TECHNICAL ANALYSIS FOR THE PETITION TO DELIST THE WESTERN DISTINCT POPULATION SEGMENT OF THE YELLOW-BILLED CUCKOO

May 3, 2017

WestLand Resources

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Petitioners American Stewards of Liberty, Inc., Arizona Cattlemen's Association, Arizona Mining Association, Hereford Natural Resource Conservation District, Jim Chilton, National Cattlemen's Beef Association, Public Lands Council, WestLand Resources, Inc. (WestLand), and Winkelman Natural Resource Conservation District have submitted this petition to delist the threatened western Distinct Population Segment (DPS) of the Yellow-billed Cuckoo (YBCU; *Coccyzus americanus*) to the U.S. Fish and Wildlife Service (USFWS) pursuant to section 4 of the Endangered Species Act (ESA) of 1973, as amended.[1] This document contains the technical analysis for the petition.

Since listing of the western DPS of the YBCU in 2014, under the name *Coccyzus americanus,* a substantial amount of new scientific and commercial information has become available that demonstrates that western populations of YBCU are not a discrete and significant DPS and that regardless of the validity of the western DPS, threats to the DPS do not rise to the level that protection under the ESA is warranted. The listing, therefore, was in error, as this Petition presents both new, substantial information that listing was never appropriate as well as new analysis of prior existing data to that effect. We request that the Secretary of the Interior (Secretary), acting by and through the USFWS, evaluate this petition to delist the western DPS of YBCU based on the best available scientific and commercial data pursuant to section 4 of the ESA.

In accordance with USFWS DPS policy, three elements are considered in a decision regarding the status of a possible DPS as threatened or endangered (USFWS 1996): (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 (i.e., is the population segment, when treated as if it were a species, endangered or threatened?)." New information and analysis presented in this petition demonstrate that western populations of YBCU are neither discrete from nor significant to other populations of YBCU. As such, the listing of the purported western DPS of YBCU was in error, as the so-called DPS is not a valid entity for listing under the ESA.

New survey data that have become available since the publication of the final rule to list YBCU have expanded our understanding of what is suitable habitat for YBCU in the Southwest. As a result, we now know that the amount of suitable habitat for western populations of YBCU is substantially more than was acknowledged by USFWS in the analysis used to support listing of the purported DPS. Because USFWS determined that the threats to the purported DPS were solely a function of impacts to YBCU habitat, the analysis of threats to the species severely overstated the potential impacts to YBCU. Consequently, these new survey data not only expand our knowledge of habitat

[1] Notice of intent to file this petition was provided to the State agencies responsible for the management and conservation of fish and wildlife resources in each State where the western DPS of the YBCU currently occurs. Copies of the notification letters and/or electronic communications are provided in **Enclosure 3** of this petition.

impacts to YBCU. Consequently, these new survey data not only expand our knowledge of habitat use by YBCU in the Southwest, but indicate that the threats analyzed by USFWS do not rise to the level that listing of the purported DPS is necessary or legally appropriate.

Pursuant to ESA section 4(b)(3)(A), the question USFWS must determine at this stage is "whether the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted." This is a relatively low-threshold burden of proof. For the purposes of this decision, "'substantial scientific or commercial information' refers to credible scientific or commercial information in support of the petition's claims such that a reasonable person conducting an impartial scientific review would conclude that the action proposed in the petition may be warranted. Conclusions drawn in the petition without the support of credible scientific or commercial information will not be considered 'substantial information." 50 C.F.R. § 424.14(i).

Below, we provide an overview of the biology and regulatory history of the purported western DPS of YBCU. We then discuss the new scientific data and analyses that have become available since the listing of the proposed DPS and justification for the petitioned action.

2. DELISTING CRITERIA, PROCESS, AND HISTORICAL PRECEDENTS

Removing a species from the list of endangered and threatened species (i.e., delisting) may occur after achieving recovery, when a species is considered to be extinct, or when new data or analyses indicate that the original listing was in error. In the case of the purported western DPS of YBCU, new data and analyses presented herein indicate that the original listing of this species was in error. New genetic and morphological data and analyses provide evidence that USFWS' analyses of the discreteness and significance of the purported western DPS was incomplete and in error. Further, new data on habitat use by YBCU in the Southwest indicate that USFWS significantly underestimated the amount of suitable habitat for the species across the Southwest in its listing analysis and that the presumed threats to the species from impacts to habitat are overstated.

ESA section 4 provides the USFWS with the authority to remove species from the list of endangered and threatened species, and the statutory criteria for whether a species warrants protection under the ESA apply equally whether the USFWS is deciding to list, delist, or revise a species' listing status. 16 U.S.C. §§ 1533(a)(1), (b)(3), (c)(2). The ESA establishes five listing factors the USFWS must consider in making any listing status determination, one or more of which factors must be satisfied for a species to warrant listing: (1) the present or threatened destruction, modification, or curtailment of habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; and (5) other natural or manmade factors affecting the species' existence. *Id.* § 1533(a)(1); *see also* 50 C.F.R. §§ 424.11(c)–(d); *Friends of Blackwater v. Salazar*, 691 F.3d 428, 432 (D.C. Cir. 2012) (stating that ESA section 4(c) makes clear that a decision to delist "shall be made in accordance" with the same five factors). The USFWS is required to make all listing determinations "solely on the basis of the best scientific and commercial data available." 16 U.S.C. § 1533(b)(1)(A); 50 C.F.R. § 424.11(b). Finally, the ESA directed the USFWS to publish guidelines outlining the criteria for making findings on the petition of an interested person to list, delist, or reclassify a species, and these regulations were revised in 2016. 16 U.S.C. § 1533(h)(2); Revisions to the Regulations for Petitions, 81 Fed. Reg. 66462 (Sept. 27, 2016) (codified at 50 C.F.R. § 424.14).

USFWS regulations provide that a species may be delisted only if the best scientific and commercial data available substantiates that the species is neither endangered nor threatened based upon one or more of the following reasons: (1) extinction; (2) recovery; or (3) the original data for listing classification, or interpretation of such data, was in error. 50 C.F.R. § 424.11(d). The third, independent basis for delisting provided by regulation—"Original data for classification in error"—includes the following explanation: "Subsequent investigations may show that the best scientific or commercial data available when the species was listed, or the interpretation of such data, were in error." *Id.* § 424.11(d)(3). Therefore, delisting may be warranted if the analysis of new information or a reanalysis of the original information indicates that the existence or magnitude of threats to the species, or both, do not support a conclusion that the species is at risk of extinction now or in the foreseeable future. Thus, where the best current scientific information supports a conclusion that the scientific basis for the original listing was erroneous, and where the data substantiate that the species is neither threatened nor endangered based on the five listing criteria, delisting is warranted. *Id.* §§ 424.11(c)–(d).

Species recovery is another independent basis for delisting, and while the ESA directs the USFWS to prepare recovery plans for any listed species, 16 U.S.C. § 1533(f), it is well established that recovery plans are advisory and that species may qualify for delisting even where the recovery plan's goals are not achieved. *Fund for Animals v. Rice*, 85 F.3d 535, 547–48 (11th Cir. 1996) (holding that "recovery plans are for guidance purposes only" and that they are "not a document with the force of law divesting all discretion and judgment from the [USFWS]"); *Friends of Blackwater v. Salazar*, 691 F.3d at 434 (holding that a recovery plan is not binding on the USFWS in its delisting decision and that the USFWS reasonably relied on the current, best scientific data available). The ESA, USFWS, and courts have consistently understood that recovery and error in listing are two distinct bases upon which a delisting may be deemed warranted.

