970, pp. 329–330; Roberson 1980, pp. 225–226; Marshall 1996, pp. 1–2; Marshall *et al.* 2003, p. 306). They were also found locally in southwestern British Columbia (Hughes 1999, p. 4), but the available data are not adequate to determine historical abundance. Yellow-billed cuckoos were rare east of the Cascade Mountains in these States and Province (Campbell *et al.* 1990, p. 481; Marshall *et al.* 2003, p. 306; Wahl *et al.* 2005, p. 210).

In Oregon, the last confirmed breeding records are from the 1940s. Historically, western yellow-billed cuckoo were considered rare in the State, both in the Willamette Valley, along the lower Columbia River, and in eastern Oregon along the Snake River, although they were fairly common along the Columbia River from 1923 to 1925 (Gabrielson and Jewett 1970, pp. 329–330). Between 1970 and 1977, four yellow-billed cuckoo sightings were made west of the Cascade Mountains in the Willamette Valley (Gilligan 1994, pp. 162–163). Between 1970 and 1994 at least 20 yellow-billed cuckoos have been sighted east of the Cascade Mountains (Gilligan 1994, pp. 162–163). A 1988 survey in eastern Oregon and Klamath County located no yellow-billed cuckoos, but identified potential breeding habitat along the lower Owyhee River (Littlefield 1988, p. 34). Recent records from 1990 to 2009 are primarily from May and June and from the east side of the Cascades in Deschutes, Malheur, and Harney Counties (Johnson and O'Neil 2001, pp. 460–461; Cornell Lab of Ornithology 2012). Yellow-billed cuckoos were previously considered a rare annual visitor in Harney County at isolated groves of trees known as vagrant traps and the Malheur NWR (Altman 2001 pers. comm.), but in the last decade it has not been a regular visitor (Marshall *et al.* 2003, p. 306).

Recent records from the west side of the Cascades at the Sandy River Delta near its confluence with the Columbia River in July of 2009, 2010, and 2012 (Withgott 2012, *in. litt.;* Leal 2012, *in. litt.*) were the first observations of the species west of the Cascades since 1977. In June 2010 during surveys on the Columbia River a possible cuckoo response was heard at Wallace Island, Columbia County, but the sighting could not be verified (Flotlin 2011). Up to 87 percent of wetland and riparian habitat have been lost in the Willamette Valley due to agricultural practices and urbanization (Roth *et al.* 2004). The available data suggest that if yellow-billed cuckoos still breed in Oregon the numbers are extremely low, with pairs numbering in the single digits.

In Washington, the last confirmed breeding records of yellow-billed cuckoos are from the 1930s, and it is likely to have been extirpated as a breeder in the State. Of the 24 records between 1836 and 1940 (9 egg sets, 7 specimens, and 8 sight records), 23 were found west and one east of the Cascades. The Washington Department of Fish and Wildlife ranks the species as having historical occurrences only but still expected to occur in the State. Incidental sightings have occurred throughout the State, and the possibility of a vestigial breeding population may still exist (Wahl *et al.* 2005, p. 210). Researchers made 17 records from 1956 to 2012, of which 13 were east of the Cascades. The yellow-billed cuckoo is currently a candidate species for State listing as threatened or endangered (Washington Natural Heritage Program 2009, pp. 9, 35). Exploratory surveys have been conducted in Okanogan, Yakima, Cowlitz, and Wahkiakum Counties in recent years to check locations of previous sightings (Okanogan County) and potential habitat (Yakima, Cowlitz, and Wahkiakum Counties), but no yellow-billed cuckoos have been positively detected (Salzer 2010, pp. 1–3; Flotlin 2011, pp. 1–2); however, protocol level surveys have not been conducted. There are few remaining examples, none of which are extensive, of the river floodplain habitats bordering Puget Sound, which historically had the most yellow-billed cuckoo sightings in the State (King County 2007, p. 2). The available data suggest that if yellow-billed cuckoos still breed in Washington, the numbers are extremely low, with pairs numbering in the single digits.

Yellow-billed cuckoos historically occurred in southwest British Columbia, Canada, in the vicinity of Victoria on Vancouver Island and along the Fraser River system from Vancouver upstream to Kamloops (Bent 1940, p. 64; Campbell *et al.* 1990, p. 481). The species was apparently never common, with 23 records (18 specimen and 5 sight records) between 1881 and 1927. Two of these observations were of pairs believed to be nesting. The species has been recorded five times in British Columbia since the 1920s, with four of those records from the eastern half of the Province where historically the species had not been observed (Campbell *et al* 1990, p. 481; Siddle 1992, p. 1169; Cornell Lab of Ornithology 2012). As mentioned previously, the species is considered as an extirpated breeder in the Province and is still very rare based on reported observations (British Columbia Conservation Data Centre 2013).

Montana

We have very limited data for yellow-billed cuckoos from the area west of the Continental Divide in Montana. Three specimens have been collected since the early 1960s, and there are few recorded sightings since the early 1900s (Saunders 1921, p. 174). A few records indicate that yellow-billed cuckoos occurred around the Flathead River area, but there are no confirmed breeding records (Lenard 2001, pp. 1–3). Potential habitat within the range of the western yellow-billed cuckoo in Montana is very limited, and it is unlikely that a breeding population exists within the State.

Idaho

In Idaho, the yellow-billed cuckoo is considered a rare visitor and local summer resident that occurs in scattered drainages, primarily in the southeastern portion of the State (Burleigh 1972, p. 159; Idaho Fish and Game 2005, pp. 222–223; Cavallaro 2011, entire). In northern and central Idaho, there were only four records of yellow-billed cuckoos during the 20th century (Taylor 2000, p. 252). Reynolds and Hinckley (2005, p. 5) concluded that the few sightings in northern Idaho are most likely of transient, nomadic, or migrant individuals; with no data suggesting that the species historically or currently nests there. In southwestern Idaho the yellow-billed cuckoo has historically been considered a rare summer visitor and breeder in the Snake River Valley (Idaho Fish and Game 2005, p. 223).

Recent records are primarily from the southeastern portion of the State along the South Fork of the Snake River (Stephens and Sturts 1997, p. 36; Taylor 2000, pp. 252–254; Reynolds and Hinckley 2005, p. 7; Cavallaro 2011, entire). Taylor (2000, pp. 252–254), in his 2000 review of the status of the species in Idaho, concluded that they had declined greatly as a breeding bird in the State, and that there were currently fewer than a few dozen breeding pairs and possibly fewer than 10. More recent surveys of yellow-billed cuckoos continue to show the majority of sightings are in the Snake River corridor in southeast Idaho with few or no sightings in other areas where the yellow-billed cuckoo had been historically observed (Reynolds and Hinckley 2005, p. 7; Cavallaro 2011, p. 3). In addition, yellow-billed cuckoos likely nested in south-central Idaho near Stanton Crossing, Blaine County, in 2003 and 2004 (Reynolds and Hinckley 2005, p. 7). A survey in 2009 near Magic Lake on the Big Wood River located a singing male in a location that was previously unknown (Carlisle and Ware 2010, p. 4). Follow-up surveys in 2010 along the Big Wood River and Little Wood River failed to detect any yellow-billed cuckoos (Carlisle and Ware 2010, p. 12). The most recent statewide assessment estimated the breeding population in Idaho is likely limited to no more than 10 to 20 breeding pairs in the Snake River Basin (Reynolds and Hinckley 2005, p. 7).

Wyoming

Historically, yellow-billed cuckoos were rare and local in Wyoming. Knight (1902, p. 86), in his summary of the birds of Wyoming, did not include the species on the State's list, and Grave and Walker (1913, p. 46) reported only one record for the State. Prior to 2001, the distribution of yellow-billed cuckoos from summer records of the Wyoming Natural Heritage Database showed a few scattered sightings, with only 12 records from southwestern Wyoming (Bennett and Keinath 2001, pp. 9, 17). Currently, yellow-billed cuckoo occurs on the western side of the Rocky Mountains along the Lower Green River Basin from the Seedskadee NWR to the Flaming Gorge Reservoir and west to the Bear River Drainage. Within the range of the DPS defined in this document, breeding activity is unconfirmed in Wyoming, but observations suggest that nesting may occur within the Green River Basin and along the Snake River within the State (Deibert 2001, pers. comm., pp. 1–16). On July 4, 2003 a yellow-billed cuckoo was found by Wyoming Game and Fish Department in the town of Green River after it collided with a window of their office building (Wyoming Natural Diversity Database 2003 (WYNDD)). In July 2003, yellow-billed cuckoo surveys were conducted at the Seedskadee NWR and on July 10, 2003, a yellow-billed cuckoo near Big Island in Seedskadee NWR responded with 'kowlp' calls to a recorded play-back call (Sweanor pers comm., WYNDD 2003). Call-back surveys were again conducted near Big Island in 2004 by Service personnel. Subsequently, one observation was made of a yellow-billed cuckoo in 2005 and three cuckoos were observed in 2006 near Big Island, Seedskadee NWR (Seedskadee NWR, unpublished reports). No other recent surveys have been done (Beason 2010, pp. 2–3). The available literature suggests that the breeding population of the yellow-billed cuckoo within the State is extremely low, numbering in the single digits, and potential nesting habitat is very limited. Therefore, we conclude that the western yellow-billed cuckoo occurs in very small numbers as a breeder in Wyoming, with likely fewer than five breeding pairs.

Colorado

West of the Continental Divide in Colorado, the yellow-billed cuckoo was probably never common (Bailey and Niedrach 1965, pp. 404–406), and it is now extremely rare (Kingery 1998, pp. 204–205). Yellow-billed cuckoos were found along the Colorado River in Palisade, near Grand Junction (Mesa County), annually through the 1950s and 1960s (Righter *et al.* 2004, p. 82). Yellow-billed cuckoos were also regularly detected as recently as the mid-1980s along the Uncompahgre and Gunnison Rivers near Delta (Delta County) (Beason 2010, p. 1).

In 1998, the Colorado Breeding Bird Atlas (Kingery 1998, pp. 204–205) gave the general status of the yellow-billed cuckoo in Colorado as nearly extirpated in the western half of the State. During the 1987 to 1994 period covered by the Atlas, only three yellow-billed cuckoos were recorded on the western slope, with one confirmed nesting observation along the Yampa River near Hayden in 1988. Other confirmed nesting records (mid-1980s) were associated with outbreaks of caterpillars in box elders in the Four Corners region and Durango area (Colyer 2001, pp. 1–6). National Park Service surveys in southwest Colorado from 1988 through 1995 for the Colorado Bird Breeding Atlas provided no records of yellow-billed cuckoos.

In 1998, biologists conducted focused yellow-billed cuckoo surveys along 242 mi (389 km) of lowland river riparian habitat along six rivers in west-central Colorado. They found one probable

nesting pair (Dexter 1998, p. 3). Reports of single yellow-billed cuckoos have come primarily from the Grand Junction area and Mesa County in 2001, 2002, 2005, 2008, and 2011, with a report of more than one yellow-billed cuckoo at Orchard Mesa Wildlife Area in 2006 (Beason 2010, p. 1; Beason 2012, p. 5). Additional reports include one yellow-billed cuckoo south of Montrose in Montrose County near the Uncompahgre River in 2009, one yellow-billed cuckoo along the Gunnison River near Gunnison in 2007 (Beason 2010, p. 1), and detections by the Rocky Mountain Bird Observatory along the Yampa River near Craig in 2007 and 2008 and in far western Colorado near Nucla in 2005 and 2008 (Beason 2010, p. 1). However, surveys repeated near Craig and Nucla in 2009 failed to detect yellow-billed cuckoos. Since 2003, yellow-billed cuckoos have been detected annually at the North Fork of the Gunnison River Valley of west-central Colorado in Delta County, and breeding was confirmed in 2008 and again in 2011 near Hotchkiss (Beason 2010, p. 1; Beason 2012, p. 5).

Yellow-billed cuckoos have been detected annually since 2001 in the San Luis Valley of south-central Colorado in Conejos County where breeding is suspected, but not confirmed (Beason 2010, p. 1). Surveys conducted on the Rio Grande near Del Norte, Rio Grande County, in 2008 and 2011 found yellow-billed cuckoos at several locations (Wildlife Specialties, LLC, 2008; Rawinski 2011). Surveys by the Rocky Mountain Bird Observatory in 2010 were conducted near historical detections and at sites with suitable habitat in Archuleta, Conejos, Montezuma, and Rio Grande Counties in south-central and southwest Colorado; no yellow-billed cuckoos were detected (Beason 2010, p. 2). Survey results and the available literature indicate an extremely small breeding population of yellow-billed cuckoos in western Colorado. Therefore, we conclude that the population of breeding pairs numbers in the low single digits in the State.

Utah

Historically yellow-billed cuckoos were uncommon in Utah in woodlands along streams in the lower valleys, especially the Salt Lake Valley (Hayward *et al.* 1976, p. 107). There are scattered records for the State, mainly from the vicinity of Provo, Ogden, and Salt Lake City, as well as the Virgin River in the southwestern portion of Utah, and one record from southeastern Utah (Hayward *et al.* 1976, p. 107). Recently, nesting has been documented at Ouray NWR on the Green River and the Matheson Wetland Preserve near Moab. Additionally, there are reports from at least five other areas where breeding has been suspected (Owens 1998, pp. 3–6). Avian surveys of riparian habitats within the historical range (the Salt Lake Valley) recorded 3 yellow-billed cuckoos in 7,000 survey hours (Owens 1998, pp. 3–6). No statewide systematic surveys for yellow-billed cuckoos have been conducted. Survey results and the available literature indicate an extremely small breeding population of yellow-billed cuckoos in Utah. Therefore, we conclude that the number of breeding pairs in the State is fewer than 10 and not likely more than 20 pairs.

Nevada

The historical status of the yellow-billed cuckoo in Nevada is poorly documented, although there is evidence the species nested in western Nevada along the lower Truckee and Carson Rivers and in southern Nevada along the Colorado and Virgin Rivers (Linsdale 1951, p. 235; Neel 1999, pp. 118–120).

Surveys using call-playback techniques were completed along the Truckee, Carson, and Walker Rivers in the early 1970s. In surveys of the six remaining areas of habitat able to support yellow-billed cuckoos, as described by Gaines (1974, p. 206), no birds were heard or seen (Oakleaf 1974, pp. 18–19). Early documentation of yellow-billed cuckoos nesting in Nevada included a pair at Beaver Dam Wash, Lincoln County, in 1979 (Neel 1999, p. 119). The only set of persistent sightings along the Carson River occurred on portions near Lahontan Reservoir (Neel 1999, pp. 118–120), where sightings of single birds year after year suggested long-term occupancy from 1986 to 1997 (Tomlinson 2010, p. 1). At least one yellow-billed cuckoo was detected during surveys at the Lahontan Reservoir delta in 2012 indicating continued residency at that location (Great Basin Bird Observatory 2013, p. 48). Between 1990 and 1999, Neel (1999, p. 119) reported only sporadic sightings of single birds throughout the State.

Beginning in 2000, annual survey efforts became more consistent in the southern portion of the State. The Nevada Division of Wildlife (NDOW) (2001, pp. 1–8) conducted surveys in 2000 in southern Nevada and documented 19 yellow-billed cuckoos, comprising 4 pairs and 11 unpaired birds with no nests found. NDOW surveys in 2000 and 2001 detected more birds (19 and 28, respectively) than in subsequent years, with a general decline in detections from 2002 to 2009, although the survey area was smaller because of reduced access to private lands (Tomlinson 2010, p. 1). Surveys conducted at the Warm Springs Natural Area on the Muddy River documented a nesting record for the species in 2000, but also indicated a general decline in bird numbers from 2002 to 2009 (Tomlinson 2010, p. 1). Surveys conducted by the San Bernardino County Museum at sites along the Virgin and Muddy Rivers between 2000 and 2008 detected yellow-billed cuckoos in all but one year, with the number of individuals detected ranging from a low of 3 to a high of 12 (Braden *et al.* 2009, pp. 1–58). These surveys were resumed by the Southern Sierra Research Station in 2009 and detected one bird at each of two locations: Pahranagat Valley and the Key Pittman Wildlife Area (Tomlinson 2010, p. 2).

Incidental yellow-billed cuckoo detections were also made during other bird surveys in the Pahranagat Valley in 2008, 2010, and 2012 (SWCA 2013, Table C–1). In 2006, surveys were conducted for the species at four Nevada sites within the Lower Colorado River Multi-Species Conservation Plan Boundary area (Johnson *et al.* 2007, pp. 1–220), resulting in detection of eight yellow-billed cuckoos (Johnson *et al.* 2007, pp. 13–16). Fairly extensive surveys of potential habitat at the Ash Meadows NWR resulted in detection of single yellow-billed cuckoos in 2008 and 2009 (Tomlinson 2010, p. 2). Additional protocol surveys were conducted in 2009 and 2010 in southern Nevada along the Muddy and Virgin Rivers, resulting in the detections of 3 cuckoos at Overton Wildlife Management Area along the Muddy River and 1 cuckoo detection at Mormon Mesa along the Virgin River in 2010 (McNeil *et al.* 2010, pp. 27–29; McNeil *et al.* 2011, pp. 140–142). In addition, incidental detections of cuckoos were made almost annually during other bird surveys along the Virgin and lower Muddy Rivers between 2008 and 2012 with the highest number of 4 cuckoos occurring in 2010 (SWCA 2013, Table C–1). Survey results and the available literature indicate a small breeding population of yellow-billed cuckoos in Nevada. Therefore, we conclude that fewer than 10 breeding pairs occur in the State.

California

In California prior to the 1930s, the species was widely distributed in suitable river bottom habitats, and was locally common (Grinnell and Miller 1944, pp. 186–187; Small 1994, pp. 130–131). Yellow-billed cuckoos primarily nested in three general areas

of the State: (1) Coastal counties from San Diego County near the Mexico border to Sonoma County in the San Francisco Bay region, (2) the Central Valley from Kern County through Shasta County, and (3) along the lower Colorado River (Dawson 1923, pp. 2–7; Grinnell and Miller 1944, pp. 186–187; Gaines and Laymon 1984, pp. 53–58; Small 1994, 130–131). Yellow-billed cuckoos also bred locally elsewhere in the State, including in Inyo, San Bernardino, and Siskiyou Counties (Grinnell and Miller 1944, pp. 186–187).

The early ornithological literature for California was summarized and evaluated by Gaines (1974a, p. 204; 1974b, pp. 2–4), Gaines and Laymon (1984, pp. 53–58), and Hughes (1999, p. 4). Collectively, they report 42 locations where the yellow-billed cuckoo was historically reported or collected in abundance, but is no longer found today. Laymon and Halterman (1987b, p. 24) estimated that the geographical range of the yellow-billed cuckoo in California is about 30 percent of what it was historically. Hughes (1999, p. 2) provides an estimate of 15,000 breeding pairs in California during the late 19th century. Gaines (1974, p. 208) believed that predevelopment yellow-billed cuckoo populations in California were even greater than implied by the early literature, due to the species' inconspicuous behavior and the fact that large tracts of floodplain riparian habitat had already been lost to development before the first records and accounts of the species began appearing in literature. Most modern investigators believe that the initial decline of the yellow-billed cuckoo population in California occurred following the major era of development that began about the mid-1800s (Gaines and Laymon 1984, p. 73; Laymon and Halterman 1987b, pp. 19–25; Launer *et al.* 1990, pp. 2–3). The species was listed by the State of California as threatened in 1971, and was reclassified as endangered in 1987.

The species' population no longer breeds in the San Joaquin Valley. Yellow-billed cuckoos historically were recorded from every county in the San Joaquin Valley region except Kings County, and were locally common as a breeding bird at least in San Joaquin, Kern, Fresno, and Stanislaus Counties (Gaines and Laymon 1984, p. 66). The last nesting record for this region was in 1974 on Lewis Creek near Lindsey, Tulare County (Laymon and Halterman 1987a, p. 24).

The first statewide survey for yellow-billed cuckoos was conducted in 1977 and located 121 to 163 pairs of yellow-billed cuckoos during 44 days of survey effort (0.55–0.74 yellow-billed cuckoo pairs per survey hour)(Gaines and Laymon 1984, p. 77; Halterman *et al.* 2001, p. 47). The second statewide survey, conducted in 1986 and 1987 with 124 days of survey effort, estimated 32 to 42 breeding pairs in the State, a decline of 66–81 percent from the 1977 survey (0.05–0.07 yellow-billed cuckoo pairs per survey hour)(Gaines and Laymon 1984, pp. 59–72; Laymon and Halterman 1987a, p. 7). The third statewide survey, in 1999 and 2000, was conducted over 134 days, and estimated 39 to 43 breeding pairs (0.06 yellow-billed cuckoo pairs per survey hour), a similar population level to 1987, but lower than 1977 (Halterman *et al.* 2001, p. 47) (Figure 3). The main difference in the most recent statewide survey (1999 to 2000) when compared to earlier surveys (1977 and 1987) was the absence of yellow-billed cuckoos at isolated sites in the Prado Flood Control Basin in Riverside County, the Mojave and Amargosa Rivers in San Bernardino County, and the Owens Valley in Inyo County where they had previously bred, indicating a contraction of the range to the core areas of occurrence along the Sacramento, Kern, and Colorado Rivers. In all, the California population of the western yellow-billed cuckoo today is less than 1 percent of its estimated historical population size.

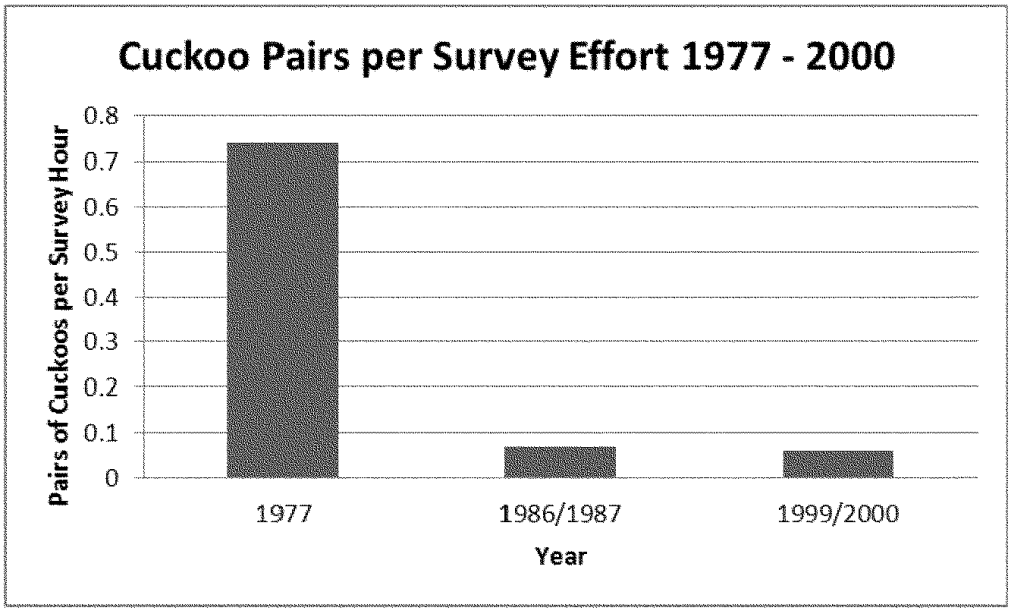

Figure 3. Yellow-billed cuckoo pairs per survey effort on California statewide surveys 1977–2000.

Yellow-billed cuckoos have been considered accidental in coastal northern California; however, from 2000 through 2012, surveys and anecdotal observations along the lower Eel River in Humboldt County detected yellow-billed cuckoos, and breeding was probable during at least two of those years (McAllister *et al.* 2010, pp. 1–6). If nesting is confirmed, this would document a new breeding site in the State.

Based on statewide survey results, only three areas in the State support more than a few breeding pairs on a regular basis: (1) The Sacramento River (roughly between Colusa and Red Bluff), (2) the South Fork of the Kern River upstream of Lake Isabella, and (3) the lower Colorado River (Laymon and Halterman 1987a, pp. 1–18). Results of surveys and population trends for these sites are summarized below.

Sacramento River—Grinnell and Miller (1944, pp. 186–187) listed the yellow-billed cuckoo as a common to fairly common breeder in the Sacramento Valley. Gaines and Laymon (1984, pp. 59–60) summarized historical occurrence in the Sacramento Valley, and cited Cooper (1870, pp. 371–373) who found the species quite common in the vicinity of Sacramento in 1865 and Belding (1890, p. 87) who found them common in the vicinity of Marysville in 1878. Gaines (1974, pp. 204–205) conducted the first surveys for yellow-billed cuckoos on the Sacramento River between Red Bluff and Colusa during 1972, and found 28 individuals at 15 sites. The following year (1973) he repeated this survey, and found 29 yellow-billed cuckoos at 21 sites (40 survey hours) (Gaines and Laymon 1984, p. 59). During a statewide yellow-billed cuckoo survey in 1977, researchers found 44 yellow-billed cuckoos at 29 sites in this same stretch of the Sacramento River, but with greater survey effort (60 survey hours) (Gaines and Laymon 1984, pp. 59–62). From these surveys it was estimated that 29 to 60 pairs of yellow-billed cuckoos nested along the Sacramento River in 1977.

The Sacramento River was resurveyed in 1987, and a much lower population of 18 to 22 pairs was found despite a more intense survey effort (128 survey hours) (Laymon and Halterman 1987a, p. 6). Halterman (1991, p. 24) continued surveys on the river for 3 additional years with even greater survey effort (255 survey hours each year), and found breeding populations of 35 pairs, 26 pairs, and 23 pairs in 1988, 1989, and 1990, respectively. Surveys in 1999 found 28 to 32 pairs of yellow-billed cuckoos, and surveys in 2000 located 35 to 40 pairs (Halterman *et al.* 2001, p. 39). The most recent survey on the Sacramento River, conducted in 2010, located only 16–18 yellow-billed cuckoos at 48 sites, despite many more hours of surveying effort (1,191 survey hours) (Dettling and Howell 2011, p. 31).

Yellow-billed cuckoo populations have declined on the Sacramento River in the past 40 years. In the 1970s a yellow-billed cuckoo was found about once every 1.4 hours of survey effort. During the 1980s a yellow-billed cuckoo was found half as often with one every 2.8 hours of survey effort. From 1990 to 2000 a yellow-billed cuckoo was found every 2.9 hours of survey effort, but in 2010 it took 66.2 hours of survey effort to locate a yellow-billed cuckoo (Figure 4). Yellow-billed cuckoos still occupy this site, but the population has declined by at least 80 percent over the past 35 years, with a major continuing decline in the most recent 10 years. Since the extent of habitat has remained stable or increased, it appears that much of the potential habitat today is unused.

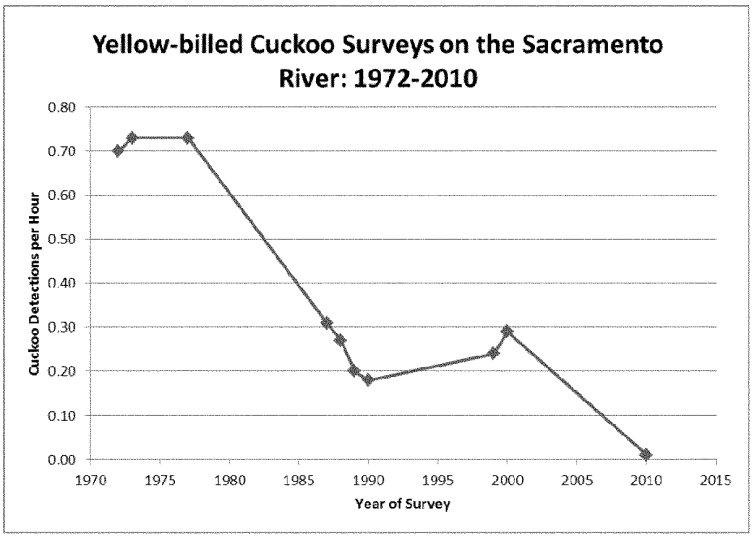

Figure 4. Yellow-billed cuckoo detection during surveys on the Sacramento River on 10 separate years from 1972 to 2010.

South Fork Kern River—The 3,300-ac (1,335-ha) riparian forest in the South Fork Kern River Valley is one of the largest remaining contiguous tracts of riparian habitat in California. This site has been the most regularly surveyed of any of the yellow-billed cuckoo breeding locations in California. The species' occurrence at this site was first documented in 1911 by a specimen collected by Grinnell's Mount Whitney Expedition (MVZ Birds #19836, Museum of Vertebrate Zoology, University of California (UC) Berkeley). Gaines (Gaines and Laymon 1984, p. 64) rediscovered this population, finding nine individual yellow-billed cuckoos there during his 1977 statewide survey of the species. From 1985 through 2001 this population was intensively monitored, and the number of pairs and

most nests found each year were documented (Laymon and Williams 2001, p 4; Laymon and Williams 2002, p. 5). During this period, the population fluctuated from a low of 2 pairs in 1990 to a high of 24 pairs in 1992, with a yearly average of 10.6 pairs.

From 2002 to 2004 and 2008 to 2010, the population was surveyed less intensively and fewer nests found (Halterman 2003, p. 10; Halterman 2004, p. 10; Henneman 2008, pp. 8–10; Henneman 2010, pp. 8–10; Whitfield and Stanek 2011, pp. 8–10). The number of yellow-billed cuckoo pairs is no longer being estimated, but from reviewing the location of the survey sightings, approximately 8 to 14 pairs (with an average of 10.5 pairs) have nested in the area during this period. From the available survey data and literature, this small breeding population currently appears to be stable. Most of the population is currently nesting on the U.S. Army Corps of Engineers (USACE), U.S. Forest Service (USFS) South Fork Wildlife Area in the western third of the site. The eastern two-thirds of the site is sparsely occupied, and it appears that not all of the potential nesting habitat is currently being used (Henneman 2008, pp. 8–10; Henneman 2010, pp. 8–10; Whitfield and Stanek 2011).

Lower Colorado River—The lower Colorado River on the California-Arizona border supported an estimated 180 yellow-billed cuckoo pairs during the first California statewide yellow-billed cuckoo survey in 1976 to 1977 (Gaines and Laymon 1984, p. 72). When the second California statewide survey was conducted in 1986 yellow-billed cuckoos had decreased by 80–90 percent (Laymon and Halterman 1987a, pp. 34–35). Another study (Rosenberg *et al.* 1991, p. 203) estimated a decline of 93 percent over this same time period, from an estimated initial 242 pairs in 1976 to 1977. Final results from a Service-funded 1999 statewide survey found only two pairs of yellow-billed cuckoos on the California side of the Colorado River (Halterman *et al.* 2001, p. 19), an area where 44 yellow-billed cuckoos were found in 1977 (Gaines and Laymon 1984, pp. 64–65).

In 2006, surveys were conducted at various sites throughout the Lower Colorado River Multi-Species Conservation Plan Boundary area for the yellow-billed cuckoo (Johnson *et al.* 2007, pp. 1–220). Two survey areas were on the California side of the lower Colorado River, the Picacho State Recreation Area and the Imperial NWR (Imperial Paradise area); only one bird was detected, at the Picacho State Recreation Area, Imperial County (Johnson *et al.* 2007, p. 25). During 2010 and 2011, yellow-billed cuckoos were found at two locations on the California side of the river. One pair was found at the Picacho State Recreation Area in both years. At the newly created restoration habitat at Palo Verde Ecological Reserve, Riverside County, two to five pairs were found in 2010, and 10 to 19 pairs were found in 2011 (McNeil *et al.* 2011, p. 19; McNeil *et al.* 2012, p. 24). Yellow-billed cuckoo numbers on the lower Colorado River went from the largest known range-wide population in 1977 to near extirpation from the region in the 1980s. Recent population increases appear to be a result of increased habitat from active riparian habitat restoration along the river, though numbers are still well below 1977 population levels.

Yellow-billed cuckoos have declined by more than 99 percent from historical levels in California, and declines appear to be continuing, especially along the Sacramento River and at isolated sites that recently supported small populations, but are now unoccupied. Current nesting populations for the State are found at only 3 locations, and likely do not exceed 40 to 50 pairs, down from approximately 280 pairs as recently as 1977 and perhaps as many as 15,000 pairs prior to the increased human settlement in the 1850s.

Arizona

The yellow-billed cuckoo was historically widespread and locally common in Arizona (Phillips *et al.* 1964, p. 45; Groschupf 1987, p. 7). A 1976 study based on existing habitat and known yellow-billed cuckoo population densities estimated 846 pairs were present on the lower Colorado River and its five major tributaries in Arizona (Groschupf 1987, pp. 20–28). In a statewide survey in 1999 that covered 265 mi (426 km) of river and creek bottoms, 172 yellow-billed cuckoo pairs and 81 single birds were located in Arizona (Corman and Magill 2000, pp. 9–10). While this survey did not cover all potential yellow-billed cuckoo habitat in Arizona, it indicated that the number of yellow-billed cuckoos in 1999 was substantially lower than previous estimates for the State. However, Arizona still contains the largest remaining yellow-billed cuckoo population among the States west of the Rocky Mountains, and the species is considered a Species of Concern by the Arizona Game and Fish Department, a designation that does not provide protection to the species (Corman 1999, p. 1). As habitat has declined, yellow-billed cuckoo numbers have likely declined, as has been documented for the lower Colorado River (Rosenberg *et al.* 1991, pp. 202–205) and described above for California.

Yellow-billed cuckoo populations greater than 10 pairs are found at 12 locations in Arizona: Bill Williams River, Colorado River, Gila River, Hassayampa River, San Pedro River, Santa Maria River, Verde River, Sonoita Creek, Santa Cruz River, Upper Cienega Creek, Altar Valley, and Agua Fria River. Sites with smaller populations are found at the Roosevelt Lake Complex, Upper Tonto Creek, Pinto Creek, Sycamore Creek in Pajarita Mountains, Oak Creek, Lower Cienega Creek, Babocomari River, Pinal Creek, Bonita Creek, San Bernardino NWR, Hooker Hot Springs, Big Sandy River, and many smaller drainages. However, many drainages have not been thoroughly surveyed, and it is likely that some additional yellow-billed cuckoo locations will be discovered. These include, but are not limited to the mountain ranges of southeastern Arizona, Eagle Creek, and along the Gila, San Francisco, and Blue Rivers.

Yellow-billed cuckoo sightings reported by birders between 15 June and 31 August, 1998 to 2012, in more than 1 year in southeastern Arizona mountain ranges include Carr Canyon, Ash Canyon, Garden Canyon, Ramsey Canyon, and Miller Canyon in the Huachuca Mountains; Walker Canyon, Madera Canyon, and Montosa Canyon in the Santa Rita Mountains; Scotia Canyon and Sycamore Canyon in the Atascosa/Pajarito Mountains; French Joe Canyon in the Whetstone Mountains; Harshaw Canyon and Paymaster Spring in the Patagonia Mountains; Kitt Peak on Baboquivari Mountain; and a few locations in the Chiricahua Mountains (Bird05 listserve, 2012). Yellow-billed cuckoos are breeding in at least some of these locations, with nesting confirmed at Sycamore Canyon (Arizona Game and Fish Department, unpublished data). The Arizona Breeding Bird Atlas recorded yellow-billed cuckoos on 50 of 1,834 blocks (2.7 percent), illustrating the species' rare status. Yellow-billed cuckoos were confirmed breeding and probably breeding on 29 of these blocks, and possibly on 21 blocks (Corman and Wise-Gervais 2005, pp. 202–203). Multiyear surveys have been conducted at five of these locations, which are discussed below.

Bill Williams River—In the mid-1970s, an estimated 57 pairs of yellow-billed cuckoos bred in the riparian forest of the Bill Williams River Delta (Gaines and Laymon 1984, p. 71). Following the sustained high water levels of 1983 to 1984 and 1986, which inundated and killed most of the

cottonwoods and willows along the Colorado River, yellow-billed cuckoo numbers also declined on the Bill Williams River Delta where similar habitat mortality occurred (Rosenberg *et al.* 1991, p. 203). In 1987, 17 pairs of yellow-billed cuckoos were located at this site and a total of 25 to 30 pairs were estimated to be present, a decline of 47 to 56 percent over 10 years (Laymon and Halterman 1987a, p. 32). Surveys were conducted regularly at this site from 1993 to 2002. The breeding population fluctuated from a low of 6 to 9 pairs in 1999 and 8 pairs in 2002 to a high of 28 to 30 pairs in 1993 and 28 to 39 pairs in 2001 (Halterman 2003, p. 32). Surveys were next conducted at this site in 2006 using revised survey protocols; 117 detections were recorded and no attempt was made to estimate the number of pairs occupying the site. In 2007, researchers recorded 139 detections at this site, and no estimate of pairs was made (Johnson *et al.* 2008a, p. 29). In 2010, researchers estimated 12 to 31 pairs, and the most recent survey in 2011 estimated 9 to 23 pairs (McNeil *et al.* 2010, p. 19; McNeil *et al.* 2012, p. 24). Bill Williams River NWR is considered the largest, highest quality stand of suitable habitat for the yellow-billed cuckoo along the lower Colorado River (Johnson *et al.* 2008a, p. 106). Data from this site show an important, but fluctuating, breeding population that has not recovered to 1977 levels.

Lower Colorado River—The lower Colorado River on the California-Arizona border supported an estimated 180 yellow-billed cuckoo pairs in 1976 to 1977 (Gaines and Laymon 1984, p. 72), a number that had declined by an estimated 80–90 percent in 1986 (Laymon and Halterman 1987a, pp. 34–35). In 2006 and 2007, surveys were conducted at various sites throughout the Lower Colorado River Multi-Species Conservation Plan Boundary area for the yellow-billed cuckoo (Johnson *et al.* 2007, pp. 1–220; Johnson *et al.* 2008a p. 1). Breeding was detected at the Grand Canyon National Park/Lake Mead National Recreation Area in 2006 (Johnson *et al.* 2008a, p. 1107). In addition to the Bill Williams River NWR, other sites in Arizona where Johnson *et al.* (2008a, p. 29) detected yellow-billed cuckoos in 2006 and 2007 include: the Grand Canyon National Park/Lake Mead National Recreation Area, Havasu NWR, Cibola NWR, Imperial NWR, Gila-Colorado River confluence, Limitrophe Division, and Quigely Pond Wildlife Management Area (Johnson *et al.* 2008a p. 107). In 2010, based on intensive surveys, 8 to 18 pairs were estimated, and the most recent survey in 2011 estimated 9 to 23 pairs on the Arizona side of the Colorado River, excluding the Bill Williams River (McNeil *et al.* 2010, p. 19; McNeil *et al.* 2012, p. 24). Recent population estimates are well below the breeding population in 1977, even though more area was surveyed.

Upper San Pedro River—This site has had the largest yellow-billed cuckoo population in Arizona. Yellow-billed cuckoos were surveyed on 42 mi (67 km) of riparian habitat on the upper San Pedro River for 7 years from 2001 to 2007 (Halterman 2002, pp. 10, 22; Halterman 2003, pp. 9, 23; Halterman 2004, pp. 9, 33–34; Halterman 2005, pp. 8, 22–23; Halterman 2006, pp. 26–27; Halterman 2007, pp. 5, 11; Halterman 2009, p.23). The number of surveys varied from year-to-year with one to five surveys per year and with different methods used to determine population size. In 2001, researchers estimated a total of 40 to 52 pairs, and 29 to 50 pairs the next year. A total of 26 or more pairs was estimated in 2003, but the number of pairs was not estimated after that year. Year-to-year comparisons were made by summing the maximum number of yellow-billed cuckoos in each transect for each year, which yields a minimum population of individual yellow-billed cuckoos over the breeding season.

In 2001, reserchers located 71 individual yellow-billed cuckoos. The population rose to 114 individual yellow-billed cuckoos in 2002 and 128 individual yellow-billed cuckoos in 2003, before dropping to 101 yellow-billed cuckoos in 2004, 76 in 2005, and a low of 47 in 2006. In 2007, the number of yellow-billed cuckoos detected increased to 83. The 2006 results indicated a continuing downward trend, but the 2007 results show a substantial increase in the population. Other yellow-billed cuckoo populations have shown annual fluctuation in detections (Halterman 2007, p. 23). Unfortunately, intensive yellow-billed cuckoo surveys have not been conducted at this site since 2007, so it is uncertain whether or not the population has truly rebounded from the 2006 low. During 2001 and 2002, researchers detected 36 and 81 yellow-billed cuckoos, respectively, along the San Pedro River during southwestern willow flycatcher surveys (EEC 2002, pp. 6, 12, 13). A repeat of these surveys in 2009 detected only 26 yellow-billed cuckoos (The Vernadero Group 2009, pp. 9, 19). While survey effort between these two time periods may not be comparable, the findings show evidence of a long-term downward trend for yellow-billed cuckoos at this location.

Sonoita Creek—A 4-mi (6-km) segment of Sonoita Creek was surveyed in 7 years between 1976 and 1986 (Groschupf 1987, p. 14). Yellow-billed cuckoo pairs were not estimated, but lows of 5 and 6 individuals were found in 1976 and 1986, respectively, and highs of 24 to 28 individuals were found between 1977 and 1979. The site was surveyed again in 1998 and 1999, with 11 to 12 pairs and 8 to 9 single yellow-billed cuckoos located (Corman and Magill 2000, pp. 39–40). In 2005, 17 individuals were found while conducting bird surveys for Important Bird Area designation (Arizona Audubon 2012, *http://iba.audubon.org/iba*). This population, while fluctuating, does not appear to have decreased in size from 1976 to 2005. No recent yellow-billed cuckoo surveys have been conducted at this site.

Verde River—Surveys conducted in 2004 and 2005 at 37 sites within the Verde River watershed were done at historical sites (16) at locations where yellow-billed cuckoos were previously detected in 1998 to 1999 and at random sites (21) with riparian forest that appeared to be suitable nesting habitat (Holmes *et al.* 2008, pp. 6–7). In the 2 years, 59 percent of sites had detections: 75 percent of historical sites and 48 percent of random sites (Holmes *et al.* 2008, p. v). Holmes *et al.* (2008, p. 20) confirmed nesting at five sites and found evidence of probable breeding at nine additional sites. The maximum number of detections during any one survey period was 23 in 2004 and 31 in 2005.

Thus, the available literature and surveys suggest that yellow-billed cuckoo populations in Arizona over the past 30 years have declined by 70 to 80 percent, with recent declines since approximately 2000 at some of largest populations (for example, San Pedro River). At present, it appears that the State's population could be as low as 170 pairs of yellow-billed cuckoos, and probably does not exceed 250 pairs. Despite these recent declines, the population of the western yellow-billed cuckoo in Arizona is the largest in the United States.

Western New Mexico

Yellow-billed cuckoos were historically common in riparian areas along the Rio Grande, as well as uncommon to common locally along portions of the Gila, San Francisco, and San Juan Rivers (Bailey 1928, pp. 307–309; Hubbard 1978, p. 32). A habitat analysis and wildlife survey of the middle Rio Grande Valley from

Espanola to La Joya estimated that 315 pairs of yellow-billed cuckoos bred along this river segment (Howe 1986, p. 10).

Recent surveys have been conducted by the Bureau of Reclamation (Reclamation) from 2006 through 2010 along the middle Rio Grande, from Highway 60 downstream to Elephant Butte Reservoir (Ahlers *et al.* 2010, p. 4; Ahlers and Moore 2011, p. 13). The area covered by the surveys increased from 36 mi (58 km) in 2006 to 90 mi (144 km) in 2009 and 2010. Data indicate detection of an estimated 44 pairs in 2006, 71 in 2007, 87 in 2008, 95 in 2009, and 75 in 2010; however, these estimates are not directly comparable due to variation in survey efforts and protocols (Ahlers *et al.* 2010, pp. i, 3, 12, 17). These surveys have documented a sizable population, but many fewer than the 315 pairs estimated for this region in 1984 (Howe 1986, p. 10).

Systematic surveys have not been carried out on the Gila, San Francisco, and San Juan Rivers. The extent of habitat in these areas is limited, and much is discontinuous and fragmented. Based on available habitat, a maximum of 35 yellow-billed cuckoo pairs could breed on the Gila River, while no more than 15 and 5 pairs could breed on the San Juan and San Francisco Rivers, respectively. An estimated 100 to 155 yellow-billed cuckoo pairs currently breed in western New Mexico.

Western Texas

The yellow-billed cuckoo historically was considered to be fairly common in riparian habitat at elevations of 3,000–7,500 ft (900–2,200 m) in El Paso, Hudspeth, Culberson, and Presidio Counties (Oberholser and Kincaid 1974, pp. 434–435; Rappole and Blacklock 1994, pp. 125–126). Recent information reports that yellow-billed cuckoos have declined in El Paso County (Peterson and Zimmer, 1998, p. 66). Population reports in the Trans-Pecos area of western Texas near Big Bend National Park show scattered populations of yellow-billed cuckoos (Wauer 1971, pp. 18, 27). These populations tend to be associated with areas of springs and developed wells or earthen ponds that support cottonwoods and willows.

Yellow-billed cuckoo population trends from 1966 to 1998 for the entire State of Texas, eastern and western, show a decline (USGS Biological Resources Division 1999, p. 1). The Texas Parks and Wildlife Department (TPWD) currently does not separate the eastern and western populations of the yellow-billed cuckoo, and identifies the species as globally abundant and State secure since the State ranking was last revised in 1994. However, subsequent publications by the TPWD indicate the species is becoming increasingly rare and declining (Shackelford and Lockwood 2000, p. 1). During 4 years, between 1988 and 1998, a 116-mi (189-km) segment of the Rio Grande (16 mi (26 km) in New Mexico and 99 mi (159 km) in Texas) was surveyed for yellow-billed cuckoos. The 1988 and 1992 survey results were similar, with yellow-billed cuckoos responding at 20 of 67 sites and 25 of 109 sites, respectively. The population then dramatically declined, with only 4 yellow-billed cuckoos at 113 sites in 1995 and 7 yellow-billed cuckoos at 134 sites in 1998 (Sproul 2000, p. 3). The author concluded that the yellow-billed cuckoo is a rare, highly vulnerable, and declining species in the Rio Grande Valley of southern New Mexico and extreme west Texas (Sproul 2000, p. 5). Sproul attributed the decline to habitat loss and degradation as well as other unknown factors in the species' migratory and wintering grounds (Sproul 2000, pp. 3–4). The current population of the western yellow-billed cuckoo in western Texas is likely fewer than 10 pairs.

Northwestern Mexico

The yellow-billed cuckoo breeds locally in northwestern Mexico, and is a widespread transient during migration (Howell and Webb 1995, pp. 346–347). In northwestern Mexico, it has been recorded as a summer resident (presumably breeding), including the extreme northern and southern portions of the Baja California Peninsula, northwest Mexico from Sonora and Chihuahua south to western Durango and Sinaloa (Howell and Webb 1995, pp. 346–347), and irregularly and locally south to western Nayarit and western Zacatecas (World Bird Info 2012).