The ESA requires delisting petitions to present "substantial scientific or commercial information indicating that the petitioned action may be warranted" in order for the Service to reach positive 90-day and 12-month findings on the petitioned action. 16 U.S.C. § 1533(b)(3). New regulations finalized by USFWS in 2016 somewhat revised the definition of the "substantial information" standard, stating:

> "[S]ubstantial scientific or commercial information" refers to credible scientific or commercial information in support of the petition's claims such that a reasonable person conducting an impartial scientific review would conclude that the action proposed in the

> petition may be warranted. Conclusions drawn in the petition without the support of credible scientific or commercial information will not be considered "substantial information."
>
> The "substantial scientific or commercial information" standard must be applied in light of any prior reviews or findings the Services have made on the listing status of the species that is the subject of the petition. Where the Services already conducted a finding on, or review of, the listing status of that species (whether in response to a petition or on the Services' own initiative), the Services will evaluate any petition received thereafter seeking to list, delist, or reclassify that species to determine whether a reasonable person conducting an impartial scientific review would conclude that the action proposed in the petition may be warranted despite the previous review or finding. *Where the prior review resulted in a final agency action, a petitioned action generally would not be considered to present substantial scientific and commercial information indicating that the action may be warranted unless the petition provides new information not previously considered.*

50 C.F.R. §§ 424.14(h)(1)(i)–(ii) (emphasis added). In the preamble to the final rule establishing requirements for ESA petitions, the USFWS reiterated that:

> In the case of prior reviews *that led to final agency actions* (such as final listings, 12-month not warranted findings, and 90-day not-substantial findings), a petition generally would not be found to provide substantial information unless the petition provides new information *or a new analysis or interpretation not previously considered in the final agency action*. By "new" we mean that the information was not considered by the Services in the prior determination *or that the petitioner is presenting a different interpretation or analysis of the data*.

81 Fed. Reg. at 66480 (emphasis added). This "new information" standard—applicable only where the prior USFWS review resulted in a final agency action challengeable under the Administrative Procedure Act ("APA"), 5 U.S.C. ch. 7—is further clarified in the preamble, where the USFWS stated:

> In conducting status reviews, the Services may reevaluate data they already considered in previous status reviews. Petitioners may similarly present a new analysis of existing data in support of their requests, and the Services will evaluate such requests on that basis. A petitioned request could be based on discovery of an error in research regarding information previously considered by the Services.
>
> Unless such a petition provides different data, or a different analysis or interpretation of, or errors discovered in, the data, model or analytic methodology used in a previous finding, review, or determination, the conclusions may be the same, and the Services may

> find that such a petition does not provide substantial information indicating that the petitioned action may be warranted.
>
> We make the distinction that, in the case of prior reviews that led to final agency actions (such as final listings, 12-month not-warranted findings, and 90-day not-substantial findings), a petition would generally be presumed not to provide substantial information unless the petition provides new information or a new analysis not previously considered in the final agency action. On the other hand, if the previous status review did not result in a final agency action, the petition would not be required to overcome the presumption that, unless it includes information or analysis that was not considered in the previous status review, it generally will not present substantial information indicating that the petitioned action may be warranted.

Id. at 66474. The USFWS further explained that, for example, a completed 5-year status review is not in itself a final agency action. *Id.* at 66480. Finally, the USFWS explained the relationship between the "new information" requirement and judicial reviewability of final agency actions, stating:

> This rule will not limit the ability to file delisting or other petitions. In cases where petitioners request an outcome that differs from the outcome reached in a previous Service finding or determination, the rule simply recognizes that the courts apply a presumption that agency actions are valid and reasonable, and therefore the petitioner should provide new or additional information or a new analysis not previously considered. We add this requirement [of new information or analysis] to prevent the petition process from being used inefficiently—in effect, to voice disagreement with a previous determination by one of the Services without providing any new information or analysis relevant to the question at issue, *and instead of using the appropriate judicial forum to challenge the previous determination directly. An appropriate showing may include an explanation of how information used in the previous analysis was misused, misrepresented, or misinterpreted.* Also, this rule does not prevent a petitioner from requesting a delisting of a listed entity based on error in classification of that listed entity.

Id. (emphasis added). Thus, it is only in the instance where a prior USFWS decision regarding a species' listing status is a final agency action challengeable under the APA that "new information" is required in a delisting petition, and the concept of "new information" includes new interpretations or analyses of already-considered information. Therefore, if the USFWS publishes a new or revised recovery plan, or if the USFWS conducts a 5-year status review that results in no final agency action, a delisting petition is not required to present new information or analysis in order to meet the substantial information standard. In sum, listing in error can be demonstrated through any information or analysis arising since the original listing decision. This statement of the law is consistent with the ESA, concomitant regulations, and the USFWS' 2016 interpretation and explanation of those regulations.

3. YBCU SPECIES OVERVIEW

YBCU is a neotropical migrant bird that winters in South America and breeds in North America during the summer (USFWS 2014b). Its breeding range includes most of North America, from Canada south to Mexico. The purported western DPS is reportedly widespread and locally common in Arizona, locally common in some areas in California and New Mexico, uncommon in western Colorado, western Wyoming, Idaho, Nevada, and Utah, and rare to absent in Oregon, Washington, and British Columbia. The winter range of this population is poorly known, but the species is known to use South America, east of the Andes, as a winter range. Migration routes are also poorly known, but this population generally moves in a northwest/southeast direction, and there may be co-mingling with YBCU from eastern populations during migration (USFWS 2013). Members of the western populations of YBCU are thought to arrive at breeding grounds later than members of eastern populations (USFWS 2013, 2014b). However, YBCU that breed in the Southwest are also known to migrate first to areas occupied by breeding eastern YBCU before flying to areas in the Southwest to breed (Sechrist 2012), indicating that there is no physical barrier that markedly separates eastern and western populations. Indeed, both mitochondrial and nuclear genetic markers fail to support a conclusion that western YBCUs are different in genetic characteristics from eastern populations, and the high levels of gene flow indicated by both mitochondrial and nuclear markers, show that there is no substantive geographical barrier between YBCUs breeding west or east of the DPS boundary that biologically separates these populations (see **Section 5.1** for a complete discussion of available genetic data).

The USFWS concluded that the population of the purported western DPS of the YBCU has declined by several orders of magnitude over the past 100 years. The USFWS estimated that the current breeding population of the western DPS of the YBCU is low, with approximately 350 to 495 pairs in the United States and 330 to 530 pairs south of the Mexican border, totaling 680 to 1,025 breeding pairs (USFWS 2013). Substantial issues with the interpretation of historical data of YBCU populations and the direct comparison by USFWS of data collected using vastly different sampling protocols to claim that YBCU have declined severely are discussed in depth by WestLand (2013b).

4. REGULATORY HISTORY OF THE WESTERN YBCU

4.1. PETITIONS TO LIST THE WESTERN YBCU

The western populations of the YBCU were originally petitioned to be listed under the ESA in 1986 in the states of California, Washington, Oregon, Idaho, and Nevada. A 90-day finding by the USFWS determined that substantial information was presented by the petition such that further review was warranted (USFWS 1987). The USFWS issued a 12-month finding of "not warranted" because there was no genetic or morphological evidence to indicate that YBCU in the West were a distinct subspecies, and YBCU in the states referenced above could not be considered a DPS because birds in adjoining states, including Arizona, were *part of the same population* (USFWS 1987).

The Center for Biological Diversity (CBD), among others, re-petitioned for the YBCU to be listed under the ESA and argued that the species was endangered in a significant portion of its range and that this range in the West was synonymous with the range of the purported western subspecies (Southwest CBD 1998). This petition received a positive 90-day finding in 2000 (USFWS 2000).

4.2. 12-Month Finding for a Petition to List the YBCU (2001)

In 2001, USFWS determined that YBCU populations west of the Rocky Mountains constitute the western DPS of the species and that listing of the YBCU DPS was warranted but precluded by higher listing priorities (USFWS 2001a). This conclusion was based entirely on USFWS' description of breeding habitat for YBCU in the Southwest and the perceived threats to habitats of this description.

USFWS concluded that YBCUs that constitute the purported western DPS "appear to require large blocks of riparian habitat for nesting," particularly "woodlands with cottonwoods and willows" (USFWS 2001a, pg. 38613). In fact, USFWS (2001a, pg. 38616) concluded that "nesting west of the Continental Divide occurs almost exclusively close to water…and the species may be restricted in nesting in moist river bottoms in the west."

The conclusion that listing was warranted was based almost exclusively on threats to large blocks of riparian woodland. USFWS described losses of 90 to 99 percent of riparian habitat in the West as the main threat to the purposed DPS, focusing on reductions of riparian habitat in "major lowland riparian habitat," "bottomland riparian forests," loss of "cottonwood-willow riparian forest that has had widespread impact on the distribution and abundance of bird species," and "manipulation of perennial rivers and streams" (USFWS 2001a, pg. 38623).