Baja California Peninsula—Historically, the yellow-billed cuckoo was a rare and local migrant and summer resident in Baja California and Baja California Sur (Grinnell 1928, p. 119). Miller (1950, p. 83) observed a migrating flock of yellow-billed cuckoos in the Cape region of Baja California Sur in late May or early June 1896. Lamb (1927, p. 157), during 2 years living in the Cape region, saw yellow-billed cuckoos on only two occasions, once in late June and again in early September. A recent status review of birds on the Baja California Peninsula listed the species as a probable breeder only along the Colorado River and in the Cape region (Howell 2001, p. 17; Howell *et al.* 2001, p. 182). The population along the Colorado River was formerly numerous, but now very few yellow-billed cuckoos can be found (Patten *et al.* 2001, p. 46). Bird surveys conducted along the Colorado River, Mexico, from May 2002 to July 2003 concluded that the presence and density of breeding yellow-billed cuckoos is largely dependent on the state of riparian habitat and presence of water (Hinojosa-Huerta *et al.* 2008, pp. 75–92). Suitable habitat disappeared from the Río Colorado floodplain in the latter part of the 20th century due to dewatering of this portion of the river. Pulse floods in the 1990s and 2000s promoting cottonwood and willow habitat regeneration resulted in yellow-billed cuckoos returning to breed once riparian nesting habitat developed. Yellow-billed cuckoo persistence will depend on dedicated instream flows and pulse floods, maintenance of vegetative cover and structural diversity, and an increase in older riparian stands (Hinojosa-Huerta *et al.* 2008, pp. 75–92). The population levels of yellow-billed cuckoos in the Cape Region of Baja California Sur are not known, but from available information they appear to be extremely small and may not exceed 10 breeding pairs.

Sonora—Yellow-billed cuckoos are a common summer resident in Sonora, and were observed with higher frequency than in adjacent Arizona (Russell and Monson 1998, p. 131). In the vicinity of Alamos in southern Sonora, Short (1974, p. 24) found the species a common to abundant breeder during the rainy season in late July and early August. During general bird surveys in northern Sonora from 2000 to 2007, yellow-billed cuckoos were detected in 11 of 16 watersheds (Flesch 2008, pp. 35–36). On the Sonoyta River in northwestern Sonora, the species was not found on the lower stretches and was rare upstream on the Vamori section. On Rio de la Concepcion, yellow-billed cuckoos were not found on the lower river section or the upper or lower Plomo sections. They were rare on the upper and lower Sasabe sections and uncommon on the Altar, Busani, Coyotillo Magdalena, and Cocospera-Bambuto sections. They were not found on the Santa Cruz River and were uncommon on the San Pedro River. They were also uncommon on the San Miguel and Bacanuchi-Sonora section of the Rio Sonora. The author defined rare as ''present but rarely detected and often restricted to localized area'' and defined uncommon as ''present but may not be found in a day or two of field observations'' (Flesch 2008, pp. 35–36).

Yellow-billed cuckoos were described as fairly common summer residents, probable breeders, on bird transect

surveys conducted in July and September 2007 and July 2008 between 1,542–3,773 ft (470–1150 m) in the 45,000-ac (18,211-ha) Northern Jaguar Reserve in the foothills of the Sierra Madre near the town of Sahuaripa in east-central Sonora (Flesch 2009, pp. 5, 9, 12, 16, 21). The reserve, bordered by the Ríos Aros and Bavispe, is composed of oak forests mixed with native fan palms, dense thornscrub that transitions into subtropical vegetation, mesquite bosque, and perennial streams lined with sycamores.

Breeding yellow-billed cuckoos were documented from July through September along approximately 60 km (37 mi) of the Santa Cruz River in northern Sonora during riparian bird point count surveys in 2001 and 2003. They were fairly common at sites ranging from typical cottonwood-dominated riparian habitat (with or without understory) to mesquite-oak-grass habitat. The riparian habitat in this region is moderately impacted from water use, vegetation loss, presence of cattle, and land clearing for agriculture (Sonoran Institute 2008; pp. 2, 25, 55).

Yellow-billed cuckoo call playback surveys conducted from 21 June through 26 September 2003 documented 142 yellow-billed cuckoos at 10 sites ranging from 1,148 ft to 3,937 ft (350 to 1,200 m). Yellow-billed cuckoos were found in riparian habitat at Agua Calienta on the Río Bambuto north of Imuris; Río Tubutama near Tubutama and La Reforma; Río Cuchujaqui northwest of Alamos; Río Sonora at Aconchi and Baviacora, northeast of Hermosillo on the Cananea-Ures stretch of State Highway 116; El Gavilan on Río Sonora east of Ures; Upper Río San Pedro near San Pedro Palominas, and near the ejido Jose Ma. Morelos in Cananea (IMADES 2003, pp. 4, 14, 20).

Yellow-billed cuckoo call playback surveys conducted from July through September 2005 documented yellow-billed cuckoos in northeastern Sonora along the Ríos Sonora, Bacanuchi, Cajon Bonito, Bavispe, Moctezuma, and Sahuaripa. Habitat consisted of cottonwood, willow, and mesquite (CEDES 2005, pp. 5, 10, 11). Extensive grazing, agriculture, mining and related water withdrawals have reduced the riparian quality on these rivers.

Marshall (1957, p. 74), in his pine-oak woodland bird study in southern Arizona and adjacent Mexico, found the yellow-billed cuckoo as a migrant or wanderer in riparian timber only once in Sonora in the Ajos Mountains on July 17, 1952. During wildlife surveys by boat and foot in July and August 2005, of the 115-mi (185-km) stretch of the Ríos Aros and Yaqui and tributaries from Nátora (2,275 ft (700 m)) to El Río (1,138 ft (350 m)) in east-central Sonora, yellow-billed cuckoos were described as common in riparian groves and thorn scrub woodland. They were detected on both side drainages and main river channels (O'Brien *et al.* 2006, pp. 4, 8, 24, 37, 46, 51).

In a study focusing on cactus ferruginous pygmy-owls during late spring and summer from 2001 through 2010, Flesch (2012 *in litt.*) found yellow-billed cuckoos at 95 sites from June to September at elevations from 328 to 6,902 ft (100 to 2,104 m). The number of birds at each site ranged from 1 to 15 individuals. Flesch also confirmed breeding at four sites in thorn scrub habitats and at one site in upland Sonoran Desert habitat. These records indicate a broader use of habitat by yellow-billed cuckoos in Sonora. Yellow-billed cuckoos are more common as breeders in southern Sonora where they nest in thorn forest than in the more arid northern Sonora. There is some evidence that yellow-billed cuckoos may be nesting farther north and then re-nest in southern Sonora and northern Sinaloa during the rainy season in late July and August (Rohwer *et al.* 2009, pp. 19050–19055), but additional data are needed to confirm where and how commonly this occurs. Yellow-billed cuckoos appear to breed at higher density, especially in southern Sonora, but the breeding population for the State of Sonora is probably similar to the State of Arizona with 150 to 250 pairs because Sonora is half the size of Arizona. However, some of the yellow-billed cuckoos that breed in southern Sonora late in the nesting season may have been counted on breeding grounds farther north earlier the same year.

Chihuahua—Most of the State of Chihuahua is desert with very little rainfall and few waterways with significant riparian habitat. The Rio Conchos is the primary river system that drains the southern half of the State. This river is highly degraded, with a high density of nonnative tamarisk and little regeneration of willows and cottonwoods due to extremely heavy grazing. This problem has been worsened by a prolonged drought from the late 1990s to the present. Only one sighting of a yellow-billed cuckoo is listed on the e-Bird online database for the State of Chihuahua, found on July 1, 2003, along Highway 16 between the city of Chihuahua and the town of Lopez Mateos (Cornell Lab of Ornithology 2012). The breeding population for the State of Chihuahua is likely very low, probably in the low double digits and possibly in the single digits.

Sinaloa—How far south yellow-billed cuckoos breed in Sinaloa is uncertain. The only two observations of the species (Cornell Lab of Ornithology 2012) are from extreme northern Sinaloa along the Rio Fuerte. Because a thorough survey has not been conducted, the yellow-billed cuckoo population in the State is likely higher than these records imply. However, much of the thorn forest and riparian habitat has been converted to industrial agriculture over the past 30 years (Rohwer 2010, p. E16). The breeding population of yellow-billed cuckoos in Sinaloa is unlikely to exceed that of Sonora (150 to 250 breeding pairs), and it may be less.

Western Durango—Three observations of the yellow-billed cuckoo (Cornell Lab of Ornithology 2012) have been made for the State of Durango west of the Continental Divide. The population for this region is likely very low, possibly in the low double or single digits.

Population summary in Mexico—The available literature indicates that knowledge about the status of the breeding population of the western yellow-billed cuckoo in Mexico is less certain than in the United States. No systematic State-level surveys for the species have been carried out in any of the Mexican States. General bird surveys in Sonora have found yellow-billed cuckoos in similar habitats and abundances as in Arizona, as well as in thorn forest and dry deciduous forest, which do not occur north of Mexico. The riparian habitat in Mexico appears to be more fragmented and heavily grazed than it is north of the international border, and the thorn-forest habitat that the species is using in southern Sonora and Sinaloa is being converted to industrial agriculture at a high rate. Therefore, we conclude that the western yellow-billed cuckoo in Mexico has a breeding population of 330 to 530 pairs that is likely declining.

Population Summary of the Western Yellow-billed Cuckoo—The available surveys and literature support the conclusion that the population of the western yellow-billed cuckoo has declined by several orders of magnitude over the past 100 years, and that this decline is continuing. Recent declines over the past 15 years have shown both a loss of breeding yellow-billed cuckoos in smaller isolated sites and declines in numbers at core breeding areas. The current breeding population is low, with 350 to 495 pairs north of the Mexican border and another 330 to 530 pairs in Mexico for a total of 680 to 1,025 breeding pairs. The breeding population may actually be lower than these estimates, as some of these pairs may be counted twice since yellow-billed

cuckoos apparently move into southern Sonora and Sinaloa during the rainy season in late July and August after they have previously bred farther north. Therefore, we conclude that the western yellow-billed cuckoo has a small and declining population.

Summary of Factors Affecting the Species

Section 4 of the Act, and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on any of the following five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination. Each of these factors is discussed below.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

The decline of the western yellow-billed cuckoo is primarily the result of riparian habitat loss and degradation. Within the three States with the highest historical number of yellow-billed cuckoo pairs, past riparian habitat losses are estimated to be about 90 to 95 percent in Arizona, 90 percent in New Mexico, and 90 to 99 percent in California (Ohmart 1994, pp. 276–281; U.S. Department of Interior 1994, p. 215; Noss *et al.* 1995, pp. 37, 46; Greco 2008, p. 5). Many of these habitat losses occurred historically, and although habitat destruction continues, many past impacts have subsequent ramifications that are ongoing and are affecting the size, extent, and quality of riparian vegetation within the range of the western yellow-billed cuckoo. These ongoing impacts are occurring now and are anticipated to continue for decades to come.

Moreover, these impacts are often subtle. As described in the Habitat Use and Needs section, above, during the breeding season, the habitat of the western yellow-billed cuckoo consists of expansive blocks of riparian vegetation containing trees of various ages, including in particular larger, more mature trees used for nesting and foraging. In order for these areas to remain as viable yellow-billed cuckoo habitat, the dynamic transitional process of vegetation recruitment and maturity must be maintained. Without such a process of ongoing recruitment, habitat becomes degraded and is eventually lost. In our discussion below, we identify the manmade impacts to riparian vegetation as resulting in current and ongoing destruction and modification of existing and future potential habitat for the western yellow-billed cuckoo.

Additional subtle consequences from the manmade impacts are the indirect effects that result in the curtailment of the habitat of the western yellow-billed cuckoo. Past actions by humans have resulted in changes to the landscape, the hydrology, or both such that they prevent the riparian plants that are the basis of the species' habitat from growing at all. The consequences of these past actions may have initially resulted in destruction or modification of then-existing riparian habitat; however, once that habitat is lost, the changed conditions (such as changed hydrologic regime) also prevents riparian habitat from regenerating, even in the absence of other impacts. For example, channelization—through manmade levees or other constructs, or through channel incising as a consequence of other actions—may leave the geographical area where riparian plants once grew (such as the watercourse's floodplain) physically untouched, but the altered hydrology prevents riparian plant species from germinating and growing.

Principal causes of riparian habitat destruction, modification, and degradation in the range of the western yellow-billed cuckoo has occurred from alteration of hydrology due to dams, water diversions, management of riverflow that differs from natural hydrological patterns, channelization, and levees and other forms of bank stabilization that encroach into the floodplain. These losses are further exacerbated by conversion of floodplains for agricultural uses, such as crops and livestock grazing. In combination with altered hydrology, these threats promote the conversion of existing primarily native habitats to monotypic stands of nonnative vegetation, which reduce the suitability of riparian habitat for the western yellow-billed cuckoo. Other threats to riparian habitat include long-term drought and climate change. These threats are summarized in a recent detailed review of the literature on the subject (Poff *et al.* 2011). These Factor A threats are described in more detail below. Moreover, past and ongoing impacts to the species' habitat are working in combination with other threats, which are discussed in greater detail in Factors C and E, below.

Habitat Loss From Dams and Alteration of Hydrology

Dams

Poff *et al.* (1997, pp. 769–784), Greco (1999, pp. 36–38), National Academy of Sciences (NAS) (2002, pp. 145–150), and the Service (2002, Appendix I, pp. 1–12) reviewed the following effects of human modification of natural hydrological processes on riparian habitat, including those from dams. Dams result in an immediate effect of destroying riparian structure and functioning due to habitat displacement from dam construction and by permanent inundation, sometimes flooding miles of upstream riparian areas. This results in the physical loss of riparian vegetation. In the absence of vegetation, the yellow-billed cuckoo cannot breed, feed, or find shelter. Current and future releases of water downstream from dams at unnatural rates of flow, inappropriate times of year, or at too frequent or too infrequent intervals, may lead to flooding or desiccation beyond the tolerance limits of the native riparian vegetation, thus resulting in loss of habitat of the western yellow-billed cuckoo.

Dam construction has been occurring since the settlement of western North America with its peak in the mid-20th century. These include most major western rivers, many of which have a series of dams, and include, but are not limited to, the Sacramento, Kern, San Joaquin, Mojave, Snake, Gila, Salt, Verde, and Rio Grande, including 25 major reservoirs built on the Colorado and Green Rivers alone between the 1930s and 1970s (Richter *et al.* 1998, p. 332). In northern Mexico, some of these rivers include the Río Conchos, Yaqui, and Mayo, Río Bambuto, Río Bravo, Tubutama, La Reforma, Cuchujaqui River in Alamos, Aconchi and Baviacora in Río Sonora, and Upper San Pedro River in Sonora, Mexico (Instituto del Media Ambiente y el Desarrollo Sustentable del Estado de Sonora (IMADES) 2003, p. 4; Kelly and Arias Rojo 2007, pp. 2–3; Cornell *et al.* 2008, p. 96).

There are now dozens of large dams and scores of smaller dams on rivers throughout the range of the western yellow-billed cuckoo. Today the rate of building new dams has slowed because most of the highest quality dam sites already have dams constructed on them. There were proposals to build two dams on Cottonwood Creek, one of the major tributaries of the Sacramento River

(USACE 1982), but it is not clear when or if these dams will be built. A larger current threat is the enlargement of existing dams. Enlargement of Terminus Dam on the Tule River in California by 21 ft (6.5 m) in height was completed in 2004 (Barcouda *et al.* 2006, p. 12), and proposals to enlarge Shasta Dam on the Sacramento River by up to 200 ft (62 m) in height and doubling its storage capacity (Reclamation 1999, pp. 3–8) and Friant Dam on the San Joaquin River by up to 140 ft (43 m) in height are being explored (Reclamation 2003, pp. 3.1–3.8). Larger dams with additional storage would likely flood potential western yellow-billed cuckoo habitat upstream and cause additional hydrologic disruption downstream.

While the amount of habitat lost within the construction zone of a dam is relatively small, far greater amounts of habitat are destroyed in the areas of inundation and through the ongoing effects of the amount and timing of water releases through the dam operation, which affects both upstream and downstream habitats. Ongoing downstream effects to riparian habitat from dams include changes in sediment transport due to sediment retention behind the dams so that channels below a dam become increasingly ''sediment starved.'' This situation causes vertical erosion (downcutting), which can lead to loss of river terraces that sustain riparian vegetation (NAS 2002, pp. 145–150; Poff *et al.* 2009, pp. 773–774).

Ongoing operations of large dams can also dampen the magnitude of normal high flows, thus preventing cottonwood germination (Howe and Knopf 1991, p. 218), and dewater downstream reaches, causing substantial declines of riparian forests (NAS 2002, pp. 145–150). For example, Groschupf (1987, p. 19) found that almost all cottonwoods and over half of all willow trees were eliminated from one waterway in Arizona that was exposed to repeated large releases of water from a dam. This situation reduced the density of yellow-billed cuckoos from 13 per 100 ac (40 ha) before the flooding to 3 per 100 ac (40 ha) after the flooding (Groschupf 1987, p. 19). In another example, a study of the San Joaquin River from downstream of the Friant Dam to the Merced River confluence found that, between 1937 and 1993, the area of riparian forest and scrub decreased 28 percent, from 6,787 to 4,914 ac (2,727 to 1,989 ha), and the herbaceous riparian vegetation decreased from 4,076 to 780 ac (1,650 to 316 ha) (Jones and Stokes Associates, Inc. 1998, Chap. 5, pp. 1–2). These losses are most likely attributed to reduced stream flow down the river as a result of water diversions. In the case of the San Joaquin River, efforts are under way for restoring a more natural functioning hydrologic system and to restore riparian habitat (San Joaquin River Restoration Program Record of Decision 2012, pp. 7–8). Generally, in absence of ongoing dam operations in such circumstances, the habitat is likely to regenerate naturally; however, because of the way the majority of dams are operated, these impacts are happening now and are likely to continue for decades to come.

After the completion of the larger dams on the Colorado River system starting in the 1930s, limited pulse flows reached the lower Colorado River in Mexico for nearly 50 years, resulting in the loss of cottonwood–willow forests and the establishment of tamarisk (Glenn *et al.* 2001, pp. 1175–1186; Nagler *et al.* 2005, pp. 1843–1844). Local decline of the yellow-billed cuckoo western DPS and other riparian birds has been attributed to that habitat loss and degradation (Hinojosa-Huerta *et al.* 2008, p. 81). Additionally, along the Río Altar in northern Mexico, completion of the Cuauhtémoc Dam and Reservoir (Presa Cuauhtémoc) in 1950 diverted surface water and contributed to increased vegetation clearing for agriculture, degradation of mature cottonwood forests, and subsequent declines in distribution and abundance of riparian bird species associated with these forests (Flesch 2008, p. 43), including the yellow-billed cuckoo, which is known to occur there. In addition to past habitat losses, the altered hydrology caused by dams continues to have an ongoing impact on riparian habitat.

While alteration of hydrology due to dam construction and other water supply projects has been widely implicated in the loss and degradation of downstream riparian habitat for the western yellow-billed cuckoo (Gaines and Laymon 1984, p. 73; Greco 1999, pp. 36–38; Greco 2012, pp. 8–9), some dams have resulted in temporary habitat expansion for the yellow-billed cuckoo within the immediate upstream influence of the associated reservoirs. For example, one of the largest concentrations of yellow-billed cuckoo in New Mexico occurs at the inflow to Elephant Butte Reservoir on the middle Río Grande (Sechrist *et al.* 2009, p. 1; Ahlers *et al.* 2011, pp. 19–20). Yellow-billed cuckoo numbers increased following several years when water levels receded and riparian vegetation expanded into the exposed area of the reservoir pool. The yellow-billed cuckoo population there continues to increase, likely as a result of continued drawdown from long-term drought that allows maturation of the riparian forest into suitable breeding habitat (Ahlers *et al.* 2011, pp. 19–20). Drought patterns are cyclical and, when wetter conditions return to the region, Elephant Butte Reservoir likely will be refilled. When this happens, approximately 92 percent of 44 to 87 pairs of yellow-billed cuckoos there (detected during the 2007 and 2008 surveys) would be displaced through inundation (Reclamation 2009, pp. 64–65).

The threat to the yellow-billed cuckoo's habitat from fluctuating water levels behind dams is likely to occur elsewhere in the range of the western yellow-billed cuckoo. In California, the State's second largest population of yellow-billed cuckoos occurs within the inflow delta footprint of Lake Isabella, a dammed reservoir on the Kern River. Breeding yellow-billed cuckoos are also found at other reservoir inflow deltas, such as Horseshoe Reservoir on the Verde River (Dockens and Ashbeck 2011a, p. 1) and the Tonto Creek and Salt River inflows to Roosevelt Lake in Arizona (Sferra 2012, *in litt.*).

The temporary gain in riparian habitat at the inflow of reservoirs can be beneficial to the western yellow-billed cuckoo by providing large expanses of additional nesting and foraging habitat during a sequence of low-water years. However, the value of such habitat is affected by fluctuating water levels between years. Drastically fluctuating water levels with alternating inundation and desiccation cycles have been associated with fluctuations in populations of western yellow-billed cuckoos that breed in reservoir inflow sites (Laymon and Williams 2002, pp. 12–13; Henneman 2008, pp. 12–13). For example, along the Kern River, yellow-billed cuckoo numbers increased during low reservoir levels for multiple years when vegetation recolonized the drawdown area (Laymon *et al.* 1997, p. 10), but yellow-billed cuckoos moved to other sites during a wet year when lake levels rose and flooded out habitat (Launer *et al.* 1990, p. 10; Halterman *et al.* 2001, p. 20). When the water receded, it took up to 2 years for yellow-billed cuckoos to return to breed, but at reduced numbers (Laymon and Williams 2002, pp. 12–13; Henneman 2008, pp. 12–13), although the actual mechanism needs further study (Henneman 2010, pp. 12–14). The water level continues to remain below capacity at Lake Isabella due to dam safety concerns (Stewart 2012, pers. comm.).

Once Lake Isabella fills again to capacity, the riparian habitat that has since formed at the inflow and that supports cuckoos will become

inundated, at least periodically (Whitfield 2012, pers. comm.), thereby impacting the habitat of the western yellow-billed cuckoo. In addition, the USACE and the USFS are developing a proposal and have completed a final environmental impact statement (EIS) on options to repair dam deficiencies and raise the height of the dam an additional 16 ft (4.9 m) (Isabella Lake Dam Safety Modification Project Environmental Impact Statement Final October 2012). Pursuant to section 7 of the Act, a biological opinion was completed for the proposed action, but the yellow-billed cuckoo was not a species addressed in the section 7 consultation.

Lake Isabella is currently managed under long-term biological opinions issued by the Service to the USACE and the USFS to address impacts to the southwestern willow flycatcher (flycatcher) (*Empidonax traillii extimus*) from reservoir operations and recreation (Service 1996, 1999, and 2005, entire). Some of the measures to conserve the flycatcher in those biological opinions may be beneficial to the western yellow-billed cuckoo; however, the eventual inundation of the drawdown area of the reservoir will result in some degree of temporary habitat loss and degradation under current conditions and may result in permanent loss of habitat for the western yellow-billed cuckoo if the proposed dam raise is implemented. Similar periods of inundation and drawdown, resulting in corresponding development and destruction of suitable yellow-billed cuckoo habitat, occurs at Roosevelt Lake (Salt River Project (SRP) 2002, entire).

In Arizona, following the high water levels of 1983–1984 and 1986 on the Bill Williams River Delta, which is influenced by fluctuating water levels from dams in the Colorado River system (Rosenberg *et al.* 1991, pp. 18–23), the yellow-billed cuckoo numbers declined by 70–75 percent. Habitat has since recovered on the Bill Williams River Delta, but yellow-billed cuckoo numbers remained low for several years (Laymon and Halterman 1987a, pp. 10–18). The actual mechanism that influences the yellow-billed cuckoo's response to fluctuations in water levels is unknown, but loss of prey has been implicated; areas that were inundated normally support ground-nesting invertebrates, such as katydids and sphinx moths, that yellow-billed cuckoos feed upon, and it may take several years for these prey populations to rebound (Laymon and Williams 2002, pp. 12–13; Henneman 2008, pp. 12–13).

In Sonora, Mexico, large dams exist on the Mayo, Yaqui, and Sonora Rivers (Villaseñor 2006, p. 107). We do not have information on the magnitude or frequency of effects, positive or negative, from water management activities, to the western yellow-billed cuckoo in those locations. However, we have no reason to believe that the dams are managed in a substantially different manner in Mexico than in the southwestern United States, and the effects to riparian habitat are expected to be similar.

Despite some positive effects of dams on increasing western yellow-billed cuckoo habitat in a few areas, these gains in habitat are only temporary, and overall, the net effect of dams on the species has been negative. As such, dams and their ongoing operations are a threat to the western yellow-billed cuckoo over most of its range. This threat has resulted in substantial historical losses of western yellow-billed cuckoo habitat resulting in a curtailment of the DPS's range. The ongoing operation of these dams is likely to have minor impacts to the DPS at any given location, but because so many of the waterways within the range of the DPS have been dammed, we believe this threat has a substantial cumulative impact on the habitat of the western yellow-billed cuckoo, especially when considered with other threats. Moreover, we expect the operation of these dams will continue in a similar manner for decades to come, and thus we expect this threat to be an ongoing impact to the DPS's habitat.

The areas where the floodplain is still hydrologically connected to the river and has relatively unconstrained riverflow, such as in some areas of California and Sonora, Mexico, support the highest number of western yellow-billed cuckoos (Villaseñor 2006, pp. 107–108; Greco 2008, p. 6; Greco 2012, pp. 8–9). For example, the Sacramento River from Red Buff to Colusa has a highly dynamic mosaic of habitat patches of varying ages that form, disappear, and re-form in response to active river channel processes that operate over decades (Greco 2008, p. 6; Greco 2012, pp. 8–9). Although this section of the Sacramento River is also affected by altered hydrology, it is far enough below Shasta Dam and below several major undammed tributaries, such as Cottonwood Creek and Battle Creek, that it still has flood events every few years that help support riparian habitat processes (Werner 2012, pers. comm.). The river provides habitat characteristics that Laymon (1998, p. 4) indicated were important for the yellow-billed cuckoo in California, such as a meandering system with young riparian habitat that, compared to mature woodlands, provides preferred nesting sites, high productivity of invertebrate prey, and reduced predator abundance (Laymon 1998, p. 4). Another example of relatively unimpacted riparian habitat in the range of the western yellow-billed cuckoo is found in the highlands of central Sonora, Mexico, which supports occupied habitat of the yellow-billed cuckoo. Villaseñor (2005, p. 108) found that the maintenance of the natural flooding regimes due to the limited number of water development structures has allowed riparian vegetation along sections of the Sonora, Moctezuma, and Sahiaripa Rivers to persist in very good condition in some areas. Most of the known occurrences of yellow-billed cuckoo in central Sonora are associated with these regions.

Therefore, even though most of the dams within the range of the western yellow-billed cuckoo were constructed in the past, dams continue to affect both the downstream and upstream habitat through alteration of flows. These effects can include widely fluctuating water levels at inflow sites that inundate nesting habitat, limit food resources, and flood or desiccate habitat (Poff *et al.* 1997, pp. 769–784; Greco 1999, pp. 36–38; NAS 2002, pp. 145–150; Service 2002, Appendix I, pp. 1–12). Downstream effects such as sediment retention caused by controlled water flows, or sediment scouring and removal caused by excessive water releases, do not mimic the natural flow regimes and often result in the inability for cottonwoods to become established or regenerate and provide habitat for the yellow-billed cuckoo. Woody and herbaceous debris accumulates in the absence of these scouring flows, increasing fire risk and intensity (Stromberg and Chew 2002, pp. 195–219) (see section on Wildfire below).

Dams and their flow modifications have ongoing effects to habitat and will likely do so for decades to come, further modifying the habitat of the western yellow-billed cuckoo. Furthermore, because a relatively high proportion of individual yellow-billed cuckoos utilize reservoir inflow areas, dam operations at those sites that result in changes in water level can negatively affect a high proportion of the western yellow-billed cuckoo. Therefore, direct and indirect destruction of riparian habitat resulting from altered hydrology from past dam-building activities continues to contribute to the curtailment of the range of the western yellow-billed cuckoo. Additionally, as a result of future predicted climate change (see Climate Change section below), the climate within the range of the western yellow-billed cuckoo will likely become

drier, which will increase the demand for water storage and conveyance systems, which in turn will likely increase the frequency and severity of impacts on western yellow-billed cuckoo habitat (Stromberg *et al.* 2013, pp. 411–415).

Surface and Ground Water Diversion

Water extractions, both from surface water diversions and ground water pumping, can negatively affect riparian vegetation (Poff *et al.* 1997, pp. 769–784; Service 2002, Appendix I, pp. 1–8). Water diversions and withdrawals can lower ground water levels in the vicinity of riparian vegetation. Because ground water and surface water are generally connected in floodplains, lowering ground water levels by only about 3 ft (1 m) beneath riparian areas is sometimes sufficient to induce water stress in riparian trees, especially in the western United States (NAS 2002, p. 158). Physiological stress in native vegetation from prolonged lower flows or ground water results in reduced plant growth rate, morphological change, or mortality, as well as alters species composition to favor more drought-tolerant vegetation, and conversion to habitat dominated by nonnative species (Poff *et al.* 1997, p. 776). These effects reduce and degrade habitat for the western yellow-billed cuckoo for foraging, nesting, and cover.

Adverse effects of excessive ground water extraction on riparian vegetation have been well documented in the southwestern United States. Case histories on many river systems in Arizona including the Santa Cruz River and on the Owens River in California have documented the connection between overutilization of the ground water, lowering of the water table, and the decline and eventual elimination of riparian vegetation (Zektser *et al.* 2005, pp. 400–401; Webb and Leake 2006, pp. 317–320). Ground water extraction is also affecting river flows and riparian vegetation along rivers that support the western yellow-billed cuckoo in Mexico, including the Río Conchos in Chihuahua (Kelly and Aria-Rojo 2007, p. 174; Cornell *et al.* 2008, p. 98) and the Río Altar in Sonora, where the quantity of surface water declined greatly between 2000 and 2007 (Flesch 2008, pp. 44–45). Therefore, ground water extraction and water diversions create an ongoing threat to western yellow-billed cuckoo habitat.

The hydrologic regime (stream flow pattern) and supply of (and interaction between) surface and subsurface water is a driving factor in the long-term maintenance, growth, recycling, and regeneration of western yellow-billed cuckoo habitat (Service 2002, p. 16). As streams reach the lowlands, their gradients typically flatten and surrounding terrain opens into broader floodplains (Service 2002, p. 32). In these geographic settings, the stream-flow patterns (frequency, magnitude, duration, and timing) will provide the necessary stream-channel conditions (wide configuration, high sediment deposition, periodic inundation, recharged aquifers, lateral channel movement, and elevated ground water tables throughout the floodplain) that result in the development of western yellow-billed cuckoo habitat (Poff *et al.* 1997, pp. 770–772; Service 2002, p. 16).

Allowing the river to flow over the width of the floodplain, when overbank flooding occurs, is integral to allow deposition of fine moist soils, water, nutrients, and seeds that provide the essential material for plant germination and growth. An abundance and distribution of fine sediments extending farther laterally across the floodplain and deeper underneath the surface retains much more subsurface water, which in turn supplies water for the development of the vegetation that provides western yellow-billed cuckoo habitat and microhabitat conditions (Service 2002, p. 16). The interconnected interaction between ground water and surface water contributes to the quality of riparian vegetation community (structure and plant species) and will influence the ability of vegetation to regenerate and maintain itself as well as germination, density, vigor, and composition (Arizona Department of Water Resources 1994, pp. 31–32).

In many instances, western yellow-billed cuckoo breeding sites occur along streams where human impacts are minimized enough to allow more natural processes to create, recycle, and maintain the habitat. However, there are also breeding sites that are supported by various types of supplemental water including agricultural and urban runoff, treated water outflow, irrigation or diversion ditches, reservoirs, and dam outflows (Service 2002, p. D–15). Although the waters provided to these habitats might be considered ''artificial,'' they are often important for maintaining the habitat in appropriate condition for breeding western yellow-billed cuckoos within the existing environment.

Encroachment of Levees and Flood Control and Bank Stabilization Structures Into the River Channel and Floodplain

Other alterations in river hydrology with ongoing effects on western yellow-billed cuckoo habitat include river channelization, construction of levees, bank stabilization, and placement of any flood control structures that encroach into the river and its floodplain. These actions result in direct loss of habitat from construction and from maintenance activities that remove woody vegetation that has become established on the structures. Furthermore, these structures are effective, by design, at severing the hydrologic connection of the river's main channel and the river's immediate floodplain, thereby preventing overbank flooding. By preventing overbank flooding, levees and other similar structures reduce the amount of water available to riparian vegetation in the floodplain, which results in desiccation and eventual loss and degradation of riparian habitat (Vogl 1980, pp. 84–86; NAS 2002, p. 155; Greco 2012, pp. 8–9). Such effects are less destructive, however, for those levees located farther from the stream system, such as those outside the meander belt of a river (Greco 2012, p. 4).

As an illustrative example, we provide a brief summary of how river channelization, construction of levees close to the river, and rock riprap armoring along the levees have caused destruction and modification of yellow-billed cuckoo habitat on the Sacramento River, one of the most substantial historical nesting and foraging habitat areas for the DPS. The Sacramento River is now disconnected from ecological processes that both renew and restore riparian and aquatic habitats (Laymon and Halterman 1987a, pp. 11–14; Halterman 1991, pp. 1–2; Greco 2008, p. 6; Greco 2012, pp. 8–9). More than one-half of the Sacramento River's banks within the lowermost 194 mi (312 km) of river have now been rip-rapped by 40 years of bank protection (Service 2000, pp. 26–29). Rock riprap armoring a river reach often changes the river dynamics and leads to cutting and erosion immediately downstream from the riprap. Therefore, riprapping banks leads to the need for more riprapping, a repeating process that is not complete until the entire river is channelized.

Channelizing the river and severing the connection to the floodplain has severely altered the natural disturbance regime that would have allowed riparian habitat to regenerate now and in the future (Poff *et al.* 1997, pp. 769–784; Greco 2008, p. 6; Greco 2012, pp. 8–9). The result is that much of the river's remaining riparian habitat is modified, and now occurs in narrow, disconnected, linear strips (Service 2000, pp. 26–29; Halterman *et al.* 2001, p. 4) that are not utilized by the yellow-

billed cuckoo for breeding (Gaines 1974, p. 204; Greco 2012, p. 9). With the example of the Sacramento River, nesting yellow-billed cuckoos no longer occur south of Colusa as the river has been channelized and riprapped from that point to the Sacramento San Joaquin River Delta. These flood control and bank stabilization structures also keep the riparian habitat from regenerating and maturing. The factors that reduce yellow-billed cuckoo breeding in these areas are not well understood, but reductions of breeding population have been attributed to lack of patches of adequate size for nesting (Greco 2012, pp. 8–9), increased predators, and the species inability to use highly isolated patches (Halterman 1991, pp. 33–38), as discussed under Factor E. The Sacramento River is but one of many rivers within the range of the western yellow-billed cuckoo where these activities have destroyed and modified riparian habitat and where the ramifications of these past actions are continuing to impact the DPS's habitat today. These ongoing impacts will likely continue for decades to come.

Transportation Systems

Similarly, transportation systems have directly and indirectly altered a large number of riparian areas in western North America (NAS 2002, p. 182). Road and rail systems are frequently sited along rivers, and often entail removing riparian vegetation for construction of the roadbed, and modifying local hydrology to reroute surface water and ground-water. Bridges or culverts require abutments along the bank to provide roadway support. Because abutments and roadbeds physically constrain the stream, future lateral adjustments by the stream, which can affect floodplain dynamics, are effectively eliminated, which reduces and degrades riparian habitat (NAS 2002, p. 182). Such impacts result in additional destruction and modification of habitat for the western yellow-billed cuckoo. In comparison with construction of dams and altered hydrology this threat, by itself, is less likely to result in severe impacts to riparian habitat; however, this threat is but one of many that, in combination, result in substantial changes to physical and hydrological properties of a watercourse, which in turn contributes to a substantial curtailment in the habitat of the western yellow-billed cuckoo.

Gravel Mining

Other past and ongoing effects to riparian habitat result from gravel mining (Kondolf *et al.* 2001, pp. 54, 59). Extraction of gravel, primarily for construction products, typically occurs along rivers and adjacent floodplains where gravel deposits are naturally found. Large amounts of gravel removal from the stream and active floodplain result in channel downcutting or incision, which affects groundwater levels, frequency of overbank flows, bank stability, and the extent and character of riparian vegetation of specific stream reaches (Collins and Dunne, 1989, pp. 213–224; Kondolf 1995 pp.133–136; NAS 2002, p. 179). Some examples of downcutting on streams in California that historically had, but no longer have, populations of yellow-billed cuckoos, include: Cache Creek, Yolo County (15.0 ft (4.6 m) average and 26.0 ft (8.2 m) maximum downcutting); Merced River, Merced County (5.9 ft (1.8 m) average and 7.8 ft (2.4 m) maximum downcutting); Putah Creek, Yolo County (7.8 ft (2.4 m) average and 15.0 ft (4.6 m) maximum downcutting); Russian River, Sonoma County (11.4 ft (3.5 m) average and 17.9 ft (5.5 m) maximum downcutting); and Santa Clara River, Ventura County (15.6 ft (4.8 m) average and 20.2 ft (6.2 m) maximum downcutting) (Kondolf *et al.* 2001, p.50).

Furthermore, gravel extraction creates a knickpoint (a sharp change in channel slope) that typically erodes upstream in a process known as headcutting, which has the potential to propagate upstream for miles on the main river and its tributaries. As headcuts migrate upstream, the incision propagates upstream (Kondolf *et al.* 2001, p. 49). This process creates ongoing and future impacts to habitat from past as well as current gravel mining operations. Similar to the effects of manmade levees when they disconnect floodplain habitat from the active river channel, artificial channel incision as a result of gravel mining and similar activities reduces overbank flooding. This situation reduces the hydrological connection to the floodplain (Kondolf *et al.* 2001, p. 56), thereby resulting in subsequent loss and degradation of riparian habitat for the western yellow-billed cuckoo, throughout its range, including Mexico (Cornell *et al.* 2008, p. 98). The effects of incision and channel erosion are further exacerbated where gravel mining occurs in sediment-starved reaches below dams (Kondolf *et al.* 2001, p. 10). We expect past and ongoing gravel mining activities, either alone or in combination with other hydrological changes in riparian areas, to continue to modify habitat and further curtail the range of the western yellow-billed cuckoo for decades.

In conclusion, dams, channelization, and other manmade features that alter the watercourse hydrology and encroach into the active channel and floodplain are threats to the habitat of the western yellow-billed cuckoo because they, separately or in combination, significantly reduce and degrade nesting and foraging habitats. The natural processes that sustain riparian habitat in these and similar dammed and channelized river systems in the American West and in northwestern Mexico have been altered, resulting in only fragments or remnants of formerly large tracts of native riparian forests that no longer support breeding yellow-billed cuckoos. The multiple effects from altered hydrology comprise the most widespread and greatest magnitude of current threats to habitat that supports the western yellow-billed cuckoo. Such effects continue to modify habitat and further curtail the range of the western yellow-billed cuckoo. Moreover, we expect these alterations in the hydrology to continue to affect habitat of the western yellow-billed cuckoo into the future.

Habitat Loss and Degradation From Agricultural Activities

Following the effects from alterations in hydrology, in severity, conversion of riparian areas for agricultural crops and livestock grazing has been, and continues to be, a major contributor to riparian habitat loss and degradation (NAS 2002, p. 161; Johnson *et al.* 2007, p. 61).

Large areas of cottonwood–willow floodplain vegetation have been converted to agricultural uses, further reducing the extent of habitat available to western yellow-billed cuckoos for breeding (Swift 1984, pp. 225–226; Rosenberg *et al.* 1991, pp. 18–23). For example, within areas that support the yellow-billed cuckoo, clearing for agricultural uses occurred extensively in the past. On the floodplains of the Sacramento River (Greco 1999, pp. 2, 107), riparian habitat was reduced from 775,000 ac (314,000 ha) in the 1850s to less than 18,000 ac (7,287 ha) by 1977 (Swift 1984, p. 226). Clearing for agriculture is also extensive along the lower Colorado River (Rosenberg *et al.* 1991, pp. 18–23), San Pedro River, Gila River (Swift 1984, p. 226), Río Grande, and several river courses in northern Mexico including, but not limited to, the Río Yaqui, Río Mayo, Río Bambuto, Río Tubutama, and Río Sonora (Russell and Monson 1998, p. 11; IMADES 2003, p. 4; Villaseñor 2006, p. 108). Clearing also occurred along the coasts of Sinaloa and southern Sonora, Mexico, resulting in massive losses of thorn forest to

industrial agriculture (Rohwer *et al.* 2009, p. 19054).

Although most riparian and thorn scrub habitat losses largely stem from past agricultural clearing, effects from cultivated agricultural lands are ongoing. Agricultural lands continue to dominate much of the remaining riparian landscape, particularly along the Sacramento (Greco 1999, pp. 94, 104, 107), parts of the Gila, and lower Colorado Rivers (Johnson *et al.* 2007, p. 207); along the latter, 65 percent of yellow-billed cuckoo survey sites are bordered on at least one side by agriculture fields (Johnson *et al.* 2007. p. 61). Riparian areas are sometimes viewed as a potential source of plant and animal pests, a source of shade that may reduce crop yields, and competition for scarce water resources (NAS 2002, pp. 170–171). For example, in the Salinas Valley in California, a vigorous program is under way to comply with food safety practices that involve the clearing of riparian habitat adjacent to certain types of crops in an effort to eliminate wildlife presence, which has been linked to contamination of crops with a virulent strain of the bacteria *Escherichia coli* (Beretti and Stuart 2008, pp. 68–69). While yellow-billed cuckoos do not currently breed along the Salinas River (Gaines and Laymon 1984, p. 52), if these same rules are applied to farmland along the Gila, Rio Grande, Sacramento and Colorado Rivers, yellow-billed cuckoo habitat will be eliminated to meet these food safety concerns.

Accidental fire from farm workers operating machinery or burning weeds sporadically escapes into adjacent riparian habitat. Recent fires on western yellow-billed cuckoo and southwestern willow flycatcher conservation properties occurred in 2011, burning 58 ac (24 ha) and 6 ac (2 ha), respectively, within the Fort Thomas Preserve, on parcels owned by the Salt River Project and U.S. Bureau of Reclamation. Both fires were determined to be human-caused, likely from farm workers burning weeds along irrigation drains (SRP 2011, p. 39).

Other ongoing effects from cultivated agriculture on the western yellow-billed cuckoo are addressed under Factor E. These include fragmentation of habitat into smaller, more widely disjunct patches, ongoing influence of agriculture on riparian bird community composition, and effects from pesticides, which can negatively impact insect prey populations of the western yellow-billed cuckoo.

Domestic livestock grazing is a traditional agricultural land use practice in the southwestern United States since at least the 1600s (Little 1992, p. 88; Clary and Kruse 2004, p. 239). Livestock grazing continues to be a widespread agricultural use of riparian areas in the western United States and is one of the most common sources of past and ongoing riparian habitat degradation (Carothers 1977, p. 3; Rickard and Cushing 1982, pp. 2–4; Cannon and Knopf 1984, p. 236; Klebenow and Oakleaf 1984, p. 202; Swift 1984, pp. 225–226; Clary and Webster 1989, pp. 1–2; Schultz and Leininger 1990, pp. 298–299; Bock *et al.* 1993, p. 300). Livestock grazing occurs in yellow-billed cuckoo habitat along sections of the middle Rio Grande in New Mexico (Lehmann and Walker 2001, p. 12), Río Conchos (Cornell *et al.* 2008, p. 96), Río Bambuto, Tubutama, La Reforma, Cuchujaqui River in Alamos, Aconchi and Baviacora in Río Sonora, and upper San Pedro River (IMADES 2003, p. 4), and several other rivers in central Sonora, Mexico (Villaseñor 2006, p. 108). Grazing also occurs extensively along watercourses in a protected reserve on the Río Aros and Río Yaqui in Sonora, Mexico, where the yellow-billed cuckoo has been documented (O'Brien *et al.* 2008, p. 8). Grazing intensity in northern Sonora, Mexico, is generally much higher than in adjacent Arizona (Balling 1988, pp. 106–107; Flesch 2008, pp. 44–45), which leads to greater degradation of riparian habitat than in Arizona.

The Service (2002, Appendix G, pp. 5–7) and Krueper *et al.* (2003, p. 608) reviewed the effects of livestock grazing, primarily in southwestern riparian systems. The frequency and intensity of effects vary across the range of the species, due to variations in grazing practices, climate, hydrology, ecological setting, habitat quality, and other factors (Service 2002, Appendix G, p. 1). However, these effects generally include the removal and trampling of vegetation and compaction of underlying soils, which can inhibit germination and change hydrology (Rea 1983, p. 40; Belsky *et al.* 1999, pp. 419–431) and promote the dispersal of nonnative plant species. Such effects are most significant when riparian areas have been subject to overuse by livestock (NAS 2002, pp. 24, 168–173). Overuse occurs when grazed vegetation does not recover sufficiently to maintain itself and soils are left bare and vulnerable to erosion. Over time, livestock grazing in riparian habitats, combined with other alterations in streamflow, typically results in reduction of plant species diversity and density, and may increase the distribution and density of nonnative tamarisk by eliminating competition from native cottonwood and willow saplings, which are preferred forage for livestock (Krueper *et al.* 2003, p. 608).

Long-term cumulative effects of livestock grazing involve changes in the structure and composition of riparian vegetation (Service 2002, Appendix G, pp. 5–7), which may affect suitability of habitat for yellow-billed cuckoo breeding and prey population abundance. The western yellow-billed cuckoo nesting habitat is structurally complex with tall trees, a multistoried vegetative understory, low woody vegetation (Halterman 1991, p. 35) and higher shrub area than sites without yellow-billed cuckoos (Hammond 2011, p. 48). Livestock grazing alters understory vegetation, reducing height and density or eliminating new growth in riparian areas, and thereby hampering recruitment of woody species that, when mature, provide nest sites. Furthermore, the relatively cool, damp, and shady areas favored by yellow-billed cuckoos are those favored by livestock over the surrounding drier uplands. This can concentrate the effects of habitat degradation from livestock in western yellow-billed cuckoo habitat (Ames 1977, p. 49; Valentine *et al.* 1988, p. 111; Johnson 1989, pp. 38–39; Clary and Kruse 2004, pp. 242–243).