4.3. Annual Reviews of Candidate Species (2001, 2002, 2004, 2005)

Annual status reviews by USFWS of the purported western DPS of YBCU continued to assume that habitat was restricted to large riparian forests and that threats to this type of habitat warranted listing of the species. USFWS (2001b, 2002, 2004, 2005) stated that "90 percent of the bird's riparian (streamside) habitat in the West has been lost or degraded" and concluded that "these modifications, and the resulting decline in the distribution and abundance of yellow-billed cuckoos throughout the western States, is believed to be due to conversion to agriculture; grazing; habitat degradation by competition from nonnative plants, such as tamarisk; river management, including altered flow and sediment regime; and flood control practices, such as channelization and bank protection."

4.4. ANNUAL REVIEWS OF CANDIDATE SPECIES (2006)

In 2006, the USFWS provided additional details on breeding habitat for the purported western DPS that focused solely on large areas of riparian woodland consisting of cottonwoods and willows. In its review of candidate species, USFWS (2006) explicitly restricted the consideration of suitable habitat for YBCU in western North America to "large blocks of riparian habitats (particularly woodlands with cottonwoods [*Populus fremontii*] and willows [*Salix* sp.])" (USFWS 2006, pg. 53779). Threats that warranted listing of the purported DPS included most of the those identified in previous annual reviews, but conspicuously added livestock impacts to the specific lowland riparian woodland plants, willows and cottonwoods, as "one of the most common causes of riparian degradation" (USFWS 2006, pg. 53780).

4.5. PROPOSED RULE TO LIST THE WESTERN DPS OF THE YELLOW-BILLED CUCKOO AS THREATENED (2013)

On October 3, 2013, USFWS published a proposed rule to list the western DPS of the YBCU as threatened under the ESA (USFWS 2013). USFWS (2013) concluded that western populations of YBCU are discrete from other populations of YBCU, are significant to the species as a whole, and that the DPS, when treated as a species, was likely to become endangered within the foreseeable future.

The analyses provided by USFWS (2013) relied heavily on the assumption that, despite a lack of genetic evidence that eastern and western YBCU populations differ, differences in morphology and migratory timing can only have occurred through evolved differences between populations and are strong evidence that the genetic characteristics of the purported western DPS differ markedly from eastern populations of YBCU. These assumed differences in genetic characteristics are used by USFWS in reaching the conclusion that the purported western DPS is both discrete from other populations of YBCU and significant to the species as a whole (USFWS 2013, pg. 61628-61629). USFWS implied that, although there is no genetic evidence to support genetic differentiation between eastern and western populations, additional genetic studies using more variable nuclear microsatellite markers would support its conclusion that differences in morphological and behavioral traits reflect marked differences in genetic characteristics between eastern and western populations of YBCU (USFWS 2013, pg. 61625). As discussed in detail in WestLand (2013b), differences between eastern and western populations of YBCU in every morphological and behavioral trait brought forth by USFWS (2013) can be explained by phenotypic plasticity or environmental factors that are not a consequence of genetic differentiation.

Of particular importance to the argument presented in USFWS (2013) that morphology reflects genetic differences between eastern and western populations of YBCU is the assumption that variation in body size of YBCU is not clinal between or within western and eastern populations (USFWS 2013, pg. 61629). Rather, USFWS implied that there is an abrupt increase in body size at the eastern boundary of the purported DPS that is sufficient to conclude that the DPS is markedly different in its genetic characteristics from other YBCU populations. Evidence of clinal variation in morphological traits as is presented below weakens this argument and provides evidence to suggest that morphological variation in these traits is due to environmental factors rather than marked genetic differences between YBCU populations.

The habitat types used by western YBCUs played a major role in USFWS' (2013) analysis of the discreteness, significance, status, and threats to the purported western DPS of YBCU. USFWS (2013) concluded that a difference in habitat use between western and eastern YBCU is evidence that the western populations of YBCUs are discrete from other populations (USFWS 2013, pg. 61628). USFWS (2013) also contended that this difference in habitat use is a genetically-controlled trait that supports the conclusion that eastern and western YBCUs differ markedly in genetic characteristics (USFWS 2013, pg.61628). In particular, the analysis of threats to western YBCU habitat in USFWS (2013) relied heavily on the assumption that western YBCUs occur mostly in large tracts of lowland riparian woodland. YBCU habitat is described by USFWS (2013) as "low to moderate elevation riparian woodlands that cover 50 acres (ac) (20 hectares [ha]) or more within arid to semiarid landscapes (Hughes 1999)" (USFWS 2013, pg. 61633). USFWS (2013) concluded that large tracts of riparian vegetation dominated by cottonwood are particularly important to YBCU (USFWS 2013, pgs. 61633-61634). Although USFWS (2013) does reference other studies that report western YBCU breeding, or potentially breeding, in tropical deciduous forest, thornscrub, desertscrub, and upland Sonoran desert communities, the implications of these data are neither acknowledged nor incorporated into analyses of threats to the purported DPS.

The implications of this habitat description and the clear focus on large blocks of cottonwood-willow vegetation in bottomland river systems is particularly evident in the analysis of threats to the purported DPS. USFWS (2013) proposed listing of the purported western DPS of YBCU based on two threats:

1) The present or threatened destruction, modification, or curtailment of its habitat or range; and
2) Other natural or manmade factors affecting its continued existence, including the rarity of habitat for the species.

The analysis of both of these threats relied on specific examples of impacts to large riverine systems that support or supported substantial areas of riparian woodland habitat dominated by cottonwoods and willows.

4.6. FINAL RULE TO LIST THE WESTERN DPS OF YBCU AS THREATENED (2014)

On October 3, 2014, the USFWS published a final rule to list the purported western DPS of the YBCU as threatened (USFWS 2014b). The discussion of the role that genetic and morphological differences play in the analysis of the discreteness and significance of the DPS changed little from that provided by USFWS (2013); the discreteness and significance of the DPS is largely dependent on morphological and behavioral differences that are assumed to be genetic characteristics while genetic data reportedly played no role in the conclusions of USFWS (2014b). However, USFWS implied that genetic studies using microsatellite markers would likely detect genetic differences between eastern and western populations of YBCU. In the discussion and interpretation of available genetic data to support separation of eastern and western populations of YBCU, USFWS (2014b) also included a notable addition to its analysis. USFWS (2014b) stated that the available genetic data "show that western yellow-billed cuckoos have developed unique genetic haplotypes not present in eastern cuckoos and that these are reflected in phenotypic (outwardly visible) divergence that has been observed between eastern and western yellow-billed cuckoos" (USFWS 2014b, pg. 59993). This statement is an attempt by USFWS to directly link genetic data and analysis of these data to the phenotypic traits, i.e., morphology and behavior, which USFWS used in the analysis of whether or not western populations of YBCU constituted a valid DPS. As such, USFWS (2014b) explicitly used genetic data to support its conclusion that the purported DPS is discrete and significant.

The identification of habitat for the purported DPS in USFWS (2014b) relied on the descriptions provided by USFWS (2013). In response to comments on the proposed listing that indicated that YBCU in the Southwest do not require the large blocks of riparian vegetation identified as habitat by USFWS (2013), USFWS (2014b) reasserted its stance that habitat for YBCU in the Southwest is restricted to large tracts of riparian woodland: "the use of large blocks of riparian habitat for yellow-billed cuckoos in western United States is well-documented. Recent studies of habitat use using radio telemetry have shown that a western yellow-billed cuckoo will use 100 ac (40 ha) of habitat or more during the breeding season" (USFWS 2014b, pg. 60010). In addition, USFWS failed to address the inconsistency between what is considered habitat in the analyses used to list the species as threatened (USFWS 2013, 2014b) and the analyses used to propose the designation of critical habitat (USFWS 2014a).

The threats to the purported western DPS of YBCU identified by USFWS (2014b) were identical to those identified in USFWS (2013): destruction, modification, and degradation of riparian habitat along lowland rivers and the rarity of this type of habitat remained the major justification underlying the decision to list the purported DPS as threatened.