Removal, reduction, or modification of cattle grazing has resulted in increases in abundance of some riparian bird species. For example, Krueper (1993, pp. 322–323) documented responses of 61 bird species, most of which increased significantly 4 years after removal of livestock grazing in Arizona's San Pedro River Riparian National Conservation Area (NCA). The bird species guilds that increased most dramatically were riparian species, open-cup nesters, Neotropical migrants, and insectivores, all species that share characteristics with the yellow-billed cuckoo. The yellow-billed cuckoo numbers in the study increased, although not significantly ($p=0.13$) (Krueper 2003, p. 612) but their survey methodology was not designed to detect yellow-billed cuckoos. Recovery of vegetation in response to grazing removal in that study was quickest and most pronounced in the lower vegetation layers, the most accessible to grazing cattle. Thus, this situation would allow a greater number of seedlings and saplings of cottonwoods and other nest trees to attain maturity as suitable nesting sites.

In another example, livestock grazing was terminated along portions of the South Fork Kern River at the Kern River Preserve in the 1980s, and yellow-billed

cuckoos increased in number in the years following livestock removal. Smith (1996, p. 4) contended that termination of grazing at the Kern River Preserve was responsible for the dramatic increase in riparian vegetation, which was concurrent with the increase in yellow-billed cuckoo numbers. These examples suggest that even severely degraded riparian systems can recover quickly, in at least some cases, after livestock removal (Krueper 2003, p. 615), and that damage to riparian vegetation from grazing is at least partly reversible. They also illustrate the extent to which livestock grazing destroys and modifies nesting and foraging habitat of the western yellow-billed cuckoo.

In conclusion, most of the direct loss of habitat from farming has occurred in the past, but ongoing agricultural activities, in whole or in combination with other impacts, especially those that result in changes in a watercourse's hydrology, have resulted in the curtailment of nesting and foraging habitat for the western yellow-billed cuckoo by restricting or preventing the growth of riparian plants, and such activities present an ongoing threat. Most of the current impacts from agricultural land uses arise from livestock overgrazing in riparian areas. Riparian vegetation can recover relatively quickly from these effects after livestock removal (Smith 1996, p. 4; Krueper 2003, p. 615). However, without proper management to reduce overgrazing, ongoing overgrazing will continue to contribute to habitat modification in the range of the western yellow-billed cuckoo into the future.

Habitat Loss and Degradation Due to Conversion to Nonnative Vegetation

Throughout most of its range, habitat for the western yellow-billed cuckoo is threatened by the conversion of native riparian woodlands to riparian vegetation dominated by tamarisk and other nonnative vegetation. The major threat from this habitat conversion is the change from vegetation that supplies the western yellow-billed cuckoos with essential food and adequate thermal cover to vegetation that does not supply these attributes. The establishment and persistence of tamarisk is often, but not always, aided by altered hydrology, as described above. Altered hydrology is not the cause for establishment and persistence of other types of nonnative vegetation; therefore, we present information on nonnative vegetation in this separate section.

Tamarisk is the most widespread nonnative woody plant species found in habitat for the western yellow-billed cuckoo. Glenn and Nagler (2005, pp. 420–423) provide most of the following overview of tamarisk. Tamarisk is present in nearly every southwestern riparian plant community, but varies in dominance from stream to stream. On streams where altered hydrology can no longer support native species, it has replaced native plant communities entirely, but occurs at a low frequency on other streams. Tamarisk was introduced into western North America in the 1800s to serve as ornamental windbreaks, and for erosion control and other purposes. Several species escaped cultivation and have since spread rapidly. The center of distribution is currently Arizona, New Mexico, and Utah, and tamarisk has spread throughout most of the range of the western yellow-billed cuckoo at least as far north as the Yellowstone River in Montana in the Rockies, and at least as far south as the Yaqui River Valley in Sonora, Mexico. Recent studies in the northwest have located major populations of tamarisk in southwestern Idaho, and eastern Washington and Oregon. Models based on projected climate change predict that this invasive species will become more dominant in this region over the next 100 years (Kerns *et al* 2009). Tamarisk also occurs west to the Owens, San Joaquin, and Sacramento Rivers in California, although it is still nearly absent from the mainstem Sacramento River in California, and suitable habitat west of the Cascades in Oregon and Washington.

Tamarisk also occurs as isolated individuals along sections of the Sonora, Moctezuma, and Sahiaripa Rivers in Sonora, Mexico, where the hydrology has been little altered by human modifications (Villaseñor 2006, pp. 107–108). Its presence is highly variable within sections of the Río Conchos in Chihuahua, Mexico, and becomes dominant in some reaches of that river (Kelly and Arias Rojo 2007, pp. 177–178; Cornell et al. 2008, p. 4).

The threshold (in terms of percent tamarisk) for abandonment of a riparian system by western yellow-billed cuckoos is not known. They are not found in areas that are totally dominated by tamarisk with the complete lack of willows or cottonwoods. In California, two native-dominated areas occupied in 1977 by several pairs of yellow-billed cuckoos had, by 1986, converted to monotypic stands of tamarisk and were found to be uninhabited by yellow-billed cuckoos. For example, above Laguna Dam on the Colorado River in 1977 at least three pairs of yellow-billed cuckoos occupied a 30-ac (12-ha) site that was approximately 20–40 percent willow (Laymon and Halterman 1987a, p. 12). By 1986 no yellow-billed cuckoos were detected on the site where the dominant vegetation had become tamarisk, with less than 1 percent willow cover. In the vicinity of Picacho State Recreation Area, on the California side of the Colorado River, in 1977, 21 yellow-billed cuckoos were found in 297 ac (120 ha) of a 230-ft-wide (70-m-wide) willow forest (Gaines and Laymon 1984, p. 72). By 1986, tamarisk and aquatic vegetation dominated this area, and no yellow-billed cuckoos were found in the 12 ac (5 ha) of scattered willow–cottonwood habitat that remained (Laymon and Halterman 1987a, pp. 12–13).

Human disturbance, such as water diversion, flood control, vegetation clearing, and improper grazing management, often facilitates replacement of native vegetation with tamarisk (Kerpez and Smith 1987, pp. 1–5; Hunter *et al.* 1988, p. 113; Rosenberg *et al.* 1991, pp. 18–23). Altered hydrologic regimes (flooding or reduction in water flows from dams) has disrupted natural flooding events that are essential for maintaining native riparian ecosystems (Vogl 1980, pp. 84–86; Rosenberg *et al.* 1991, pp. 18–23), and the disruption (usually elimination) of flooding tends to favor tamarisk. In contrast to native cottonwoods, tamarisk does not need flooding to regenerate (Kerpez and Smith 1987, pp. 1–5).

Tamarisk is also tolerant of high salt levels, which can be present in river systems as a combined result of water diversions that lower the near-surface ground water and irrigation water runoff that contains high levels of dissolved salts (Kerpez and Smith 1987, pp. 1–5; Busch and Smith 1993, pp. 186–194). This higher tolerance to water stress and salt accumulation is a principle mechanism by which tamarisk has become dominant on some regulated western rivers (Glenn and Nagler 2005, p. 439). In addition, tamarisk takes salts from the ground water and exudes them from its leaves, rendering the soil even more unsuitable for germination of native riparian vegetation. This is a significant problem in streams with artificially reduced streamflows where salts accumulate and are not flushed from the system. These factors favor regeneration of tamarisk over native trees and shrubs and are an ongoing threat. Additional areas of native habitat are continuing to be lost to this process. In summary, the persistence and expansion of tamarisk-dominated habitat is the result of multiple forms of ongoing human-related disturbances, which result in degradation of native-

dominated riparian habitat, thus reducing its suitability as breeding habitat for the western yellow-billed cuckoo.

Other nonnative tree and shrub species have become established within the range of the western yellow-billed cuckoo. In western Colorado and Utah, Russian olive (*Elaeagnus angustifolia*) has become established and is a dominant tree species in many riparian systems. Giant reed (*Arundo donax*), common edible fig (*Ficus carica*), and the Himalayan blackberry (*Rubus discolor*) are some of the more conspicuous nonnative plants widely established along the Sacramento River, with Himalayan blackberry dominating the understory at some restoration sites (Borders *et al.* 2006, p. 310). Along the Sacramento River, yellow-billed cuckoos were far less likely to be detected at sites with an understory dominated by Himalayan blackberry than sites with a predominant native understory. Himalayan blackberry may prevent establishment of native understory species due to its dense growth habit (Hammond 2011, pp. 48–49). Nesting of the yellow-billed cuckoo has not been documented in riparian stands dominated by giant reed, common fig, or Himalayan blackberry that lack at least some native canopy trees.

In conclusion, because of the absence or near absence of nesting by yellow-billed cuckoos in nearly monotypic stands of tamarisk and other nonnative vegetation, the available literature suggests that conversion of native or mixed (native and nonnative) riparian woodlands to nearly monotypic stands of tamarisk and other nonnative vegetation, coupled with the inability of native vegetation to regenerate under altered hydrological conditions, is a significant threat to the western yellow-billed cuckoo now and in the future. Nonnative vegetation occurs across most of the range of the western yellow-billed cuckoo; its establishment can be caused by altered hydrology or other disturbances, which are widespread throughout the range. We expect nonnative vegetation to increasingly modify and curtail habitat for the western yellow-billed cuckoo within a majority of its range in the United States and northern Mexico into the future.

Use of Tamarisk by Western Yellow-billed Cuckoos and the Spread of the Introduced Tamarisk Leaf Beetle Into the Southwest

Yellow-billed cuckoos use habitat with a tamarisk component for nesting in southern California, Arizona, and western New Mexico, but are not found in monotypic stands of tamarisk. Yellow-billed cuckoo presence in tamarisk-dominated habitats does not necessarily equate to habitat suitability (Sogge *et al.* 2008, p. 149; Hammond 2011, p. 50), and additional research is needed to determine productivity, survivorship, physiological condition, and food availability in these habitats. Healthy native riparian vegetation provides much better habitat for the species.

Tamarisk can add to foliar cover that contributes toward reducing temperatures in riparian areas (Paxton *et al.* 2011, p. 259). Even relatively small decreases in foliar cover may render a site unsuitable for nesting western yellow-billed cuckoos (Paxton *et al.* 2011, p. 260). Removal of tamarisk in drainages occupied by western yellow-billed cuckoos could be considered a threat if the removal leaves little or no woody vegetation and native riparian vegetation is unable to reestablish. The available literature that pertains to riparian restoration in New Mexico and Arizona (Poff *et al.* 1997, pp. 769–784; Glen and Nagler 2005, pp. 439–441; Sogge *et al.* 2008, pp. 151–152; Stromberg *et al.* 2009, pp. 181–182) suggests that restoration of natural hydrological processes, rather than direct removal programs, would be a more effective method for promoting regeneration of native riparian vegetation and diminishing the presence of tamarisk. However, tamarisk removal programs coupled with native riparian plantings can speed up the restoration process assuming that the hydrologic system will support the native vegetation.

Tamarisk leaf beetle insects (leaf beetles) (*Diorhabda* spp.) were released into many locations throughout the southwest to control tamarisk. Leaf beetles are now spreading within the more arid range of the yellow-billed cuckoo in Nevada, Utah, Arizona, New Mexico, and Texas. Defoliation of tamarisk by the beetles occurs in the summer months when western yellow-billed cuckoos are in the process of nesting. Tamarisk leaf beetles could eventually occur throughout the western United States and northern Mexico (Tracy *et al.* 2008, pp. 1–3). The future effects of the beetle introductions to the western yellow-billed cuckoo are unknown. If beetles succeed in killing tamarisk, western yellow-billed cuckoo numbers may decline in areas where the hydrology is no longer capable of supporting a native riparian habitat and the numbers may increase in areas where native riparian vegetation is able to become reestablished.

Wildfire

Historically, wildfire was uncommon in native riparian woodlands (Busch and Smith 1993, pp. 186–194). However, the lack of scouring floods on regulated and unregulated rivers has resulted in the accumulation of fuel on the floodplain, which increases fire risk and intensity (Stromberg and Chew 2002, pp. 195–219). Water withdrawal, dams, climate change, drought, and human use also contribute toward an increased fuel load and probability of wildfire occurrence. Most fires today are human-caused (Service 2002, p. L–8). In degraded habitat with tamarisk the threat of fire may be greater. Tamarisk ignites quickly, further increasing the incidence of periodic fires. Exacerbating the immediate loss of native trees from fire, tamarisk recovers more quickly than native trees (Glenn and Nagler 2005, pp. 435–436). Along the Rio Grande River in New Mexico and Texas, wildfire has been documented as destroying, degrading, or setting back successional stages of vegetation development of yellow-billed cuckoo habitat (Sproul 2000, p. 3). In summary, the alteration of riparian systems through changes in hydrologic functioning and the introduction of nonnative tamarisk have increased the incidence of wildfire into yellow-billed cuckoo habitat. These fires further degrade, isolate, or fragment yellow-billed cuckoo habitat.

Environmental Impacts of Cross Border Foot Traffic in the Southwest

The environmental impact caused by cross border foot traffic has been increasingly occurring in more fragile and remote areas. The number of U.S. Border Patrol apprehensions of border crossers varies annually. Between October 1, 1999, and September 30, 2012, a yearly average of 333,517 border crossers were apprehended by the United States Border Patrol in the Tucson Sector, which does not account for the many others who were not caught (U.S. Border Patrol 2013, p. 1). Impacts associated with border crossings include creation of erosion and watershed degradation, loss of vegetation and wildlife, and human-caused wildfire (Defenders of Wildlife 2006, pp. 1–42). Drainages used by border crossers include the San Pedro River, Santa Cruz River, Cienega Creek, and many remote drainages in the mountain ranges of southeastern Arizona.

Human-caused wildland fires have been particularly damaging to areas of riparian habitat in Arizona, especially within 100 mi (161 km) of the United

States-Mexico border where border crossers are known to set fires to divert law enforcement agents. Border crossers are also responsible for campfires that can escape and spread as wildfires. At least 2,467 wildfires began along the Arizona border with Mexico from 2006 to 2010 (Government Accounting Office (GAO) 2011, p. 1). Federal officials have officially investigated only 77 of those fires. Of the fires investigated, 30 were started by border crossers. The resulting environmental impacts include the expansion of nonnative plant species, degraded endangered species habitat, and soil erosion.

Climate Change

Climate change may be impacting the western yellow-billed cuckoo. Climate change is discussed here under Factor A because, although it may affect the western yellow-billed cuckoo directly by creating physiological stress, the primary impacts of climate change on the species are expected to be through changes in the availability and distribution of western yellow-billed cuckoo habitat.

Our analyses under the Act include consideration of ongoing and projected changes in climate. The terms ''climate'' and ''climate change'' are defined by the Intergovernmental Panel on Climate Change (IPCC). The term ''climate'' refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements (IPCC 2007a, p. 78). The term ''climate change'' thus refers to a change in the mean or variability of one or more measures of climate (for example, temperature or precipitation) that persists for an extended period, whether the change is due to natural variability or human activity (IPCC 2007a, p. 78).

Scientific measurements spanning several decades demonstrate that changes in climate are occurring, and that the rate of change has increased since the 1950s. Examples include warming of the global climate system, and substantial increases in precipitation in some regions of the world and decreases in other regions (for these and other examples, see IPCC 2007a, p. 30; Solomon *et al.* 2007, pp. 35–54, 82–85). Results of scientific analyses presented by the IPCC show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate and is ''very likely'' (defined by the IPCC as 90 percent or higher probability) due to the observed increase in greenhouse gas (GHG) concentrations in the atmosphere as a result of human activities, particularly carbon dioxide emissions from use of fossil fuels (IPCC 2007a, pp. 5–6 and figures SPM.3 and SPM.4; Solomon *et al.* 2007, pp. 21–35). Further confirmation of the role of GHGs comes from analyses by Huber and Knutti (2011, p. 4), who concluded it is extremely likely that approximately 75 percent of global warming since 1950 has been caused by human activities.

Scientists use a variety of climate models, which include consideration of natural processes and variability, as well as various scenarios of potential levels and timing of GHG emissions, to evaluate the causes of changes already observed and to project future changes in temperature and other climate conditions (for example, Meehl *et al.* 2007, entire; Ganguly *et al.* 2009, pp. 11555, 15558; Prinn *et al.* 2011, pp. 527, 529). All combinations of models and emissions scenarios yield very similar projections of increases in the most common measure of climate change, average global surface temperature (commonly known as global warming), until about 2030. Although projections of the magnitude and rate of warming differ after about 2030, the overall trajectory of all the projections is one of increasing global warming through the end of this century, even for the projections based on scenarios that assume that GHG emissions will stabilize or decline. Thus, there is strong scientific support for projections that warming will continue through the 21st century, and that the magnitude and rate of change will be influenced substantially by the extent of GHG emissions (IPCC 2007a, pp. 44–45; Meehl *et al.* 2007, pp. 760–764, 797–811; Ganguly *et al.* 2009, pp. 15555–15558; Prinn *et al.* 2011, pp. 527, 529). See IPCC 2007b, p. 8, for a summary of other global projections of climate-related changes, such as frequency of heat waves and changes in precipitation. Also see IPCC 2011 (entire) for a summary of observations and projections of extreme climate events.

Various changes in climate may have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as threats in combination and interactions of climate with other variables (for example, habitat fragmentation) (IPCC 2007a, pp. 8–14, 18–19). Identifying likely effects often involves aspects of climate change vulnerability analysis. Vulnerability refers to the degree to which a species (or system) is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the type, magnitude, and rate of climate change and variation to which a species is exposed, its sensitivity, and its adaptive capacity (IPCC 2007a, p. 89; see also Glick *et al.* 2011, pp. 19–22). There is no single method for conducting such analyses that applies to all situations (Glick *et al.* 2011, p. 3). We use our expert judgment and appropriate analytical approaches to weigh relevant information, including uncertainty, in our consideration of the best scientific information available regarding various aspects of climate change.

Global climate projections are informative, and, in some cases, the only or the best scientific information available for us to use. However, projected changes in climate and related impacts can vary substantially across and within different regions of the world (IPCC 2007a, pp. 8–12). Therefore, we use ''downscaled'' projections when they are available and have been developed through appropriate scientific procedures, because such projections provide higher resolution information that is more relevant to spatial scales used for analyses of a given species (see Glick *et al.* 2011, pp. 58–61, for a discussion of downscaling). With regard to our analysis for the western yellow-billed cuckoo, downscaled projections are available.

The Southwest is already experiencing the impacts of climate change. The region has heated up markedly in recent decades, and the period since 1950 has been hotter than any comparably long period in at least 600 years (Graumlich 1993, pp. 249–255; Salzer and Kipfmueller 2005, pp. 465–487; Millar *et al.* 2006, pp. 273–287; Ababneh 2008, pp. 59–78; Bonfils *et al.* 2008, pp. 6404–6424; Stevens *et al.* 2008, pp. 1–15; Salzer *et al.* 2009, pp. 20348–20353; Woodhouse *et al.* 2010, pp. 21283–21288; Hoerling *et al.* 2012, pp. 74–92). The decade 2001–2010 was the warmest in the 110-year instrumental record, with temperatures almost 2°F higher than historic averages, with fewer cold snaps and more heat waves (Hoerling *et al.* 2012, pp. 74–92). Compared to temperature, precipitation trends vary considerably across the region, with portions experiencing both decreases and increases (Hoerling *et al.* 2012, pp. 74–92). There is mounting evidence that the combination of human-caused temperature increases and recent drought has influenced widespread tree mortality (Van Mantgem *et al.* 2009, pp. 521–524; Allen *et al.* 2010, pp. 660–684), increased fire

occurrence and area burned (Westerling *et al.* 2006, pp. 940–943), and forest insect outbreaks (Bentz *et al.* 2010, pp. 602–613). Human-caused temperature increases and drought have also caused earlier spring snowmelt and shifted runoff to earlier in the year (Barnett *et al.* 2008, pp. 1080–1083).

There are three predictions for anticipated effects from climate change in the southwestern United States and parts of northwestern Mexico. First, climate change is expected to shorten periods of snowpack accumulation, as well as reduce snowpack levels. With gradually increasing temperatures and reduced snowpack (due to higher spring temperatures and reduced winter-spring precipitation), annual runoff will be reduced (Smith *et al.* 2003, p. 226; Ellis *et al.* 2010, p. 236), consequently reducing ground water recharge. Second, snowmelt is expected to occur earlier in the season because increased minimum winter and spring temperatures could melt snowpacks sooner, causing peak water flows to occur much sooner than the historical spring and summer peak flows (Smith *et al.* 2003, p. 226; Stewart *et al.* 2005, pp. 217–218, 224, 230) and reducing flows later in the season. Third, the hydrological cycle is expected to become more dynamic on average with climate models predicting increases in the variability and intensity of rainfall events. This will modify disturbance regimes by changing the magnitude and frequency of floods.

Precipitation events under most climate change scenarios will decrease in frequency, but increase in severity so that, paradoxically, a warmer atmosphere and an intensified water cycle are likely to mean not only a greater likelihood of drought for the Southwest, but also an increased risk of flooding (Karl *et al.* 2009, pp. 132–133; Dominguez *et al.* 2012, pp. 1–7). Precipitation patterns are already observed to be shifting in the Southwest, with more rain falling in heavy downpours that can lead to flooding (Karl *et al.* 2009, p. 133). Adding to flood risk is that the earlier streamflow from earlier snowmelt may impinge on the flood protection stages of reservoir operations so that less streamflow can be captured safely in key reservoirs, increasing spring flooding downstream (Smith *et al.* 2005, p. 1154; Karl *et al.* 2009, p. 133). In some sites, where natural floodplain dynamics allow for overbank flooding, this could result in a positive regenerating effect on habitat for the western yellow-billed cuckoo. However, where floodplains have been constrained, as in many areas of the range, such changes in hydrology could excessively scour remaining habitat, thus preventing their reestablishment and resulting in smaller patch size or loss of habitat for the western yellow-billed cuckoo. Long drought cycles could also hamper recruitment of riparian vegetation following scouring floods and lead to reduced cover and nest sites for the western yellow-billed cuckoo.

Exactly how climate change will affect precipitation from site to site within the range of the western yellow-billed cuckoo in the southwestern United States and northwestern Mexico is uncertain. However, consistent with recent observations of regional effects of climate change, the projections presented for the southwest predict overall warmer, drier, and more drought-like conditions (Hoerling and Eischeid 2007, p. 19; Seager *et al.* 2007, p. 1181; Ellis *et al.* 2010, p. 243). For example, climate simulations of the Palmer Drought Severity Index (PSDI) (a calculation of the cumulative effects of precipitation and temperature on surface moisture balance) for the Southwest for the periods of 2006 to 2030 and 2035 to 2060 show an increase in drought severity with surface warming. Additionally, drought-like conditions will increase even during wetter simulations because of the effect of heat-related moisture loss through evaporation and evapotranspiration (Hoerling and Eischeid 2007, p. 19). Annual mean precipitation is likely to decrease in the Southwest, as is the length of snow season and snow depth (IPCC 2007b, p. 887; Sun *et al.* 2013, pp. 21–22). Most models project a widespread decrease in snow depth and earlier snowmelt in the Rocky Mountains (IPCC 2007b, p. 891).

Assessments for the Sonoran Desert are few, but the region is also expected to warm (IPCC 2007a, p. 887). Since about the 1970s, the Sonoran Desert region appears to have experienced ''widespread warming trends in winter and spring, decreased frequency of freezing temperatures, lengthening of the freeze-free season, and increased minimum temperatures per winter year'' (Weiss and Overpeck 2005, p. 2065).

In California, regional downscaled climate change assessments (Point Reyes Bird Observatory (PRBO) Conservation Science 2011, pp. 1–68) indicate changes in precipitation and temperature of varying magnitude across ecoregions. Assessments for areas occupied by the western yellow-billed cuckoo, such as the Sacramento River, Sierra Nevada (southern), and Sonora Desert (lower Colorado River) (PRBO Conservation Science 2011, pp. 25, 28, 48), mostly indicate an overall reduction in precipitation and increase in average temperature, which can alter hydrology and negatively affect habitat for the western yellow-billed cuckoo, as described previously. Furthermore, Gardali *et al.* (2012, pp. 8–10) ranked 358 avian taxa in California, and classified 128 as vulnerable to climate change. They ranked the western yellow-billed cuckoo as subject to a moderate level of climate vulnerability, owing in part to its specialization in habitat (riparian) that has already experienced significant loss or alteration. Of the 128 species that were rated vulnerable, only 48 were rated as having high or moderate climate vulnerability.

Regionally downscaled climate models for the Pacific Northwest project higher air temperatures in the next century (Littell *et al.* 2009, pp. 6–7) that will lead to lower soil moisture and increased evaporation from streams and lakes (Climate Leadership Initiative (CLI) and the National Center for Conservation Science and Policy 2009, p. 8). While high uncertainty exists in the total precipitation projections for the region (Littell *et al.* 2009, p. 1), effective precipitation (precipitation that contributes to runoff) may be reduced significantly even if there is no decline in total precipitation (CLI and the National Center for Conservation Science and Policy 2009, p. 8). Increases in extreme high precipitation falling as rain in the western Cascades and reductions in snowpack are key projections from high-resolution regional climate models (Littell *et al.* 2009, p. 1). These may result in more winter flooding and reduced summer streamflows in rivers that depend on snowmelt, which include many of the rivers in the Pacific Northwest.

In drier climates overall, there will be increases in riverine system temperatures that are predicted to result in periods of prolonged low flows and stream drying (Stromberg *et al.* 2013, pp. 411–415) and increased demand for water storage and conveyance systems (Stromberg *et al.* 2013, pp. 411–415). Warmer water temperatures across temperate regions are likely to increase the density and expand distribution of tamarisk because it has a higher tolerance for drought and salt than native cottonwoods and willows (Glenn and Nagler 2005, p. 439). This situation is expected to lead to the conversion of native and mixed (native and nonnative) riparian habitat to monotypic stands of tamarisk, which, outside of the Southwest, provides little or no suitable breeding habitat for the western yellow-

billed cuckoo (as described previously above).

Increased drought is expected to adversely affect food availability for western yellow-billed cuckoos (Newton 1980, pp. 11–12; Durst 2004, pp. 40–41; Scott *et al.* 2004, p. 70) through the disruption of the timing between a species and its food resources (Visser and Both 2005, pp. 2561–2569). For example, changes in precipitation or temperature may influence the peak timing of insect emergence or timing of the yellow-billed cuckoo's arrival from its wintering grounds so that the nesting season does not coincide as closely with peak insect abundance (Anders and Post 2006, p. 225). This change in timing could result in reduced food availability for the western yellow-billed cuckoo and breeding success, possibly causing further population decline and curtailment of its occupied range.

Virtually all future climate scenarios for the Pacific Northwest predict increases in wildfire in western North America, especially east of the Cascades, due to higher summer temperatures, earlier spring snowmelt, and lower summer flows, which can lead to drought stress in trees (Littell *et al.* 2009, p. 14). These effects could result in both short-term and long-term loss of riparian habitat from excessive winter scouring, summer drying, and wildfire. Regional downscaled climate change models for the Intermountain West also provide similar projections for warmer, drier climate with a reduced snowpack and episodic precipitation events. Prolonged drought in the southwestern United States and northern Mexico is expected to increase fire frequency, which results in a short-term loss of patches of riparian or thorn forest habitat for breeding. When fire frequency increases, riparian and thorn forests do not have sufficient time to recover, resulting in habitat conversion to fire-adapted nonforested vegetation types unsuitable for nesting. Furthermore, the effects of climate change and ongoing reduction in habitat and patch fragmentation, discussed previously, would increase.

Little is known about the wintering habitat of the western yellow-billed cuckoo in South America, and uncertainty exists about how climate change will affect it there. Regional downscaled models project an increase in wet-season precipitation and a decrease in dry-season precipitation over most of South America (Kitoh *et al.* 2011, p. 1). In the future, precipitation intensity will increase over most of South America. In particular, precipitation intensity will be greatest over southeast South America, implying an increasing risk of flooding in this region (Kitoh *et al.* 2011, p. 1). At the same time, a large increase of consecutive dry days is projected over the western part of the Amazon, where extremes in seasonal precipitation and resulting runoff is projected to increase in the Amazon River, implying more floods in the wet season and droughts in the dry season (Kitoh *et al.* 2011, p. 1). Uncertainty exists regarding the specific effects of such changes on the wintering habitat of the western yellow-billed cuckoo.

In summary, the available climate change models are predicting altered future environmental conditions across the breeding range of the western yellow-billed cuckoo. In the southwestern United States, northern Mexico, California, Intermountain West, and Pacific Northwest, climate change is generally predicted to result in an overall warmer, drier climate, with periodic episodic precipitation events that, depending on site conditions, are expected to have adverse effects on habitat of the western yellow-billed cuckoo. In rivers that depend on snowmelt, these changes are expected to result in more winter flooding and reduced summer stream flows. The amount of surface ground water available to regenerate and sustain riparian forests is expected to decline overall with persistent drought, favor the spread of tamarisk and other nonnative vegetation, and increase fire frequency. Precipitation events under most climate change scenarios will decrease in frequency and increase in severity. This change may reduce available nesting sites, patch size, and affect prey abundance as a result of lower humidity in riparian areas from reduced moisture retention, and through periods of prolonged desiccation followed by scouring flood events. In addition, evidence shows that climate change may disrupt the synchrony of nesting yellow-billed cuckoos and their food supply, causing further population decline and curtailment of its occupied range.

Impacts to habitat from climate change exacerbate impacts from impoundments, channelization, and alteration of river flows across the western United States and Mexico, and from conversion of habitat from native to mostly nonnative vegetation. Changing climate is expected to place an added stress on the species and its habitats. While we do not have evidence to suggest that the habitat of the western yellow-billed cuckoo is being substantially affected by climate change at this time, we expect long-term climate trends to have an overall negative effect on the available habitat throughout the breeding range of the western yellow-billed cuckoo. Moreover, a drying trend associated with global climate change may result in more dams, levees, or other activities to ensure fresh water for human consumption, which may result in additional habitat loss from the activities described in the Habitat Loss from Dams and Alteration of Hydrology section, above.

Conservation Efforts To Reduce Habitat Destruction, Modification, or Curtailment of Its Range

A number of beneficial actions with the potential to partially offset decades of habitat loss and degradation have occurred within the range of the western yellow-billed cuckoo. These actions include land acquisition and habitat restoration efforts for the western yellow-billed cuckoo and its habitat.

Along the Sacramento River and its tributaries in California, beneficial actions that are hoped to eventually counter some of the long-term decline of riparian habitat include the acquisition of approximately 25,000 ac (10,117 ha) of riparian habitat, which has been preserved by public and private resource conservation entities, mostly in the past 20 years (Werner 2012, pers. comm.). The Sacramento River NWR is encompassed in this area and consists of 27 units totaling 10,146 ac along the river between Red Bluff and Princeton (Service 2012, p. 1). Riparian habitat restoration activities have been conducted on 4,513 ac (1,826 ha) with 2,400 ac (738 ha) slated for additional restoration (Hammond 2011, p. 14), and is resulting in larger habitat patch sizes (Werner 2012, pers. comm.). Yellow-billed cuckoos have been found utilizing these restoration sites as early as 4 years after planting, but the total number observed on the sites is very low (23 sightings during 2 years of intensive study) (Hammond 2011, pp. 3, 50). Overbank flows have been restored in a small section of the Sacramento River on the Sacramento River NWR through a small-scale levee removal project that has resulted in increased riparian habitat and floodplain function (Silveira 2012, pers. comm.). Additional riparian habitat is owned and managed by the California Department of Parks and Recreation (CDPR) (671 ac (272 ha)) and the California Department of Fish and Wildlife (CDFW) (4,014 ac (1,625 ha)).

Conservation efforts elsewhere in California include the protection of the Kern River Preserve near Lake Isabella in Kern County, which was purchased for permanent conservation in 1979 by

The Nature Conservancy (TNC) and is now managed by Audubon California. This 2,987-ac (1,209-ha) site has had an active ongoing riparian habitat restoration program for the past 20 years, and more than 500 ac (202 ha) have been restored. Livestock grazing has been eliminated or managed to reduce impacts to riparian habitat for 30 years (Audubon Kern River Preserve 2012).

In Nevada, Arizona, and other southwestern States, numerous conservation plans are in various stages of implementation that result in actions covering thousands of acres of riparian habitat that could benefit the western yellow-billed cuckoo, as reviewed by the Service (2010, pp. 5–7). These include, but are not limited to, the Lower Colorado River Multi-Species Conservation Program (LCRMSCP), which calls for restoring more than 4,000 ac (1,618 ha) of habitat for the western yellow-billed cuckoo, various State Wildlife Action Plans, the Virgin River Habitat Conservation and Recovery Program, Muddy River Recovery Implementation Program, Warm Spring Natural Area Stewardship Plan, Horseshoe and Bartlett Reservoirs Habitat Conservation Plan, and Las Vegas Wash Comprehensive Adaptive Management Plan (Service 2010a, pp. 5–7).

In Arizona, implementation of the LCRMSCP has successfully increased occupied western yellow-billed cuckoo habitat through restoration, and researchers have found greater occupancy of yellow-billed cuckoos in restored compared to natural habitat along the lower Colorado River and tributaries (McNeil *et al.* 2011, pp. 40–41). Additionally, a number of conservation properties have been purchased in fee title or as easements since 1996 to offset the effects elsewhere to southwestern willow flycatchers at Roosevelt Lake and the Salt River (SRP 2011b, pp. 17–50), and southwestern willow flycatchers and yellow-billed cuckoos at Horseshoe Reservoir and the Verde River (SRP 2011a, pp. 25–35). These properties, which also support yellow-billed cuckoos, include the San Pedro River Preserve, Adobe Preserve, Stillinger Preserve, Spirit Hollow and Spirit Hollow Annex on the lower San Pedro River, Camp Verde Riparian Preserve, and the Fort Thomas Preserve on the Gila River. Other conservation properties along the lower San Pedro River include Cook's Lake, owned by Reclamation, and Three Links Farm, with conservation easements held by TNC and Reclamation. Management actions that have benefitted riparian habitat include retiring water rights, hiring onsite managers, fencing livestock from streams, prohibiting off-road vehicles, removing trespass livestock, and patrolling properties for trespassers and breaks in fences (Sferra 2012, in litt.).

In Arizona, permanent protection of the 6,105-ac (2,472-ha) Bill Williams River NWR in 1941 conserved one of the best remaining willow-cottonwood riparian habitat areas on the lower Colorado River, though it is vulnerable to periodic inundation from Lake Havasu, reduced flows from Alamo Dam, and an increase in tamarisk. The San Pedro Riparian National Conservation Area (NCA) encompasses approximately 40 mi (64 km) of the upper San Pedro River meanders. It was designated by Congress in 1988 with its primary purpose to protect and enhance the desert riparian ecosystem as an example of what was once an extensive network of similar riparian systems throughout the American Southwest. It contains nearly 57,000 ac (23,077 ha) of public land between the international border with Mexico and St. David, Arizona, and supports one of the largest western yellow-billed cuckoo populations in Arizona. However, continually increasing demands for water use within the basin threatens future flow in the upper San Pedro River. The 2011 District of Arizona case, *Center for Biological Diversity, et al.* v. *Kenneth Salazar, et al.,* CV 07–484–TUC—AWT, ruled that the 2007 plan by the U.S. Army and U.S. Fish and Wildlife Service failed to protect the upper San Pedro River or properly analyze Fort Huachuca's ground water pumping effect on the ecosystem's endangered species and critical habitat.

In Colorado's San Luis Valley, approximately 1,500 ac (607 ha) of riparian habitat are under permanent conservation easement along the Rio Grande and Conejos River, which supports the western yellow-billed cuckoo. The easements prohibit any activity that alters or diminishes the value of the wildlife habitat (Service 2011, p. 11). In northern Mexico, some riparian habitat has regenerated along the lower Colorado River floodplain in recent years in response to improved hydrological conditions resulting from binational water agreements, as discussed previously. During 50 years of reduced flows resulting from extensive damming of the upper Colorado River in the 1930s, the lower Colorado River nearly lost its cottonwood–willow forests and was being replaced by tamarisk (Glenn *et al.* 2001, pp. 1175–1186; Nagler *et al.* 2005, pp. 1843–1844). Local loss of the yellow-billed cuckoo and other riparian birds has been attributed to this habitat loss and degradation, resulting from decades of limited river flows reaching Mexico. Large-volume releases of water now reach the floodplain of the lower Colorado River in Mexico, which has allowed regeneration of limited but vital stands of native riparian vegetation (Zamora-Arroyo *et al.* 2001, pp. 49–50; Nagler *et al.* 2005, pp. 1849–1851; Hinojosa-Huerta *et al.* 2008, p. 81). The yellow-billed cuckoo has been regularly detected during May–July surveys, and is presumably breeding (Hinojoas-Huerta *et al.* 2008, pp. 80–81).

In northeastern Sonora, Mexico, habitat conservation action includes the purchase and protection in 2003 of the 10,000-ac (4,046-ha) Los Pavos-Northern Jaguar Preserve by a nongovernmental conservation organization. While not managed on the site, yellow-billed cuckoos were commonly sighted during bird surveys (O'Brien *et al.* 2008, p. 1). This rugged roadless area is located on the Río Aros, which is part of the Río Yaqui watershed, and is in the core area that supports one of the largest unfragmented wild areas of foothills thorn scrub in the State of Sonora (Lorenzana-Piña *et al.* 2004, p. 354). The region surrounding the preserve, however, remains vulnerable to various new resource extraction activities (O'Brien *et al.* 2008, p. 1).

In summary, we believe that conservation actions, such as habitat protection and restoration, have strong potential to be beneficial to the species. However, because many of these projects are either in the planning stages or have not been fully implemented, there is no data to show that these efforts have reduced or eliminated impacts from ongoing long-term effects to riparian habitat from the multiple threats of altered hydrology, livestock grazing, and nonnative vegetation. Conservation actions that have been implemented have either had insufficient time in which to demonstrate a population increase or other factors continue to affect the western yellow-billed cuckoos and keep abundance low. Even if all of these conservation actions are successful, they are not of a sufficient magnitude to counter the long-term decline of the western yellow-billed cuckoo. Impacts to habitat continue to modify and curtail the occupied range of the western yellow-billed cuckoo.

Summary of Factor A

We have identified a number of threats to the habitat of the western yellow-billed cuckoo that have operated in the past, are impacting the species now, and will continue to impact the

species in the future. The curtailment and decline in the habitat of the western yellow-billed cuckoo is primarily the result of the long-lasting effects of habitat loss from manmade features that alter watercourse hydrology so that the natural processes that sustained riparian habitat in western North America are greatly diminished. Loss and degradation of habitat has also occurred as a result of livestock overgrazing and encroachment from agriculture. All of these have the potential to promote, and are exacerbated by, the conversion of native habitat to predominantly nonnative vegetation. The curtailment, degradation, fragmentation, and loss of habitat for the western yellow-billed cuckoo is ongoing and, absent changes in the landscape, hydrology, or other factors, it will likely continue to be negatively impacted or lost into the future.

We recognize that climate change is a critical issue with potentially severe wide-ranging effects on the species and its habitat. The available scientific literature suggests that the effects of climate change will likely exacerbate multiple existing threats to the western yellow-billed cuckoo and its habitat. These threats include habitat loss and degradation from altered hydrology, with secondary effects from increases in nonnative vegetation and wildfire. These threats may result in smaller patch sizes of habitat such that many will be no longer occupied by the western yellow-billed cuckoo.

Conservation actions, such as habitat protection and restoration described above, have strong potential to be beneficial to the species by increasing the amount of available habitat and patch size. However, these efforts offset only a small portion of past losses and degradation of riparian habitat in the range of the western yellow-billed cuckoo. Habitat elsewhere in the range continues to be vulnerable to loss and degradation from ongoing alterations in hydrology, nonnative vegetation, and agricultural activities combined with additional or synergistic effects associated with climate change. Moreover, we expect these multiple stressors to continue to affect habitat of the western yellow-billed cuckoo into the future.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

There are no known threats to the western yellow-billed cuckoo resulting from overutilization for commercial, scientific, or educational purposes. Our review of the best available scientific and commercial information yielded nothing to indicate that overutilization for commercial, recreational, scientific, or educational purposes is occurring at this time or is likely to in the near future in any portion of the western yellow-billed cuckoo range. We, therefore, conclude that such overutilization does not currently constitute a threat to the western yellow-billed cuckoo, nor do we expect it to be a threat in the future.

Factor C. Disease or Predation

Little is known about diseases in the western yellow-billed cuckoo. West Nile virus has recently spread throughout portions of the western United States. It poses a potential threat to many bird species. The USGS National Wildlife Health Center has identified the yellow-billed cuckoo as a species that is subject to the effects of West Nile virus (USGS—National Wildlife Health Center 2005, p. 2). The Center for Disease Control's Vector-Borne Disease Web site reports that West Nile virus has been documented in a dead yellow-billed cuckoo (Center for Disease Control 2012); however, if this yellow-billed cuckoo was from the western DPS is unknown. Although the population of the western yellow-billed cuckoo has been in decline over several decades (see Historical and Current Status section, above), no evidence suggests that it has undergone a precipitous decline coincident with the relatively recent arrival of West Nile virus in western North America. Therefore, we conclude, based on the best available scientific and commercial information, which is limited, that the adverse effects of West Nile virus to the western yellow-billed cuckoo are not significant and do not constitute a threat at this time, nor is there any information to suggest that this situation will change in the future.

All bird species, including the yellow-billed cuckoo, are exposed, to some extent, to parasites. Greiner *et al.* (1975, pp. 1762–1787) found 5 of 16 yellow-billed cuckoos infected with Leucocytozoon, Trypanosoma, and microfilaria blood parasites. No information indicates whether these and other parasites (see Hughes 1999, p. 18, for a brief review) pose any threat to the western yellow-billed cuckoo.

Predation is a potential threat to the western yellow-billed cuckoo. On the Kern River, red-shouldered hawks (*Buteo lineatus*) and northern harriers (*Circus cyaneus*) have been observed preying on nestlings, and yellow-billed cuckoos have been observed chasing western scrub-jays (*Aphelocoma californica*) and loggerhead shrikes (*Lanius ludovicianus*) away from their nests (Laymon 1998, pp. 12–14); however, we do not have any information of the frequency of predation. An inverse relationship appears to exist between the presence of yellow-billed cuckoos and western scrub-jays on the Sacramento River, indicating a possible aversion by the yellow-billed cuckoos to nesting at sites occupied by western scrub-jays, a known predator of eggs and young (Halterman 1991, p. 38). Cooper's hawks (*Accipiter cooperii*) are thought to be the only avian predator capable of taking adult western yellow-billed cuckoos (Laymon 1998, pp. 12–13), and during migration adults are susceptible to predation by raptors, such as aplomado falcons (*Falco femoralis*) (Hector 1985, p. 338); however, we have no information to suggest that the rate of adult predation is significantly affecting the yellow-billed cuckoo population. In the Sonoran town of Alamos, Mexico, Mackay (David Mackay 2012, *in litt.*) witnessed a brown vine snake (*Oxybelis aeneus*) leaving a yellow-billed cuckoo nest after eating one of four nestlings.

On the lower Colorado River, McNeil *et al.* (2011, p. 41) found that high nest predation rates (63 percent of nests failed) contributed to the much lower average nest productivity at restoration sites (1.25 young fledged per nest) compared to nests at the Bill Williams River NWR (2.14 young fledged per nest). Most of that predation was attributed to avian predators; however, for 2 consecutive years a nest was preyed upon by a California king snake (*Lampropeltis getula californiae*) (McNeil *et al.* 2011, p. 41; McNeil *et al.* 2012, p. 50). Nest predation may have been high in restoration sites because most were located adjacent to agricultural areas, which may have increased the exposure of nests to human-adapted avian predators that thrive in agricultural areas. Additionally, these sites did not yet have the height, structure, and composition of more complex riparian habitats (McNeil *et al.* 2011, pp. 41, 49; McNeil *et al.* 2012, p. 56) that may serve to hide nests from predators. Nest predation can be partially compensated by the ability of yellow-billed cuckoos to renest when a nest fails. In general, despite the instances of nest predation listed above, western yellow-billed cuckoos have higher than normal nest success and lower nest predation rates than other open-cup nesting birds (Laymon *et al.* 1997, p. 11).

In summary, western yellow-billed cuckoos, particularly the eggs or young in nests, are vulnerable to predation. Predation may be a significant threat in some localities and in some years, and may be influenced by several factors,

such as surrounding land use and size and complexity of riparian habitat. As a result, predation may act periodically in concert with other stressors that contribute to the decline of the species (which we discuss in greater detail under Factor E, below). However, we conclude, that predation by itself does not pose a significant threat to the western yellow-billed cuckoo at this time, and we do not have any reason to believe that this will change substantially in the future.

We conclude that predation, parasites, and disease are not currently significant threats to the western yellow-billed cuckoo, and are not expected to become significant threats in the near future.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

We have identified a number of significant threats to the western yellow-billed cuckoo that are impacting the species now and will continue to impact the species in the future. The decline of the western yellow-billed cuckoo is primarily the result of the long-lasting effects of habitat loss and modification from altered hydrology resulting from decades of dam construction, channelization, water extraction, and other activities, as well as impacts associated with climate change. Other threats include loss of habitat to agricultural and other land uses, overgrazing, exposure to pesticides (which is addressed in Factor E, below), wildfire, and conversion of habitat to monotypic stands of nonnative vegetation. Under this factor, we discuss whether the existing regulatory mechanisms adequately address impacts to the western yellow-billed cuckoo described under Factors A and E, based on the best available information.

Federal Regulatory Mechanisms

In the United States, the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703–712) is the only current Federal protection provided for the yellow-billed cuckoo. The yellow-billed cuckoo (the entire taxonomically defined species), which includes the western yellow-billed cuckoo, is considered a ''migratory bird'' under the MBTA. The MBTA prohibits ''take'' of any migratory bird. Take is defined as: ''to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.'' However, no provisions in the MBTA prevent habitat destruction unless direct mortality or destruction of active nests occurs.

The Federal Land Policy and Management Act of 1976 (FLPMA) (43 U.S.C. 1701 *et seq.*) requires that ''the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that . . . will preserve and protect certain public lands in their natural condition; (and) that will provide food and habitat for fish and wildlife . . . .'' Furthermore, it is the policy of the Bureau of Land Management (BLM) ''to manage habitat with emphasis on ecosystems to ensure self-sustaining populations and a natural abundance and diversity of wildlife, fish, and plant resources on public lands'' (BLM manual 6500.06). Similarly, the National Forest Management Act of 1976 (NFMA) directs that the National Forest System ''where appropriate and to the extent practicable, will preserve and enhance the diversity of plant and animal communities.'' Additionally, section 219.12(g) calls for the maintenance of viable populations of native vertebrates in national forests. As such, FLPMA and NFMA have the potential to benefit the western yellow-billed cuckoo and its habitat. However, given that the BLM and USFS have discretion in how these statutes are carried out and measures are implemented, we continue to see continued loss and degradation of habitat for the western yellow-billed cuckoo on lands that these agencies manage.