4.7. Proposal to Designate Critical Habitat for the Purported Western DPS of YBCU (2014)

On August 15, 2014, USFWS published a proposed rule to designate approximately 546,335 acres of critical habitat for the purported western DPS of YBCU in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah, and Wyoming (USFWS 2014a). The identification of areas proposed for critical habitat clearly focused on large blocks of riparian woodland along lowland perennial river and streams. The specific Primary Constituent Elements (PCEs) used by USFWS (2014a) to identify those areas that are considered essential for the conservation of the species included:

> (1) Primary Constituent Element 1—Riparian woodlands. Riparian woodlands with mixed willow-cottonwood vegetation, mesquite-thorn-forest vegetation, or a combination of these that contain habitat for nesting and foraging in contiguous or nearly contiguous patches that are greater than 325 ft (100 m) in width and 200 ac (81 ha) or more in extent. These habitat patches contain one or more nesting groves, which are generally willow-dominated, have above average canopy closure (greater than 70 percent), and have a cooler, more humid environment than the surrounding riparian and upland habitats.
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> (2) Primary Constituent Element 2—Adequate prey base. Presence of a prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies) and tree frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas.
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> (3) Primary Constituent Element 3—Dynamic riverine processes. River systems that are dynamic and provide hydrologic processes that encourage sediment movement and deposits that allow seedling germination and promote plant growth, maintenance, health, and vigor (e.g. lower gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams). This allows habitat to regenerate at regular intervals, leading to riparian vegetation with variously aged patches from young to old.

While the text of USFWS (2014a) focused the proposed designation exclusively on large riparian woodlands along major perennial rivers and streams, in practice, USFWS (2014a) proposed to designate as critical habitat drainages that do not contain the described PCEs, particularly PCE 1. A substantial portion of proposed critical habitat units neither support large blocks of riparian woodland nor constitute large, perennial rivers and streams (see WestLand 2015c for a more complete discussion). As a result, a considerable portion of those areas considered by USFWS (2014a) to be essential to the conservation of the species do not contain the habitat features described by USFWS (2013, 2014b) as required for western populations of YBCU. Rather, these areas contain small, ephemeral drainages that contain little to none of the riparian vegetation and are strikingly different than the riparian habitat described as required for the purported western DPS of YBCU by the listing rule (USFWS 2013, 2014b). This situation creates a remarkable disconnect between USFWS actions and conclusions regarding listing and critical habitat for the purported western DPS of YBCU. In essence, USFWS has concluded that listing of the species is warranted based on one description of habitat requirements and then explicitly considers areas that plainly do not contain these habitat features as essential for the conservation of the species in its proposed critical habitat designation. This conflict alone warrants a reanalysis of the listing decision that takes into account the expansion of what is considered suitable habitat for western populations of YBCU brought forth by the proposed designation of critical habitat.

5. JUSTIFICATION FOR THE PETITIONED ACTION

To consider a possible DPS as threatened or endangered under the ESA, USFWS' policy dictates a three-part analysis of (USFWS 1996):

1) The discreteness of a 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 ESA's standards for listing (i.e., Is the population segment, when treated as if it were a species, endangered or threatened?).

The following assessment presents and analyzes new data gathered, analyzed, or interpreted since the time of listing that indicate that USFWS' analysis for the listing of the purported DPS was incomplete and in error. Specifically, the assessment addresses:

1) New genetic and morphological data and analyses provide additional evidence that there is no marked separation between eastern and western populations of YBCU, undermining USFWS' determination that western populations of YBCU constitute a discrete and significant DPS; and
2) New data on habitat use by YBCU in the Southwest and new analyses of USFWS' proposed critical habitat designation that clearly indicate that USFWS both substantially underestimated the amount of suitable habitat for, and severely overestimated threats to, the purported western DPS of YBCU. As such, USFWS' analysis of the conservation status of the purported DPS was incomplete and in error.

Combined, these data provide strong evidence that delisting of the western DPS of the YBCU is warranted.

5.1. New Genetic and Morphological Data and Analyses Indicate that Western Populations of YBCU are Not a Discrete and Significant Distinct Population Segment

5.1.1. Data and analyses used by USFWS to conclude that western populations of YBCU constitute a significant and discrete DPS are flawed

USFWS relied on two main characteristics in the analysis of whether or not a purported western DPS of YBCU constitutes a discrete DPS: (1) geographic separation of western and eastern YBCUs between the Pecos and Rio Grande Rivers; and (2) behavioral differences in migratory timing (USFWS 2013, pgs. 61627-61629). USFWS also asserted that the conclusion that western populations of YBCU constitute a discrete DPS was "supported by differences in habitat use and morphology, which are genetically controlled traits." (USFWS 2013, pg. 61628).

Several lines of evidence question USFWS' conclusion that eastern and western YBCUs are markedly separated from one another. This evidence includes reports of breeding YBCU in the areas between the Rio Grande and Pecos River, reports of western YBCU in Nebraska and eastern Colorado, direct evidence that YBCUs move between the Rio Grande and Pecos rivers during the breeding season, and the possibility that eastern YBCU double breed in northwestern Mexico. In combination, these sources of evidence clearly demonstrate that there is not a marked geographic separation between western and eastern YBCUs. This evidence is discussed in detail in WestLand (2013b).

USFWS also relied heavily on the notion that differences in migratory timing between eastern and western YBCUs are: (1) significant; and (2) "can only have developed as an evolved trait" (USFWS 2013, pg. 61630). USFWS neither analyzed nor discussed the available evidence indicating that YBCUs could arrive earlier to the Southwest than is reported by USFWS (2013, 2014b) but may not be detected because of sampling bias. Furthermore, USFWS (2013, 2014b) failed to acknowledge that migratory behavior is under both genetic and environmental control and that phenotypic plasticity may buffer any genetic changes in migratory traits. Thus, the conclusion by USFWS that differences in migratory timing must reflect genetic differences is inappropriate, as environmental factors also influence migratory timing. WestLand (2013b) provides further discussion and detail of these flaws in USFWS' argument.

USFWS relied on two main considerations to determine that the western DPS of YBCU is biologically and ecologically significant to YBCU as a species: (1) evidence that the complete loss of the western DPS would result in a significant gap in the range of YBCU and (2) claims that a suite of four purported genetic characteristics differ *markedly* between eastern and western populations (USFWS 2013, pgs. 61629-61630, *emphasis* added).

Little data were provided by USFWS to support the first of these considerations. Evidence that a complete loss of the western DPS would result in a significant gap in the range of YBCU was limited to a statement of the range of YBCU that does little to inform specifically how western YBCUs are biologically and ecologically significant to YBCU as a species.

The available scientific data used by USFWS to conclude that four morphological characteristics—such as egg size, egg shell thickness, body size, and bill color—reflect *marked* genetic differences between eastern and western populations of YBCU instead indicate that the minor differences actually observed can be explained by environmental factors rather than genetic differences. As such, these morphological traits do not provide strong and clear evidence that western and eastern populations of YBCU differ *markedly*. Discussion and analyses of these data are provided in more detail by WestLand (2013b).

5.1.2. New genetic data and analyses provide strong evidence that western populations of YBCU are not a discrete and significant DPS

The purported western DPS of YBCU was determined to be a valid entity for protection under the ESA on the basis of being discrete from the remainder of YBCU populations and of its significance to the YBCU species as a whole (USFWS 2013, 2014b). Discreetness and significance were attributed to the purported DPS, in part, due to inferred genetic differences from eastern populations based on phenotypic differences in behavior and morphology. Phenotypes are determined by both genetic and environmental inputs, however, and individuals with the same genetic background can have different phenotypes in different environments. Nutritional, climatic, and parental effects (prenatal and postnatal influences) are common contributors to environmentally-induced phenotypic variation (Falconer & MacKay 1996, p. 134) and might contribute to the purported behavioral and morphological differences between western and eastern populations of YBCU. Food availability during the nestling period can carry over to differences in adult body size (e.g., Searcy et al. 2004), and nutrition can influence both body size and egg size (Leeson and Summers 2009, p. 138-147). Similarly, the timing of migration can change rapidly and be the result of either adaptive evolution (i.e., genetic change) or environmental conditions (i.e., environmental contribution to phenotype; Cresswell et al. 2011, Gill et al. 2014). WestLand (2013b) provides more discussion of these issues, including myriad examples from the literature of evidence that migratory timing is not a result of genetic factors alone. Thus, in the absence of studies examining the environmental contribution to YBCU phenotypes, it is not appropriate to conclude that observed phenotypic differences between western and eastern YBCUs, however slight, necessarily reflect evolved differences. Nevertheless, USFWS (2014b) concluded that western YBCUs have "unique genetic haplotypes not present in eastern cuckoos and that these are reflected in phenotypic (outwardly visible) divergence" (USFWS 2014b, p. 59993), thus attempting to use genetic data to justify the use of morphological and behavioral characteristics to conclude that the purported western DPS differ *markedly* from eastern population in genetic characteristics.