Congress passed the Federal Water Pollution Control Act Amendments of 1972 and the Clean Water Act (CWA) of 1977 (33 U.S.C. section 1251 *et seq.*) to provide for the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's lakes, streams, and coastal waters. Primary authority for the implementation and enforcement of the CWA now rests with the U.S. Environmental Protection Agency (EPA) and, to a lesser extent, the USACE. In addition to the measures authorized before 1972, the CWA implements a variety of programs, including Federal effluent limitations and State water quality standards, permits for the discharge of pollutants and dredged and fill materials into navigable waters, and enforcement mechanisms. Section 404 of the CWA is the principal Federal program that regulates activities affecting the physical integrity of wetlands and other waters of the United States.

Section 404 prohibits the discharge of dredged or fill material in jurisdictional waters of the United States, unless permitted by USACE under section 404(a) (individual permits), 404(e) (general permits), or unless the discharge is otherwise exempt from regulation as designated in section 404 (r). Some areas of riparian habitat may be considered ''waters of the United States,'' but many areas of riparian habitat do not meet the term's strict definition. The Service can review permit applications and provide recommendations to the USACE to avoid and minimize impacts and to implement conservation measures for fish and wildlife resources, including the western yellow-billed cuckoo. However, incorporation of Service recommendations into section 404 permits is at the discretion of the USACE.

Furthermore, not all activities in wetlands or streams involve fill, and not all wetlands or streams fall under the jurisdiction of the USACE. For example, in areas where the historical floodplain has been cut off from the river by levees, determining the boundaries of wetlands subject to USACE jurisdiction becomes complex. The areas behind these levees have had their hydrological characteristics altered, soil conditions changed, and riparian vegetation removed. As a result, these former floodplains, which in some cases would be important to protect and restore as habitat for the western yellow-billed cuckoo, fall outside the jurisdiction of the USACE. Additionally, many actions that resulted in adverse hydrological modifications, such as channelization and levees, were implemented in compliance with the CWA.

The National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq.*) requires all Federal agencies to formally document, consider, and publicly disclose the environmental impacts of major Federal actions and management decisions that have significant effects on the human environment (including natural resources); however, NEPA does not require that mitigation alternatives be implemented. Additionally, NEPA applies only to actions by Federal agencies, so private landowners are not required to comply with NEPA unless a Federal agency is involved through provision of Federal funding or a Federal permit.

Through the Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. 661 *et seq.*), the Service may recommend discretionary conservation measures to avoid, minimize, and offset impacts to fish and wildlife resources resulting from Federal projects and water development projects authorized by the USACE and other Federal agencies such as Reclamation. Therefore, FWCA may provide some protection for the yellow-billed cuckoo and its habitat through avoidance and

minimization measures that may be incorporated into Federal projects. However, these measures are discretionary.

A majority of dams in the western United States supply hydropower, and their construction and ongoing operation is authorized by the Federal Energy Regulatory Commission (FERC), under the Federal Power Act of 1920, which incorporates by reference the FWCA and NEPA. The remainder of hydropower in the western United States is largely produced by the USACE and Reclamation. Reclamation also oversees water diversion and delivery projects. FERC reconsiders its hydropower licenses every 30 to 50 years. Through the various Federal regulations under which these agencies implement their water projects, the Service has an opportunity to periodically review their permits and relicensing applications and provide its recommendations to avoid and minimize impacts, and implement conservation measures for fish and wildlife resources, including species such as the western yellow-billed cuckoo. Implementation of these recommendations by FERC, USACE, and Reclamation is discretionary for nonlisted species. We continue to see loss and degradation of habitat for the yellow-billed cuckoo as a result of altered hydrology from operation of dams and other water supply projects, as described under Factor A.

The EPA is responsible for regulating pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act and the Food Quality Protection Act. Before a pesticide can be distributed, sold, and used in the United States it must first go through a registration process through the EPA. The EPA conducts short- and long-term toxicity tests to evaluate potential adverse effects on humans, wildlife, fish, and plants, including endangered species and nontarget organisms, and evaluates the potential for possible contamination of surface water or ground water from leaching, runoff, and spray drift. The sensitivity of any life stages of the yellow-billed cuckoo or its prey items to exposure from common agricultural pesticides that could leach, runoff, or migrate from agricultural areas into the habitat of the yellow-billed cuckoo has not been tested. However the EPA does conduct evaluation on these factors on surrogate species and has determined the use of certain approved pesticides are appropriate in areas used by the western yellow-billed cuckoo. Even if approved application procedures are followed, pesticides could reduce available insect prey for the western yellow-billed cuckoos.

State Regulatory Mechanisms

The majority of occupied areas for the western yellow-billed cuckoo north of Mexico occur within California, Arizona, and New Mexico (Hughes 1999, p. 1). Only California classifies the yellow-billed cuckoo as endangered (CDFW 2011, p. 10). The California Endangered Species Act (CESA) prohibits unpermitted possession, purchase, sale, or take of listed species. However, the CESA definition of take does not include harm, which under the Federal Act can include destruction of habitat that actually kills or injures wildlife by significantly impairing essential behavioral patterns (50 CFR 17.3). CESA does require consultation between the CDFW and other State agencies to ensure that their activities will not jeopardize the continued existence of State-listed species; however, the yellow-billed cuckoo continues to decline in California despite its status as a State-listed species. In Arizona, the yellow-billed cuckoo is listed as a species of concern (Arizona Game and Fish Department 2002, p. 3), with no protective status. The yellow-billed cuckoo has no special protective status in New Mexico.

Washington State's Department of Fish and Wildlife considers the yellow-billed cuckoo a candidate for listing. The State wildlife agencies in Wyoming, Montana, Colorado, Utah, and Texas classify the yellow-billed cuckoo as a species of concern or a sensitive species. The yellow-billed cuckoo is identified as a Species of Greatest Conservation Need in Idaho's Comprehensive Wildlife Conservation Strategy (Idaho Department of Fish and Game 2005, Appendix B, p. 7), and, under Idaho State law, is considered a protected nongame species for which it is illegal to intentionally take or possess, except as provided in sections 36–106(e) and 36–1107, Idaho Code, by Commission rule, or the Idaho Administrative Procedures Act 13.01.10, ''Rules Governing the Importation, Possession, Release, Sale, or Salvage of Wildlife,'' subsection 100.06.b (Idaho Department of Fish and Game 2005, Appendix B, p. 5). While protected status extends certain protections to the yellow-billed cuckoo in Idaho, neither this status nor the Species of Greatest Conservation Need designation protects its habitat. In Nevada, the yellow-billed cuckoo is identified as critically imperiled due to extreme rarity, imminent threats, or biological factors, but this designation provides no protection for habitat. Yellow-billed cuckoos have no State status in Oregon because it has not been considered an active breeding species since the 1940s (Oregon Department of Fish and Wildlife 2005, p. 3). State Wildlife Action Plans that include the yellow-billed cuckoo as a species of conservation concern are: California, Washington, Arizona, Colorado, Montana, Idaho, New Mexico, Utah, Texas, Nevada, and Wyoming. These plans identify conservation needs and actions for a broad range of species and habitats, but their implementation is discretionary.

In summary, where the yellow-billed cuckoo is State-listed (CA), a State candidate (WA), a species of concern or sensitive species (AZ, ID, WY, MT, CO, TX), or critically imperiled (NV), these designations contain no protection for the western yellow-billed cuckoo from habitat modification or destruction, as described under Factors A and E. Existing State regulatory mechanisms have not protected the western yellow-billed cuckoo from habitat loss and degradation from altered hydrology from upstream dams and surface water and ground water diversions, encroachment into the floodplain by agricultural and other development activities, bank stabilization and levee construction and maintenance activities, overgrazing, pesticide use on adjacent agricultural lands, conversion of habitat to monotypic stands of nonnative vegetation, gravel mining, wildfire, drought, and climate change across the range of the western yellow-billed cuckoo.

Canadian, Mexican, and other International Laws

Canada

The Canadian Government through the Department of the Environment (Environment Canada, which was first established by the Department of the Environment Act of 1971) administers numerous acts to preserve and enhance the quality of Canada's natural environment. Acts identified for conservation of wildlife and plant species or their habitat are identified below.

1916 Great Britain-United States Convention for the Protection of Migratory Birds. Canada has committed to migratory bird protection through the 1916 Great Britain-United States Convention for the Protection of Migratory Birds in Canada, which encourages voluntary cooperative actions to protect identified migratory birds. The yellow-billed cuckoo is listed under the 1916 Great Britain-United States Convention for the Protection of Migratory Birds in Canada. In addition,

Canada has enacted the Migratory Birds Convention Act of 1994 (MBCA). The MBCA is intended to ensure the conservation of migratory bird populations by regulating potentially harmful human activities. The implementing regulations of the MBCA ban all activities that are harmful to migratory birds, their eggs or their nests, but does not protect habitat. Also, some activities, such as hunting or scientific collection may be allowed with an appropriate permit.

The Species at Risk Act of 2002. The purpose of the Species at Risk Act (SARA) is to prevent Canadian native wildlife and plant species, subspecies, and distinct populations from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species, and encourage the management of other species to prevent them from becoming at risk. SARA, establishes the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as an independent body of experts responsible for assessing and identifying species at risk. SARA also, among other objectives, establishes: prohibitions to protect listed Canadian threatened and endangered species and their critical habitat; requirements for use of the best available knowledge on assessing threats to and conservation for wildlife and plant species; and long- and short-term objectives for development of recovery strategies and action plans.

The yellow-billed cuckoo is not identified as a species that is sensitive, threatened, or endangered under Canadian law. Within the range of the western yellow-billed cuckoo, British Columbia considers the yellow-billed cuckoo as an extirpated breeder, but that the species still does occur within the Province (British Columbia Conservation Data Centre, 2013).

Canadian Environmental Protection Act of 1999. The Canadian Environmental Protection Act sets out several guiding principles for conserving the environment including but not limited to supporting: Sustainable development; pollution prevention; elimination of releases of substances that are persistent or that bioaccumulate; an ecosystem approach and using the precautionary principle on issues related to the environment; science-based national standards; and seeking intergovernmental cooperation for consistency and avoidance of duplication of efforts. Because the yellow-billed cuckoo is not considered a species at risk, implementation of environmental protection regulations are optional for the species.

Mexico

The Mexican Government, through its Secretaria de Medio Ambiente y Recursos Naturales (SEMARNAT), has authority to designate species as threatened or endangered. The western yellow-billed cuckoo is not listed by the Mexican Government's Official Mexican Norm NOM–059–SEMARNAT–2010, Mexico's threatened species law. The yellow-billed cuckoo is listed under the 1936 Mexico-United States Convention for the Protection of Migratory Birds and Game Mammals (Service 2012b), which encourages voluntary cooperative actions to protect identified migratory birds and mammals.

In 1988, the Mexican Government passed the General Law of Ecological Equilibrium and Environmental Protection, which is similar to NEPA in the United States. This Mexican statute requires an environmental assessment of private or government actions that may affect wildlife or their habitat. Currently, no known regulatory mechanisms or conservation planning is in place that specifically targets the conservation of yellow-billed cuckoo habitat within the range of the DPS in Mexico. Therefore, we anticipate continued threats in Mexico, with little or no protection to the western yellow-billed cuckoo.

The National Natural Protected Areas (NPAs) system is a Mexican program to protect sensitive habitats and species. NPA designation is supposed to protect areas that have not been significantly altered by human activities and that provide diverse ecosystem services. However, prior to 1994, most NPAs lacked sound and comprehensive management plans. By 2000, approximately 30 percent of new and existing NPAs had developed management plans; however, under the NPA model these plans lacked detailed information, and in many cases could be considered obsolete. NPA goals to promote sustainable natural resources are often unattainable because of conflicting land ownership interests (Valdez *et al.* 2006, p. 272). The allocation of funds for management of natural reserve areas in Sonora is not assured, and some reserves have not received protection other than that given by government edicts or their natural isolation (Burquez and Martinez-Yrizar 1997, p. 378). Urban development has reduced some of Sonora's natural reserves. Three of the reserves have already disappeared, reflecting the tenuous state of many nature reserves in Mexico (Burquez and Martinez-Yrizar 2007, p. 546).

Wildlife management units, or UMAs, were part of a program developed and implemented by SEMARANT in 1997 to promote wildlife management on private property in Mexico (Weber *et al.* 2006, p. 1480). The UMA program has not been effective in promoting wildlife management or biodiversity conservation. It has increased the introduction of exotic wildlife species to meet hunting demands. There is a lack of technical capability on private lands to conduct proper wildlife monitoring and management (Weber *et al.* 2006, p. 1482). In Mexico, the exploitation of minerals and industrial development has not been matched by strong measures to protect the environment (Burquez and Martinez-Yrizar 2007, p. 547). Surface water and ground water management in Mexico is also lacking, and restoring water quality and quantity to water bodies is a primary concern (OECD 2013, p. 102). In the State of Sonora, 30 years of unregulated water extraction from both above and below ground has resulted in serious water resource overexploitation and degradation (OECD 2013, p. 115). Although regulatory measures are in place, they lack consistent implementation and oversight (OECD 2013, p. 133).

Current efforts for protecting the western yellow-billed cuckoo in Mexico primarily consist of Important Areas for Bird Conservation (Áreas de Importancia para la Conservación de las Aves), but no specific projects or conservation efforts are focused on the yellow-billed cuckoo (Sánchez-González and Berlanga 2012 in litt.).

Lack of habitat protection for the yellow-billed cuckoo in northwestern Mexico also impacts the western yellow-billed cuckoo in the United States because individuals are known to make transitory movements up to several hundred miles between the southwestern United States and northern Mexico within a single breeding season (Sechrist *et al.* 2012, p. 5), so that individuals that breed in the United States also depend to some extent on habitat in northern Mexico. No known information is known on the number of yellow-billed cuckoos that utilize habitats in both countries during a given breeding season; however, these are also stopovers areas between breeding and wintering grounds in South America, and are important as foraging habitat. Therefore, lack of regulatory protections for habitat of the yellow-billed cuckoos in northwestern Mexico also affects western yellow-billed cuckoos in the southwestern United States.

In regard to potential for pesticide exposure south of the United States border, Mexico has the second largest pesticide sales in Latin America, behind Brazil, which together account for 78 percent of the volume of pesticides within 11 Latin American countries (Mora 1997, pp. 3–4). While Mexico has laws concerning pesticide use, and import regulations on certain pesticides, there is limited enforcement capacity (Behre 2003, pp. 337–338). The same is true in Paraguay, Bolivia, Brazil, and Argentina where yellow-billed cuckoos winter. For example, in Paraguay, at the center of the yellow-billed cuckoo's wintering range, importation and use of many pesticides are banned, but it is estimated that the amount of pesticides that are imported illegally are double the amount that are imported legally (Scribano 2013).- For additional information on pesticides see Factor E below.

Based on the best available information, the regulatory mechanisms in Mexico that would protect the western yellow-billed cuckoo from threats described under Factors A and E are either lacking or not being fully implemented. These include water supply projects, water diversions, expansion of agricultural activities and overgrazing, conversion of habitat to nonnative vegetation, climate change (Factor A), and pesticides, as well as the threat of small, isolated patches of western yellow-billed cuckoo habitat (Factor E).

Summary of Factor D

Various Federal, State, and international regulatory mechanisms in place provide varying degrees of conservation oversight that may to some degree address the threat of ongoing habitat loss and degradation resulting from altered hydrology, conversion of habitat to nonnative vegetation, climate change, agricultural activities (Factor A), or exposure to pesticides and effects of small and isolated habitat patches (Factor E). In California, where the species is listed as endangered, regulations prohibit unpermitted possession, purchase, sale, or take of listed species. Such prohibition of take does not include the species habitat, and the yellow-billed cuckoo continues to decline in California despite its status as a State-listed species. However, because the yellow-billed cuckoo is not a protected or sensitive species in Canada, Mexico, or in a majority of the United States, application of these regulatory mechanisms to conserve yellow-billed cuckoo or its habitat is unknown and the effectiveness of these regulatory mechanisms is uncertain.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Small and Widely Separated Habitat Patches

As described in the Background section and under Factor A, the habitat of the western yellow-billed cuckoo has undergone significant loss and modification within its occupied breeding range as a result of widespread multiple human-caused effects. These include altered hydrology in watercourses and past loss and degradation from agriculture. Past destruction and modification transformed formerly large expanses of riparian habitat into a number of smaller patches of smaller total area, isolated from each other by a matrix of mostly human-altered habitats (McGill, 1975, pp. 1–4; Thompson, 1961, pp. 294–315; Wilcove *et al.* 1986, p. 237). As a result, the DPS now primarily occurs in smaller, more widely separated populations. Compared to large populations, smaller populations are disproportionately affected by natural and manmade factors. These stressors vary in frequency, timing, and magnitude across the species' range. They are related or correlated to each other or act in combination to result in significant impacts to the western yellow-billed cuckoo within all or portions of its range.

One of the ramifications of smaller, more isolated habitat patches is that the smaller the patch, the more edge it has in proportion to its area, which increases the percentage of the available habitat exposed to the surrounding land uses (Hunter 1996, pp. 186–187). This is a particularly prevalent characteristic of the yellow-billed cuckoo's remaining disjunct habitat patches, as many patches are in proximity to agricultural and other human-altered landscapes. For example, such land use currently dominates much of the riparian landscape within many regions, particularly along some reaches of the lower Colorado River, Sacramento River, Snake River, Verde River, Gila River, Santa Cruz River, San Pedro River, and Río Grande; and also in parts of northern Mexico in the vicinity of floodplain farming along the Sonora, Magdalena, and Moctezuma Rivers (Villaseñor-Gomez 2006, p. 111).

Agricultural activities on adjacent lands affect riparian bird communities in ways that may result in lower reproductive success, and possible abandonment of the patch, as reviewed by Saab (1999, pp. 136, 147–148). Saab (1999, p. 147) found that bird species, including the yellow-billed cuckoo, were more likely to occur in riparian habitat along the Snake River, Idaho, in sites surrounded by upland natural vegetation than in habitat adjacent to agricultural lands. Saab found that, compared to habitat patches surrounded by natural habitat, patches near agricultural lands supported more avian nest predators that prosper in human-altered landscapes and have a greater effect on the smaller, fragmented habitats (Saab 1999, p. 147). Increases in these predators can result in more nest losses and discourage yellow-billed cuckoos from nesting, thus suppressing local yellow-billed cuckoo population size. Increases in nonnative vegetation can displace or degrade suitable nesting and foraging habitat, thereby leading to lower utilization of such areas by western yellow-billed cuckoos. Together, the effects can lead to yellow-billed cuckoos abandoning these small habitat patches.

The western yellow-billed cuckoo is currently found in the largest contiguous and least-fragmented remaining habitat patches. For example, in California, sites larger than 198 ac (80 ha) in extent and wider than 950 ft (600 m) provided optimal patch size for yellow-billed cuckoos (Laymon and Halterman 1989, p. 275). Nesting yellow-billed cuckoos are sensitive to patch size and seldom use patches smaller than 325 × 975 ft (100 × 300 m) (Hughes 1999, p. 20). This observed preferential use of large patches strongly suggests that the DPS is sensitive to fragmentation and reductions in habitat patch size. Moreover, patch-size reduction combined with the scarcity of larger patches keeps the yellow-billed cuckoo breeding population size depressed. Such effects prevent the western yellow-billed cuckoo from reversing its long-term decline in population and range (Hunter 1996, pp. 179–187).

Moreover, isolated breeding sites separated by hundreds of miles of nonhabitat also reduce the ease with which dispersing juvenile and returning adult yellow-billed cuckoos are able to find these sites. This isolation may result in low colonization and re-occupation rates, so that otherwise suitable habitat remains unoccupied or occupied at low densities (Laymon and Halterman 1989, p. 274; Hunter 1996, p. 185). For example, the Sacramento River still appears to have sufficient habitat to maintain a self-sustaining population of yellow-billed cuckoos, as over 25,000 ac (10,117 ha) of riparian and associated natural habitat has been protected and other sections are in the process of being restored. However, not all suitable patches are occupied or may only be

occupied in very low densities, and the yellow-billed cuckoo population remains much lower than its potential (Dettling and Howell 2011, pp. 20–21).

In summary, despite efforts to protect and restore riparian habitat along the Sacramento River and elsewhere in the range of the western yellow-billed cuckoo, these efforts offset only a small fraction of historical habitat that has been lost. Therefore, the threats resulting from the species' behavioral response to the multiple, combined effects of small and widely separated habitat patches exacerbate the effect of other threats within a large portion of the range of the western yellow-billed cuckoo. Moreover, because the threats that create small and isolated patches are ongoing (see Factor A), we expect the effects of the species' response to small patch size to continue to adversely impact the western yellow-billed cuckoo into the future.

Pesticides

Exposure to pesticides may also be a threat to western yellow-billed cuckoos because it negatively impacts populations of insect prey (Groschupf 1987, p. 29; Hughes 1999, p. 2). The effects of pesticides on western yellow-billed cuckoos can be from intentional aerial spraying of habitat for mosquito or forest pest control, or from overspray when foraging habitat is located next to agricultural fields. Prey populations were affected by aerial spraying of larvicides for control of mosquitoes at Caswell State Park in California (Laymon 1998, p. 12) and in Colorado to control an outbreak of caterpillars on box elders near Durango (Colyer 2001, pp. 1–6). The available evidence suggests that a reduction in prey availability results in reduced nesting success (Laymon 1980, p. 27; Hughes 1999, pp. 19–20), and pairs may even forgo breeding in years with inadequate food supplies (Veit and Petersen 1993, pp. 258–259). Therefore, the application of pesticides directly onto areas of riparian habitat may indirectly affect the reproductive success of the western yellow-billed cuckoo, leading to nest failure and lowered population size. Additionally, because breeding site fidelity is in part dependent on previous successful nesting (see the Breeding Site Fidelity section), yellow-billed cuckoos may abandon otherwise suitable nest sites where prey availability is limited by pesticide use, resulting in curtailment of its occupied range.

Effects from overspray of pesticides are more pronounced in smaller patches next to agricultural fields (because they have more edges, which allows for increased chances of exposure) but the effects of pesticides could also affect larger habitat patches as well. In areas where riparian habitat borders agricultural lands, such as California's Central Valley, the lower Colorado River, Snake River, Gila River, Río Grande Valley, and rivers in northern Mexico, including the Sonora, Yaqui, Mayo, and Moctezuma, pesticide use indirectly affects western yellow-billed cuckoos by reducing prey numbers, or by poisoning nestlings if sprayed directly in areas where the birds are nesting (Laymon and Halterman 1987b, p. 23; Lehman and Walker 2001, p. 12). Accumulation of chlorinated hydrocarbon pesticides, particularly dichlorodiphenyltrichloroethane (DDT), has affected other bird species, particularly top predators (Robinson and Bolen 1989, pp. 269–275). Pesticides may affect behavior (for example, loss of balance) or cause death by direct contact. Laymon (1980, pp. 11–12) reported sublethal poisoning of young yellow-billed cuckoos caused by spraying active nests in walnut orchards in California.

Although DDT use has been banned in the United States since 1972, and in Mexico since 1999, yellow-billed cuckoos may be exposed to DDT in Mexico or on wintering grounds where DDT is still used despite any bans on its use. For example, yellow-billed cuckoos (most likely of the eastern population) collected during the spring and fall migration in Florida had unusually high concentrations of DDT, suggesting exposure on the wintering grounds in South America (Grocki and Johnston 1974, pp. 186–188). Analysis of two eggs collected in California in 1979 showed very low levels of dichlorodiphenyldichloroethylene (DDE), a stable metabolite of DDT, but eggshell fragments collected in 1985 from three nests along the South Fork Kern River in California averaged 19 percent thinner than pre-DDT era eggshells (Laymon and Halterman 1987b, pp. 22–23). DDT has caused eggshell thinning in other bird species, and this percentage of thinning in other species has allowed eggs to be crushed during incubation, but there is no information showing that yellow-billed cuckoo eggs have been crushed during incubation because of shell thinning.

A recent study in southern Sonora, Mexico, tested for the presence of a group of agricultural pesticides banned in the United States, known as organochlorine pesticides (beta-hexachlorocyclohexane (BHC), lindane, aldrin, endrin, b-endosulfan, methoxychlor, p, p0–DDE, p, p0-Dichlorodiphenyldichloroethane (DDD), p, p0–DDT). Collectively called OCPs, these pesticides are persistent in the environment and, therefore, have the potential to move long distances in surface runoff or ground water. Soil samples collected from 24 localities in the Yaqui and Mayo Valleys of southern Sonora, Mexico, watersheds in which the western yellow-billed cuckoo is known to breed, were found to have higher OCP levels than other regions of the world. The OCPs were predominantly DDT (Cantu-Soto *et al.* 2011, p. 559), despite its having been discontinued in Mexico in 1999 after decades of heavy use in agriculture and for malaria control (Yañez *et al.* 2004, p. 18). This finding may indicate recent applications of DDT in agricultural soils (Cantu-Soto *et al.* 2011, p. 559). Because of the proximity of habitat for yellow-billed cuckoos to these valleys and the prevalence of floodplain agriculture in northern Mexico, these pesticides, especially DDT, may be having widespread long-lasting effects on the western yellow-billed cuckoo. These include direct and indirect exposure through ingestion of contaminated prey items, and reduction in prey availability from direct exposure and pesticide runoff into habitat that supports western yellow-billed cuckoos.

In summary, pesticide use is widespread in agricultural areas in the western yellow-billed cuckoo breeding range in the United States and northern Mexico. Yellow-billed cuckoos are exposed to the effects of pesticides on their wintering grounds, as evidenced by DDT found in their eggs and eggshell thinning in the United States. Because much of the species' habitat is in proximity to agriculture, the potential exists for direct and indirect effects to a large portion of the species in these areas through altered physiological functioning, prey availability, and therefore, reproductive success, which ultimately results in lower population abundance and curtailment of the occupied range. While agricultural pesticides can kill prey of the yellow-billed cuckoo, and documentation exists of pesticide exposure in the wild, described above, no known data is available to determine specifically how often agricultural chemicals are affecting yellow-billed cuckoo prey availability, locations where it may be particularly significant, or the extent to which pesticides are responsible for population-level effects in the western yellow-billed cuckoo. However, based on the close proximity of agricultural areas to where the western yellow-billed cuckoo breeds, the threat is potentially significant.

Collisions With Communication Towers and Other Tall Structures

Yellow-billed cuckoos are vulnerable to collision with communication towers and other tall structures, particularly during their migration. For example, several hundred yellow-billed cuckoo mortalities were documented at a single television tower in Florida over a 29-year period (Crawford and Stevenson 1984, p. 199; Crawford and Engstrom 2001, p. 383), and at an airport ceilometer in the east (Howell *et al.* 1954, p. 212). Lesser numbers of yellow-billed cuckoos have been reported as killed at other sites with both television towers and wind turbines in Wisconsin, West Virginia, and northern Texas (Kemper 1996, p. 223; Schechter 2009, p. 1; Bird Watching 2011, p. 1), Although these mortalities were in the eastern segment of the population, with the number of tall towers that have been constructed in recent years in western United States, the potential exists for collisions with the western yellow-billed cuckoo. Without further study, we anticipate this to be a minor, but ongoing, effect to individual yellow-billed cuckoos, but in combination with all the other effects to this species, as described under Factors A and E, mortality from collision would have an additive effect to the threats facing the western yellow-billed cuckoo.

Conservation Efforts To Reduce Other Natural or Manmade Factors Affecting Its Continued Existence

Restoration of riparian habitat on the Colorado, Kern, and Sacramento Rivers and elsewhere will help reduce habitat fragmentation, small patch size, and overall lack of habitat. In some restoration plans, reduction of fragmentation is a stated goal, and restoration sites are planned for sites adjacent to existing habitat. The Colorado River riparian habitat restoration work is just beginning and is part of the Lower Colorado River Multi-Species Conservation Plan. This habitat conservation plan call for the creation of 5,940 ac (2405 ha) of riparian habitat of which 4,050 ac (1,640 ha) will be suitable for western yellow-billed cuckoos (Reclamation 2012, pp. 1–3). Restoration work began on the South Fork Kern River in California, in 1986. To date, 340 ac (138 ha) of riparian habitat have been restored (Audubon California 2012, pp. 1–10). Along the Sacramento River, the Sacramento River National Wildlife Refuge has implemented a riparian restoration program. Riparian habitat restoration activities have been conducted on 4,513 ac (1,826 ha) with 2,400 ac (738 ha) slated for additional restoration (Hammond 2011, p. 14). At present, restoration is being done on a relatively small scale in comparison to the need to reduce habitat fragmentation and increase the overall extent of suitable habitat.

DDT has been banned in the United States for several decades, which reduces the exposure of yellow-billed cuckoos to this pesticide. However, use of DDT south of the border in Central and South America continues, and the yellow-billed cuckoos are exposed during migration and winter.

To date, conservation efforts, though helpful, have been inadequate to significantly reduce the effects of these other natural or manmade factors affecting the western yellow-billed cuckoo.

Summary of Factor E

As noted in Factor A, habitat for the western yellow-billed cuckoo has been modified and curtailed, resulting in only remnants of formerly large tracts of native riparian forests, many of which are no longer occupied by western yellow-billed cuckoos. Despite recent efforts to protect existing, and restore additional, riparian habitat in the Sacramento, Kern, and Colorado Rivers, and other rivers in the range of the western yellow-billed cuckoo, these efforts offset only a small fraction of historical habitat that has been lost. Therefore, we expect the threat resulting from the combined effects associated with small and widely separated habitat patches to continue to affect a large portion of the range of the western yellow-billed cuckoo. This threat is particularly persistent where small habitat patches are in proximity to human-altered landscapes, such as near agricultural fields that dominate the landscape in many areas where the western yellow-billed cuckoo occurs. As a result, the potential exists for pesticides to directly affect (poisoning individual cuckoos) and indirectly affect (reducing the prey base) a large portion of the species. These effects could ultimately result in lower population abundance and curtailment of its occupied range. Mortality from collisions with tall structures is also an ongoing, but largely unquantified effect.

Effects From Factors A through E in Combination

Habitat loss and degradation occurs throughout the range of the western yellow-billed cuckoo (see Background section and Factor A above), and many of the threats under Factor A have worked and are working in combination to reduce the amount, configuration, and quality of the riparian habitat that remains. To provide a generalized example, the following scenario is not atypical for much of the species' range: Installation of a dam along a watercourse allows for increased agricultural and urban development downstream of the dam because of the reduced risk of flooding and increased assurance of available water for human uses. This development, as it expands through time, results in increased channelization of the watercourse and increased ground and surface water extraction. These activities affect the watercourse's hydrological regime and natural hydrologic functioning such that, through reduced flooding, changes in the watercourse's channel, and a lowered water table, the native riparian vegetation becomes stressed, woody debris accumulates, and few new native plants grow. This situation then allows for increased intensity and extent of wildfires (which, in riparian areas, often has a human ignition source, another indirect effect of development) and favors conditions that encourages the growth of nonnative plants. All of these actions result in a continued loss and degradation of native riparian vegetation, which occurs as smaller, more isolated (fragmented) patches that are less likely to adequately provide for the needs of the western yellow-billed cuckoo.

This array of Factor A threats, working in combination, creates the situation that then allows threats from the other listing factors to markedly affect the species. These other-factor threats may not be significant in and of themselves, but because they are not occurring in isolation they, in combination, are contributing to the population decline of the species. For example, as discussed in the Small and Widely Separated Habitat Patches section of Factor E, above, small habitat patches (resulting from the effects of Factor A threats) are more likely to have a larger number and a wider range of nest predators (see the Predation section of Factor C, above) because more nest predators occur in ecological edges. Additionally, habitat patches near areas of agricultural or urban development can foster higher densities of potential nest predators. Thus, any western yellow-billed cuckoo nesting in a small habitat patch near development may be subject to higher levels of nest predation and thus lower productivity. Moreover, the mere presence of certain nest predators in a habitat patch may elicit a behavioral response from yellow-billed cuckoos such that they do not even attempt to nest in such habitat

patches, even if other aspects of the habitat would suggest that it is suitable for nesting.

Similarly, riparian habitat patches that occur near urban and agricultural development may be subject to intentional or accidental pesticide spraying, as discussed in the Pesticide section under Factor E. This spraying would be unlikely to occur but for the habitat patch's proximity to development. This development likely occurs close to the riparian habitat through a process similar to the generalized scenario described above (see also specific details under Factor A).

Much of the available habitat is now in small patches with only a relatively few patches regularly occupied by nesting western yellow-billed cuckoos. Thus, the species' intolerance of small patch size in combination with extensive habitat loss has resulted in much less suitable habitat and a greatly reduced western yellow-billed cuckoo population size. In areas at the edge of the western yellow-billed cuckoo's current range (e.g. the Sacramento River) restoration of riparian habitat has not been accompanied by an increase in the species' population indicating that other factors may be limiting the population in those areas. Moreover, because (1) western yellow-billed cuckoos need riparian habitat in a range of ages, including older, more structurally diverse areas for nesting, and (2) nearly all of the areas where riparian habitat could grow in western North America are modified by dams, channelization, water extraction, and other activities that disrupt natural processes to allow good-quality riparian habitat to grow in a mosaic of different ages (see Factor A), and climate change is likely to further add to these impacts, it is unlikely that large areas of suitable habitat will naturally regenerate within the range of the species into the future.

Proposed Determination

We have carefully assessed the best scientific and commercial data available regarding the past, present, and reasonably anticipated future threats to the western yellow-billed cuckoo. Threats to the western yellow-billed cuckoo exist for two of five threat factors. Threats also occur in combination, resulting in synergistically greater effects.

Factor A threats result from habitat destruction, modification, and degradation from dam construction and operations, water diversions, riverflow management; stream channelization and stabilization; conversion to agricultural uses, such as crops and livestock grazing; urban and transportation infrastructure; and increased incidence of wildfire. Continuing ramifications of actions that caused habitat loss in the past have resulted in ongoing curtailment of the habitat of the yellow-billed cuckoo western DPS throughout its range. These factors also contribute to fragmentation and promote conversion to nonnative plant species, particularly tamarisk. The threats affecting western yellow-billed cuckoo habitat are ongoing and significant and have resulted in curtailment of the range of the species. Loss of riparian habitat leads not only to a direct reduction in yellow-billed cuckoo numbers but also leaves a highly fragmented landscape, which in combination with other threats (see below), can reduce breeding success through increased predation rates and barriers to dispersal by juvenile and adult yellow-billed cuckoos.

Factor E threats, including habitat rarity and small and isolated population sizes cause the remaining yellow-billed cuckoo populations to be increasingly susceptible to further declines through lack of immigration, reduced populations of prey species (food items), pesticides, and collisions with tall vertical structures during migration. The serious and ongoing threat of small overall population size, which is the result of other threats in combination, leads to an increased chance of local extirpations.

The threats that affect the western yellow-billed cuckoo are important on a threat-by-threat basis, but are even more significant in combination. Habitat loss has been extensive throughout the range of the western yellow-billed cuckoo. The remaining riparian habitat is fragmented into small patches, which the species does not normally select as breeding habitat. Additionally, the western yellow-billed cuckoos need riparian habitat in a range of ages, including older structurally diverse areas for nesting. This diversity of tree ages within the riparian vegetation (the DPS's habitat) is largely dependent on disturbances that affect some but not all of vegetation within that habitat patch at one time. A number of threats, working in combination or individually, prevent this from happening, now and will continue to do so in the future.

For example, dams and other flood control modifications to a watercourse may prevent floods from being severe enough to affect that habitat patch; channelization may restrict floodwaters to a narrow channel, allowing floodwaters to cause too much damage to habitat within the channel and not enough (or no) damage to habitat outside the channel; altered flood regimes may allow dead wood to accumulate, allowing fires, when they occur, to be severe and affect most of the patch; development and other human activities next to habitat patches may allow more wildfires to be ignited; and the reduction in patch size, through neighboring development, alteration of hydrology, or encroachment by nonnative plants, makes it more likely that a larger proportion of that patch will be affected during any given disturbance event. Moreover, nearly all areas where riparian habitat could potentially grow are modified by dams or water withdrawal and disrupted by other activities, often in combination, that prevent the reestablishment of riparian habitat. Patch size, when coupled with habitat loss and Factor C and E threats, including proximity to incompatible land uses which increases exposure to predators and pesticides, is a significant cumulative threat to the western yellow-billed cuckoo now and in the future.

Per section 4(b)(1)(A) of the Act, prior to making our determination, we must first ''[take] into account those efforts, if any, being made by any State or foreign nation, or any political subdivision of a State or foreign nation, to protect such species, whether by predator control, protection of habitat and food supply, or other conservation practices, within any area under its jurisdiction, or on the high seas.'' Restoration of riparian habitat on the Colorado, Kern, and Sacramento Rivers and elsewhere will help reduce habitat fragmentation, small patch size, and overall lack of habitat. Moreover, at present, restoration is being done on a relatively small scale in comparison to the need to reduce habitat fragmentation and increase the overall extent of suitable habitat. DDT has been banned in the United States for several decades, but use of DDT continues in Central and South America, thus exposing western yellow-billed cuckoos during migration and winter.

Through our analysis of the best available scientific and commercial information on the abundance, life history, current population status and trends, and the response of the species and its habitat to natural and anthropogenic threats, we have determined that the western yellow-billed cuckoo DPS meets the definition of threatened under the Act, rather than endangered. The Act defines an endangered species as any species that is ''in danger of extinction throughout all or a significant portion of its range'' and a threatened species as any species ''that is likely to become endangered

throughout all or a significant portion of its range within the foreseeable future.'' Our general understanding of an ''endangered'' species is one that is currently on the brink of extinction in the wild.

The geographic extent of the western yellow-billed cuckoo remains rather widespread through much of its historic range, conferring some measure of ecological and geographic redundancy and resilience. Although there is a general decline in the overall population trend and its breeding range has been reduced, the rate of the population decline and contraction of its breeding range is not so severe to indicate extinction is imminent for the western yellow-billed cuckoo. This current downward trend is slow and not expected to increase in the near future. The majority of large-scale habitat losses and conversions through dam building and agricultural development have already occurred, and we are not aware of any large-scale projects that would affect the species to the extent that the current trend of decline would change. Therefore, threats to the species and population declines do not currently reach the level typical of an endangered species.

Because the western yellow-billed cuckoo does not face any known sudden and calamitous threats, it is not a narrowly endemic species vulnerable to extinction from elevated or cumulative threats, is not yet restricted to a critically small range or critically low numbers, and currently does not show any substantial reduction in numbers, it would not meet the definition of ''endangered'' as determined by the Act. More appropriately, we find that the western yellow-billed cuckoo is likely to become endangered throughout all or a significant portion of its range within the foreseeable future, based on the timing, severity, and scope of the threats described above. Therefore, on the basis of the best available scientific and commercial information, we propose listing the western yellow-billed cuckoo DPS as threatened in accordance with sections 3(6), 3(20), and 4(a)(1) of the Act.

Under the Act and our implementing regulations, a species may warrant listing if it is threatened or endangered throughout all or a significant portion of its range. The western yellow-billed cuckoo proposed for listing in this rule is highly restricted to riparian habitat, and the threats to the species and its habitat occur throughout its breeding range. Therefore, we assessed the status of the western yellow-billed cuckoo throughout its entire breeding range. The threats to the survival of the species occur throughout the western DPS' breeding range and are not restricted to any particular significant portion of that range. We conclude that what affects the entire breeding portion of the western DPS' range affects the status of the entire western yellow-billed cuckoo throughout its breeding range, including migration corridors and stopover areas. Accordingly, our assessment and proposed determination applies to the western yellow-billed cuckoo throughout its entire breeding range.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness and conservation by Federal, State, tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States, and requires that recovery actions be carried out for all listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act requires the Service to develop and implement recovery plans for the conservation of endangered and threatened species, unless the Secretary finds that such a plan will not promote the conservation of the species. The recovery planning process involves the identification of actions necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed, preparation of a draft and final recovery plan, and revisions to the plan as significant new information becomes available. The recovery outline indicates the species recovery number, whether or not a recovery plan will be prepared and the estimated date of completion, whether a recovery team will be appointed, and what immediate actions are anticipated to conserve the species. The recovery plan identifies site-specific management actions that will achieve recovery of the species, measurable criteria that determine when a species may be downlisted or delisted, and methods for monitoring the recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, and any draft recovery plan, or final recovery plan, subsequently developed, will be available on our Web site (*http://www.fws.gov/endangered*) or from our Sacramento Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (for example, restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and tribal lands.

If this species is listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost-share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the States of California, Nevada, Arizona, New Mexico, Texas, Colorado, Wyoming, Idaho, Washington, and Oregon would be eligible for Federal funds to implement management actions that promote the protection and recovery of the western yellow-billed cuckoo. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants.*

Although the western yellow-billed cuckoo is only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for

recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may adversely affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

Federal agency actions within or affecting the species' habitat that may require conference or consultation or both as described in the preceding paragraph include, but are not limited to, projects that will result in removal or degradation of riparian vegetation, altered streamflow or fluvial dynamics, or other habitat-altering activities on Federal lands or as a result of issuance of section 404 CWA permits by the USACE; construction and management of energy and power line rights-of-way by the FERC; construction and maintenance of roads, highways, or bridges by the Federal Highway Administration; grazing leases by the USFS or the BLM; and projects funded through Federal loan programs. Such projects may include, but are not limited to, construction or modification of reservoirs, levees, bank stabilization structures, water diversion and withdrawal projects, roads and bridges, utilities, recreation sites, and other forms of development, and livestock grazing.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. The prohibitions of section 9(a)(2) of the Act, codified at 50 CFR 17.21 for endangered wildlife, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these), import, export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. Under the Lacey Act (18 U.S.C. 42–43; 16 U.S.C. 3371–3378), it is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered species, and at 50 CFR 17.32 for threatened species. With regard to endangered wildlife, a permit must be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities.

Our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), is to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effects of a proposed listing on proposed and ongoing activities within the range of species proposed for listing. The following activities could potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of western yellow-billed cuckoos in the range of the western DPS, including import or export across State lines and international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act.

(2) Intentional introduction of nonnative species that compete with or prey upon western yellow-billed cuckoos in the range of the western DPS, or degrade its habitat, including the intentional introduction of nonnative vegetation, which may include, but is not limited to, tamarisk, Russian olive, and giant reed.

(3) Unauthorized destruction or alteration of western yellow-billed cuckoo habitat from alteration of the hydrology or fluvial geomorphic processes that include, but are not limited to, channelization, impoundment, bank stabilization, water extractions and diversions, and channel clearing along any watercourse in which the western yellow-billed cuckoo is known to occur.

(4) Unauthorized activities that result in removal, destruction, or degradation of riparian vegetation from actions that include, but are not limited to, streamside clearings, prescribed fire, off-road vehicle use, human trampling, tree harvesting, and intensive livestock grazing along any watercourse in which the western yellow-billed cuckoo is known to occur.

(5) Unauthorized use of pesticides that would reduce insect prey populations within or immediately adjacent to riparian areas in which the western yellow-billed cuckoo is known to occur.

In California, if the western yellow-billed cuckoo is listed under the Federal Endangered Species Act, the CESA (California Fish and Game Code, § 2050 et seq.) is automatically invoked, which would also prohibit take of these species and encourage conservation by California State government agencies. Further, the State may enter into agreements with Federal agencies to administer and manage any area required for the conservation, management, enhancement, or protection of endangered species. Funds for these activities could be made available under section 6 of the Act (Cooperation with the States). Thus, the Federal protection afforded to this species by listing it as a threatened species would be reinforced and supplemented by protection under State law.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Sacramento Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**). Requests for copies of the regulations concerning listed animals and general inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Endangered Species Permits, 2800 Cottage Way, Room W–2605, Sacramento, CA 95825 (telephone at 916–414–6600; facsimile at 916–414–6712).

Peer Review

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our critical habitat designation is based on scientifically sound data, assumptions, and analyses. We have invited these peer reviewers to comment

during the public comment period on our specific assumptions and conclusions in this proposed rule.

We will consider all comments and information received during the comment period on this proposed rule during our preparation of a final determination. Accordingly, the final decision may differ from this proposal.

Public Hearings

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received within 45 days after the date of publication of this proposed rule in the **Federal Register**. Such requests must be sent to the address shown in the **FOR FURTHER INFORMATION CONTACT**. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing.

Required Determinations

Clarity of the Rule

Executive Order 12866 requires each agency to write regulations that are easy to understand. We invite your comments on how to make this rule easier to understand including answers to questions such as the following: (1) Are the requirements in the rule clearly stated? (2) Does the rule contain technical language or jargon that interferes with its clarity? (3) Does the format of the rule (grouping and order of sections, use of headings, paragraphing, etc.) aid or reduce its clarity? (4) Would the rule be easier to understand if it were divided into more (but shorter) sections? (5) Is the description of the rule in the **SUPPLEMENTARY INFORMATION** section of the preamble helpful in understanding the rule? What else could we do to make the proposed rule easier to understand?

Send a copy of any comments that concern how we could make this proposed rule easier to understand to Office of Regulatory Affairs, Department of the Interior, Room 7229, 1849 C Street NW., Washington, DC 20240. You also may email the comments to this address: *Exsec@ios.goi.gov.*

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This rule does not contain any new collections of information that require approval by OMB under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), need not be prepared in connection with regulations pursuant to section 4(a) of the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A complete list of references cited in this rulemaking is available on the Internet at *http://www.regulations.gov* and upon request from the Sacramento Fish and Wildlife Office (see **ADDRESSES** for contact information).

Authors

The primary authors of this document are the staff members of the Sacramento Fish and Wildlife Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as follows:

PART 17—[AMENDED]

■ 1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 1531–1544; 4201–4245; unless otherwise noted.

■ 2. Amend § 17.11(h) by adding an entry for ''Cuckoo, yellow-billed (Western DPS) to the List of Endangered and Threatened Wildlife in alphabetical order under Birds, to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic Range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*	*	
BIRDS							
*	*	*	*	*	*	*	
Cuckoo, yellow-billed (Western DPS).	*Coccyzus americanus.*	U.S.A., Canada, Mexico.	U.S.A. (AZ, CA, CO (western), ID, MT (western), NM (western), NV, OR, TX (western), UT, WA, WY (western)), Canada (British Columbia), Mexico (Baja California, Baja California Sur, Chihuahua, Durango (western), Sinaloa, Sonora)).	T		NA	NA

Species		Historic Range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*		*
*	*	*	*	*	*		*

* * * * *

Dated: September 19, 2013.

Dan Ashe,

Director, U.S. Fish and Wildlife Service.

[FR Doc. 2013–23725 Filed 10–2–13; 8:45 am]

BILLING CODE 4310–55–P