Despite no direct evidence of genetic differentiation between western and eastern population of YBCUs, USFWS suggested that more sensitive genetic markers, such as microsatellites, would reveal genetic differences between western and eastern YBCUs:

> 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 [the watershed boundary between the Rio Grande and Pecos rivers], information on genetically controlled behavior [timing of migration and arrival on breeding grounds] available in the scientific literature provides evidence of a biological separation between the western populations and eastern populations. (USFWS 2014b, pg. 59996)

The problem with these statements and approaches taken by USFWS is that, despite claims that genetic data played no part in its analysis, USFWS has relied heavily on available genetic data and, moreover, assumed that future genetic studies would detect subtle differences between eastern and western populations of YBCU to determine that western populations constitute a valid DPS. In fact, USFWS relied on a perceived (though nonexistent) conflict in available genetic studies to justify the reliance on morphological and behavior traits to determine that eastern and western populations of YBCU differ in genetic characteristics.

Since the listing of the purported DPS, a new genetics study utilizing microsatellites found no evidence of genetic divergence between eastern and western populations of YBCU (McNeil 2015). These new data—coupled with data available to USFWS during the listing process, but improperly analyzed—severely undermine USFWS' finding that there are marked differences in the genetics and genetic characteristics between western and eastern populations of YBCU. These data provide strong evidence that:

1) There are no conflicting data as to the genetic differentiation between eastern and western populations of YBCU;
2) There are no genetic differences between these populations that would support the creation of a DPS; and
3) There is no evidence that the YBCU morphological and behavioral traits used in USFWS' analyses reflect differences in genetic characteristics.

Below, we provide:

1) A brief primer to genetic markers explaining how different markers are informative about different time periods of a taxon's evolutionary history and inform conclusions of genetic divergence among populations;
2) A critical review and new analysis of the genetic studies available to USFWS at the time of listing; and

3) An evaluation of new genetic data regarding population divergence among YBCUs.

5.1.2.1. Primer on Genetic Markers Relevant to the Analysis of Genetic Data for YBCU

Here, we review the types of genetic markers that have been used to test for genetic divergence between western and eastern populations of YBCUs. The characteristics of a genetic marker determine the likelihood of detecting differences between individuals and the evolutionary frame over which the markers are informative for assigning individuals to groups (e.g., populations, species, or genera). Genetic divergence among populations is frequently described using Wright's F_{ST} (1951), where a value of one indicates complete genetic divergence and a zero-value indicates no divergence between subpopulations (i.e., suggests a single randomly mating population). F_{ST} values are dependent on the expected heterozygosity of a subpopulation and are underestimated when the number of subpopulations compared is small. Alternative statistics that standardize for expected heterozygosity and correct for sampling bias, such as $G''_{ST,}$ are particularly useful for highly polymorphic markers (e.g., microsatellites, Meirmans and Hedrick. 2011).

Neutral versus non-neutral genetic markers

Most DNA mutations are selectively neutral or nearly neutral (Kimura 1968, 1984). Consequently, most detectable DNA sequence variation among populations is the result of genetic drift. Using population genetics models, neutral sequence variation among taxa can be used to generate genealogies (reviewed by Hudson, 1990), which have the potential to reveal the history of population size, patterns of gene flow, and selection events (Moritz and Hillis, 1996). Genetic variation that confers selective advantage (i.e., non-neutral) can spread rapidly through populations, violating the assumptions of the population genetics models used to infer genealogies, and are thus inappropriate for inferring historical divergence among populations (Moritz and Hillis, 1996). However, non-neutral genetic markers can be useful to detect recent differences in the patterns of selection among populations (Zink and Barrowclough, 2008).

Mitochondrial DNA (mtDNA)

Because of its rapid mutation rate and ease of amplification, mtDNA sequence has been used extensively to study phylogeography at various taxonomic levels. With good sampling throughout a species' geographical range and selection of a suitable outgroup taxon, a phylogenetic tree of mtDNA haplotypes will reveal if there is genetic divergence or substantial gene flow between populations (Zink and Barrowclough, 2008). Mutation rates vary across the mitochondrial genome, and regions of high mutation, such as the non-coding and hypervariable control region, often provide increased haplotype resolution relative to the more slowly-evolving genes (Baker and Marshall 1997). Mitochondrial sequences are best suited to detecting population divergence that has occurred in the intermediate past (Zink and Barrowclough, 2008). Overreliance on mtDNA for phylogeography, however, has been criticized because it represents a single genetic marker which only reflects matrilineal history (i.e., mitochondria are only inherited from mothers, and thus in birds always co-inherited with the W-chromosome) and can thereby give a misleading portrayal of the true evolutionary history if there is sex-biased dispersal or selection acting on the W-chromosome (Zink and Barrowclough, 2008). Furthermore, over long time periods, the rapid rate of mtDNA evolution results in repeated mutations at a given site, which can prevent detection of deeper splits between populations. In such a scenario, neutrally-evolving nuclear genes provide a more accurate reconstruction of evolutionary history (Zink and Barrowclough, 2008).

Nuclear non-coding DNA

Microsatellites are non-coding repetitive DNA sequences composed of simple motifs (i.e., 2-5 base pair repeats) that are found in the nuclear genome. They are routinely used to estimate population divergence because their rapid mutation rates provide high haplotype resolution (Balloux, and Lugon-Moulin, 2002, Zink and Barrowclough, 2008). However, because of the complex mutational patterns associated with microsatellites, which violate the assumptions of traditional models, it can be difficult to accurately estimate population genetic parameters (Putman& Carbone, 2014). Further, genetic diversity can be obscured by the high rates of homoplasy (i.e., alleles identical in state but not by common descent) associated with microsatellites (Estoup et al. 2002). In practice, the use of microsatellites to infer patterns of genetic variation across a species range involves selection of a low number of highly polymorphic loci (i.e., 10-20). Given a sufficient number of microsatellite loci and sampling of a given population, they can be used to assign parentage to individuals with a high level of confidence (Jones et al., 2010). This can result in even small differences in haplotype frequency among populations becoming statistically significant regardless of biological relevancy (Zink and Barrowclough, 2008). Despite high haplotype resolution, the biparental inheritance of microsatellites results in an approximately four-fold longer time period required to identify divergence among populations, thereby making microsatellites a lagging indicator of demographic structure (Zink and Barrowclough, 2008).

Relative utility of various genetic markers

Detecting divergence among populations using neutral genetic markers is based on a combination of the mutation rate and the time to coalescence for a given locus (i.e., time to the most recent common ancestor between two alleles). Markers with high mutation rates increase the likelihood that any given individuals will have different alleles and thus increase the number of genetic changes observed in a genealogy (Zink and Barrowclough, 2008). Microsatellites have the highest mutation rates of commonly used markers, followed by that of mtDNA markers (Nabholz et al. 2009). The hypervariability of microsatellites increases the likelihood of individuals differing at a given locus relative to mtDNA and thus increases the detectability of divergence events. The four-fold longer coalescence time for nuclear loci, however, results in mtDNA often being more informative for recent splits between groups. It is important to note, however, that the genealogical history for a given locus may differ from the true evolutionary history of a species (Knowles and Kubatko 2011, p. 3-5). Populations that have diverged in the recent past often show geographic structuring based on mtDNA markers but not nuclear markers (Zink and Barrowclough, 2008). Conversely, hybridization can result in mtDNA markers indicating less divergence than nuclear markers (e.g. Hailer et al. 2012). Thus, it is important to use multiple markers to reliably establish the evolutionary history of a taxon.

5.1.2.2. Genetic data available prior to listing

Three studies using mtDNA sequence data (Pruett et al. 2001, Fleischer 2001, Farrell 2006, 2013) were considered by the USFWS (2013, 2014b) to imply that western populations of YBCU may be genetically distinct from eastern populations. Collectively, these studies examined 4 genes (ATPase 8, cyt-b, ND2, and ND6) and one non-coding portion (the control region) of mitochondrial DNA.

Pruett et al. (2001) sequenced a 978 base pair region of the cytochrome b gene (cyt-b) in a small number of individuals (N = 8). Five individuals were from the western portion of the range (2 vagrants from AK and 3 from NM) and three were from the eastern portion of the range (2 from MN and 1 from VT). Two additional individuals from Veracruz Mexico, captured during migration and not definitively attributed either the western or eastern population, were sequenced but not included in the analysis. Based on an assumed molecular divergence rate of 2% per million years, Pruett et al. (2001) suggested the western and eastern populations diverged 205,000 to 465,000 years ago. Among birds, however, there is considerable variation in rates of mtDNA molecular divergence (0.35 to 9% per million years, Nabholz et al. 2009) thereby making molecular based dating, such as that used by Pruett et al. (2001), unreliable in absence of empirically determined mutation rates. Pruett et al. (2001) reported four fixed differences between the western and eastern populations, two of which were expected to result in amino acid changes to the associated protein product of cyt-b. The USFWS interprets these fixed differences to be the result of "selective evolutionary pressure rather than chance events" (USFWS 2013, pg. 61625). However, there is no evidence of adaptive evolution of cyt-b in birds (Nabholz et al. 2009). The validity of Pruett et al.'s (2001) conclusion of genetic divergence between the western and eastern populations of YBCU have been strongly criticized due to small sample size, inadequate geographic sampling, and the possibility of changes to the DNA sequence due to poor sample storage conditions (Farrell 2006 and 2013, USFWS 2013, p. 61625). Furthermore, the sequences generated by Pruett et al. (2001) that were incorporated into Farrell (2013) did not find significant genetic differentiation between western and eastern populations of yellow-billed cuckoo (details below). As such, conclusions provided by Pruett et al. (2001) have been effectively supplanted by more recent and more reliable genetic findings.

Fleischer (2001) sequenced 422 base pairs of the mitochondrial control region (N = 66, 38 from the western U.S., 25 from the eastern U.S., 3 from Mexico) and 314 base pairs of ATPase 8 in YBCUs

(N = 30; 12 eastern and 18 western birds). Birds were sampled from across their modern and historical breeding ranges (i.e., included DNA from museum specimens from Oregon, Washington, and British Columbia). The mitochondrial control region revealed high haplotype variation with four haplotypes common to both eastern and western birds and 44 rare haplotypes. Genetic divergence among populations was less than or equal to that within populations (Fleischer 2001, p. 11). Furthermore, there was no evidence of divergence between eastern and western populations of YBCUs (F_{ST} = 0.025 and was not significantly different from zero, p = 0.1), suggesting fairly high levels of migration between the populations in the recent past (Fleischer 2001, p. 11). However, USFWS (2001a, p. 38618) interpreted the low number of shared haplotypes between the eastern and western populations to indicate that there are "significant divergence in haplotype… frequencies between eastern and western samples, which suggests that they may not currently be exchanging many migrants (Fleischer 2001)." An alternative explanation for the low number of shared haplotypes, that is consistent with the evidence of high levels of gene flow described by Fleischer (2001), is the accumulation of mutations in the recent evolutionary history of YBCUs (e.g., as a result of demographic expansion, Slatkin and Hudson 1991). ATPase 8 was a less variable genetic marker than the control region, and there was a single common haplotype (in 22 of 30 individuals) shared by eastern and western populations and four rare haplotypes (Fleischer 2001, p.13). Similar to the control region, ATPase 8 sequences indicated no evidence of population structure across the range of yellow-billed cuckoos (F_{ST} values not significantly different from zero. (Fleischer 2001, p. 14). Fleischer (2001, p. 11) concluded: "there is no clear break, no diagnostic character differences, nor reciprocal monophyly between Eastern and Western haplotypes. That is, there is no evidence of genetic structure, nor support for separate ESU or subspecies designations from the mtDNA control region sequences". When considering both the mitochondrial control region and ATPase 8, Fleischer (2001, p. 14) states that the results "do not support the hypothesis that the Western U.S. populations of the Yellow-billed Cuckoo are a separate subspecies of ESU from the Eastern U.S. populations."

As part of a Master's thesis, Farrell (2006) examined sequence variation of three mitochondrial genes to test for divergence between western and eastern YBCUs. The major findings of this study were subsequently published in a peer-reviewed journal (Farrell 2013) and supplant the conclusions of Pruett et al. (2001). Farrell (2006) sequenced 512 and 560 base pairs of the mitochondrial NADH dehydrogenase subunits 2 and 6 genes but found no variation among 31 YBCUs across the breeding range (16 western, 15 eastern). These individuals were further used to sequence a 949 base pair region of cyt-b. Farrell incorporated Pruett's (2001) cyt-b sequences to generate a data set that included 42 YBCUs distributed across the range (21 western, 19 eastern, and 2 from Mexico) and found a total of 27 distinct haplotypes. There was one haplotype common to both western and eastern populations, with the remainder of haplotypes closely related to the common haplotype and mostly detected in single individuals (11 from eastern, 13 western, 2 Mexican). This is suggestive of the accumulation of mutations in the recent evolutionary history of the YBCU (Slatkin and Hudson 1991) and is consistent with the patterns of haplotype variation in the mitochondrial control region observed by Fleischer (2001). The western populations of YBCU showed some sub-structure and had higher haplotype diversity relative to the eastern population. However, Farrell (2013) found no evidence of fixed differences between western and eastern populations and no evidence of east-west genetic divergence. Analysis of molecular variance indicated that 92% of the variation occurred within the populations, with weak, non-statistically significant genetic structure between populations (F_{ST} = 0.07, $p > 0.05$, Farrell 2013). The Mexican population was significantly different from both the western and eastern populations (F_{ST} = 0.35 and 0.75), but these results should be interpreted cautiously due to a low sample size (N = 2, Farrell 2013). Farrell (2013) and Dr. Hughes, a peer reviewer of the proposed rule to list the western DPS as threatened, suggested that the use of more variable markers (i.e., microsatellites) might detect divergence between western and eastern YBCUs (USFWS 2014b, p. 59993). However, Farrell (2013) detected a relatively large number of haplotypes (i.e., high variability at the locus), resulting in only three haplotypes being observed in more than one individual. Thus, Farrell's finding of no evidence of east-west genetic divergence could reflect the true evolutionary history of YBCU or be a result of insufficient power to detect divergence due to an excessively variable genetic marker.

In summary, the patterns of DNA sequence variation at one non-coding region (the control region) and four mitochondrial genes (ATPase 8, cyt-b, NADH dehydrogenase subunits 2 and 6) indicate no evidence of east-west divergence of YBCUs. Moreover, because Farrell (2013) incorporates the data from Pruett et al. (2001) and thereby supplants its findings, the USFWS erred in concluding "the available genetic data regarding the distinguishability of the western subspecies of the yellow-billed cuckoo is conflicting" (USFWS 2013, pg. 61625). Rather, estimates of genetic variability available at the time of listing indicated no divergence between YBCUs breeding in the western and eastern portions of North America and was consistent with high levels of east-west gene flow. This undermines USFWS' contention that western YBCUs are both a discrete and significant DPS.

5.1.2.3. New genetic data provided by McNeil (2015)

In 2015, after the listing of western YBCUs as a threatened DPS, McNeil (2015) published a Master's thesis that reported findings from a genetic study that used nuclear microsatellite markers to test for population structure among eastern and western populations of YBCU. McNeil (2015) found little evidence of east-west divergence in YBCUs. Below, we examine the study in detail.

McNeil (2015) examined a large sample of birds (N = 175), but sampling was uneven across the breeding range of YBCUs. Extant western breeding populations were well sampled (N = 117 from CA, AZ, and NM; N = 23 from Sinoloa, Mexico). Sampling of eastern YBCUs, however, was limited (N = 35 from IL, NY, and NJ). McNeil (2015) found a low level of east-west genetic divergence in YBCUs (F_{ST} = 0.006, test for difference from zero p = 0.029). Such low F_{ST} are generally considered biologically irrelevant, and McNeil (2015, p. 20) states "I found no evidence of genetic structuring, suggesting sufficient dispersal is occurring to maintain gene flow among these populations". In short, McNeil (2015) concluded that there is sufficient movement and breeding of

YBCU between western and eastern portions of North America, that there is no genetic differentiation between eastern and western YBCUs.

Pairwise comparisons revealed that only the most westerly and easterly populations (Kern, CA and NY/NJ) showed significant genetic divergence from each other (G''_{ST} = 0.133, p = 0.002). The number of birds sampled from each of these populations was small (N = 12 and 7 for Kern and NY/NJ, respectively), which typically results in overestimates of genetic divergence (Hale et al, 2012). However, if the estimated genetic divergence reflects the true genetic divergence between Kern, CA and NY/NJ, this result would be consistent with populations isolated by distance (i.e., accrual of local genetic variation due to limited geographic dispersal of individuals; Meirmans 2012).

There are some issues with the analysis provided by McNeil (2015) associated with sample size and the genetic markers used, which could have influenced results, but these issues have no bearing on the overall conclusion that there is no biologically-relevant genetic divergence between eastern and western populations of YBCU. First, uneven sample sizes typically result in fewer rare alleles being detected in the smaller sample (western N = 140 and eastern N = 35). However, this should not unduly bias estimates of F_{ST} values, and the sampling is sufficient to detect east-west population structure if it existed (Hale et al. 2012). Second, pairwise estimates of subpopulation structure are likely to be *overestimated* due to a small number of individuals being tested from many of the localities (range = 5 to 28 individuals; Hale et al. 2012). It is also important to note that the Pecos River samples (N = 15) were considered part of the western population (McNeil 2015, p. 23), but this is expected to have little influence on overall estimates of east-west divergence of YBCU, because pairwise comparisons among subpopulations revealed no genetic divergence. Lastly, a total of 14 polymorphic microsatellite loci were used, but seven of these showed evidence of null alleles (McNeil 2015, p. 28). Null alleles upwardly bias estimates of homozygosity, thereby *overestimating* levels of inbreeding and population divergence described by F_{ST} or related measures (e.g., G''_{ST}) (Chaupis and Estoup 2007). Consequently, in absence of statistical corrections for the presence of null alleles, the microsatellite markers used by McNeil (2015) would *overestimate* both inbreeding within populations and genetic divergence among YBCU populations.

5.1.2.4. Conclusion

Direct estimates of genetic variability available prior to listing were based on mtDNA markers and showed no evidence of east-west divergence among YBCUs in their recent evolutionary past, and USFWS erred in its analysis of the available data at the time of listing. Newly-available estimates of genetic variability based on microsatellites corroborate the previous findings that USFWS misinterpreted. Taken together, both mtDNA and nuclear markers fail to support the conclusion that western YBCUs are genetically different from eastern populations, thereby undermining the significance of western birds to the species as a whole. Further, the high levels of gene flow indicated by both mtDNA and nuclear markers strongly suggests that there is no substantive geographical barrier between YBCUs breeding west or east of the DPS boundary and that these populations are not discrete from one another. As such, these new data provide further evidence, using genetic markers suggested as ideal markers by USFWS, that there is no genetic differentiation between eastern and western YBCUs; western YBCUs are neither discrete from other populations of YBCU nor significant to the species as a whole.

5.2. New Morphological Data and Analyses Provide Further Evidence that Western Populations of YBCU are Not a Discrete and Significant DPS

Body size is considered a key trait by USFWS (2013, 2014b) and is used to conclude that the purported western DPS of YBCU are *markedly* different in genetic characteristics from eastern populations. USFWS relied on purported differences in body size as evidence that the western YBCUs are discrete from eastern YBCUs and significant to the species as a whole, and thus as evidence supporting the consideration of western YBCUs as a DPS. In fact, USFWS (2013) cites opinions of scientists that argue "that size alone was sufficient to separate the [western] subspecies" and "that size differences…were not gradual east to west and the change in size [between eastern and western populations] was too abrupt to be clinal" (USFWS 2013, pg. 61625). Clinal variation in body size, if present, would provide evidence that eastern and western populations do not differ markedly in morphological characteristics but rather vary gradually across a geographic range, as is seen in several other avian species in North America (e.g., James 1970, 1983, 1991, Aldrich and James 1991). Evidence of gradual change in morphological traits provides evidence to suggest that morphological variation in these traits is due to environmental factors rather than genetic differences between YBCU populations. As such, evidence of clinal variation in body size would undermine USFWS' conclusion that the purported western DPS of YBCU is discrete and significant. Below we discuss new data on wing length—a primary metric of body size—that indicate that wing length in YBCU varies along a cline across North America rather than changing abruptly at the eastern boundary of the purported DPS. These new data strongly indicate that the purported western DPS of YBCU is not a valid taxonomic entity for listing under the ESA.

5.2.1. New wing length data provided by McNeil (2015)

McNeil (2015) compiled field measurements of YBCU captured at locations in the Southwest from the Pecos River in New Mexico to the Kern River in California. Wing length in males and females varied linearly with longitude, indicating a gradual increase in wing length across the boundary of the purported DPS and within western populations rather than an abrupt change at the eastern boundary of the purported DPS (McNeil 2015). This finding is in contrast to the conclusions of Franzreb and Laymon (1993) that suggests a more abrupt change in body size metrics at the boundary of the purported DPS. The analyses provided by Franzreb and Laymon (1993), however, are associated with statistical flaws and the *a priori* assumption that there are in fact two distinct populations of YBCU in North America. These flaws bias the results and interpretations of their findings towards a conclusion that there is an abrupt change in body size of YBCUs between the Pecos and Rio Grande rivers. These issues, as well as the shortcomings and misinterpretations of other morphological and behavioral data used by USFWS (2013, 2014a), are discussed in detail by WestLand (2013b).

5.2.2. New Analyses of data provided by Banks (1988)

The interpretation of data presented by McNeil (2015), however, is limited by a lack of sampling in eastern populations other than the Pecos River in New Mexico. As such, we cannot conclude from McNeil (2015) alone that there is clinal variation in wing length throughout the geographic range of the species. Yet, combined with new analyses of data provided by Banks (1988), these findings provide strong evidence that variation in a body size component—wing length—is indeed clinal across North America.

Banks (1988) collected morphological measurements from museum skins of YBCU collected throughout North America and concluded that there was no clinal variation in the morphological traits measured, but that eastern and western populations differed significantly in body size. USFWS (2013) uses this finding to justify its conclusion that the purported western DPS differs markedly in its genetic characteristics from eastern populations of YBCU:

> [Banks] 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 measurement throughout their range (Banks 1988, p. 475). Banks stated that the change from smaller to large yellow-billed cuckoos appeared to take place in extreme western New Mexico or extreme eastern Arizona (Banks 1988, p. 476).

USFWS (2013) failed to disclose, however, that Banks (1988) did not explicitly test for clinal variation, but rather concluded from visual inspection of his data that "no clines [were] evident in any [morphological] character" (Banks 1988, pg. 475). To provide additional insight into clinal variation in body size metrics of YBCU, we performed a novel analysis of wing length data provided by Banks (1988).

Banks (1988) provides wing length data for breeding YBCU across North America split into 19 populations as depicted in Figure 1 of Banks (1988). Specific locational data for these populations and data for other morphological metrics by population are not provided by Banks (1988). To test for evidence of clinal variation in wing length, we visually ranked each of the 19 populations depicted in Figure 1 of Banks (1988) by longitude (**Exhibit 1**) and used Spearman Rank Correlation to determine if there was a statistically significant relationship between the longitudinal rank and mean wing length of the 19 populations.

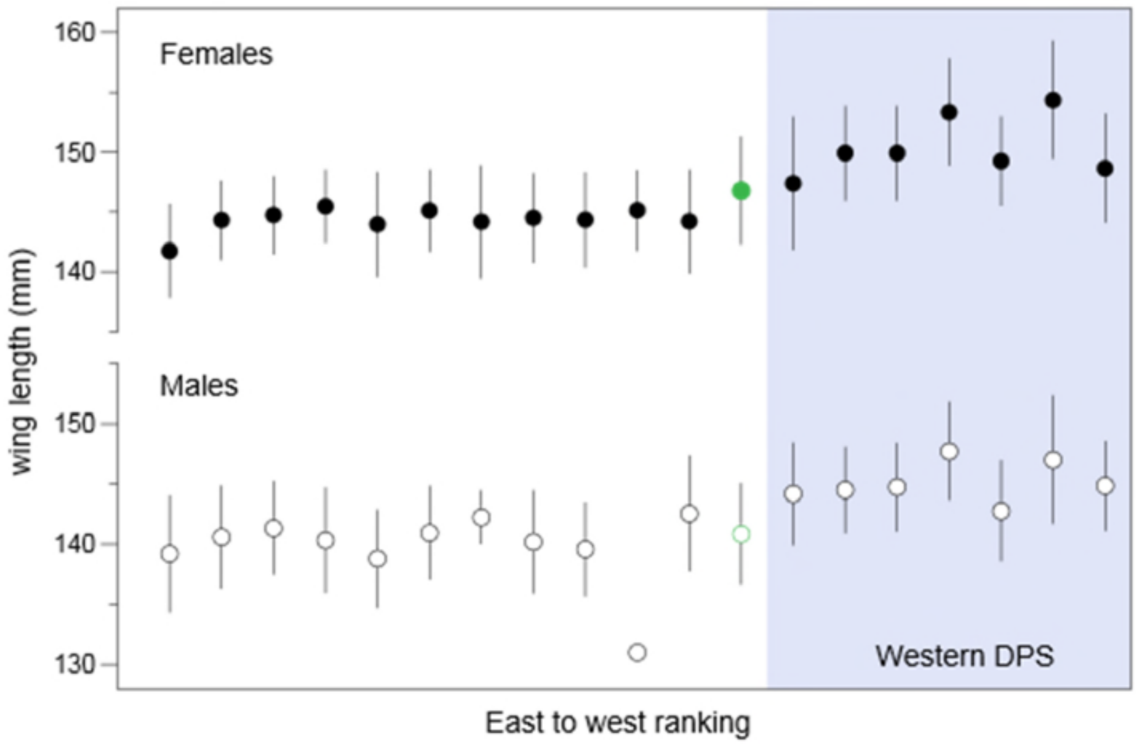

Exhibit 1. Plot of mean wing length (± SD) vs. ranking of the 19 populations depicted in Figure 1 of Banks (1988) by longitude. Green symbols indicate values from western Texas and eastern New Mexico. Note that the eastern-most population (Greater Antilles) was not included by Banks (1988) in estimate of eastern population means. Correlational analyses indicate that the variation in mean wing length is explained by a gradual increase from east to west, indicative of clinal variation.

The rank correlation between longitude and mean wing length was strongly statistically significant for both males (S=280, P < 0.001, rho=0.75) and females (S=218.6, P < 0.0001, rho=0.81). Because ranking the populations by longitude from Figure 1 of Banks (1988) involved some subjectivity due the imprecision with which the 19 populations are depicted by Figure 1 of Banks (1988), we also tested for rank correlations using different ranks for those populations. These tests did not change the conclusion; there is a strong statistical correlation between longitude and mean wing length *across* North America for both sexes of YBCU.

5.2.3. Conclusion

Combined, these findings provide evidence that there is indeed clinal variation in body size in YBCUs and not an abrupt change at the boundary of the purported western DPS. Although the data were not available to test additional morphological metrics for clinal patterns, these new data and analyses undermine USFWS' conclusion that western populations of YBCU differ *markedly* from eastern populations and question USFWS' conclusion that the purported western DPS of YBCU is a valid taxonomic entity for listing under the ESA.

5.3. New Data on YBCU Habitat Use and Requirements Indicate that USFWS' Analysis of the Conservation Status of the Purported western DPS of YBCU was in Error

USFWS' conclusion that the purported western DPS of YBCU warrants listing under the ESA relied heavily on the assumption that the DPS requires large expanses of low-elevation cottonwood-willow riparian woodland for breeding. The past, present, and ongoing impacts to this type of riparian habitat and the subsequent implications of these impacts to YBCU populations have been the focus of USFWS review and analysis since 2001 (**Sections 3.3 and 3.4**) and are the sole reason for listing the DPS (USFWS 2013, 2014b). Survey data collected since 2012, and in increasing frequency following the listing of the purported DPS by a variety of sources, provide strong evidence that USFWS' description of habitat for the purported western DPS of YBCU was incomplete, and USFWS' focus on threats to riparian vegetation along large river systems was inappropriate. Consequently, USFWS' analysis of threats to the species was misplaced and overstated threats to the purported DPS.

Recent survey data collected by WestLand (2013a,c, 2015a,b) and Tucson Audubon Society (2015) and data from southeastern Arizona and northern Mexico compiled by USFWS (**Appendix A**) are provided in **Table 1** and depicted in **Figure 1**. In addition, YBCU detections collected by citizen scientists have become increasingly available, and these data show recent observations of YBCU during the breeding season in habitats in the Southwest and Mexico that are strikingly different than those described by USFWS as necessary for the species and used by USFWS in the analysis of threats to the purported western DPS. These data are presented in **Table 2** and also depicted in **Figure 1**. These data indicate that YBCU:

1) Inhabit small ephemeral streams with limited riparian vegetation, strikingly dissimilar to the large block of riparian woodland along large perennial rivers and streams identified by USFWS (2013, 2014b) as required by the purported western DPS;
2) Are found along drainages throughout Semi-desert grassland, Madrean evergreen woodland, Plains and Great Basin grasslands, and Sinaloan thornscrub biotic communities in southern Arizona and northern Mexico; and
3) Consistently occupy and breed in these habitats.

Table 1. Recent YBCU Survey Data

Location	Biotic Community	Vegetation Present	Detections or Breeding	Year	Source
Patagonia Mtns, Harshaw Creek and tributaries	Madrean evergreen woodland and Semi-desert grassland	Oak Mesquite Juniper Sycamore Cottonwood Sumac	4 detections	2012	WestLand Resources
			20 detections	2013	

Location	Biotic Community	Vegetation Present	Detections or Breeding	Year	Source
Patagonia Mtns, Hermosa Canyon	Madrean evergreen woodland	Sycamore Juniper Willow Oak Manzanita	2 detections	2012	WestLand Resources
			8 detections	2013	
Patagonia Mtns, Corral Canyon	Madrean evergreen woodland and Semi-desert grassland	Oak Mesquite Juniper	4 detections	2012	WestLand Resources
			8 detections	2013	
Patagonia Mtns, Goldbaum Canyon	Semidesert Grassland	Oak Juniper Sumac Manzanita	13 detections	2013	WestLand Resources
Patagonia Mtns, Willow Spring	Madrean evergreen woodland	Sycamore Oak Juniper Hackberry Mesquite Sotol Walnut	3 detections	2013	WestLand Resources
Patagonia Mtns, Finley and Adams Canyon	Madrean evergreen woodland	Oak	4 detections 3 occupied territories	2015	Tucson Audubon Society
Patagonia Mtns, Flying R Ranch and Paymaster Creek	Madrean evergreen woodland	Oak	2 detections 1 occupied territory	2015	Tucson Audubon Society
Patagonia Mtns, Sycamore Canyon	Madrean evergreen woodland	Oak Ash Cottonwood	4 detections 1 breeding territory 1 occupied territory	2015	Tucson Audubon Society
Patagonia Mtns, Washington Gulch	Madrean evergreen woodland	Oak	2 detections 1 breeding territory 1 occupied territory	2015	Tucson Audubon Society
Santa Rita Mtns, Barrel Canyon	Semi-desert grassland and Madrean evergreen woodland	Mesquite Walnut Juniper Oak Desert Willow	2 detections	2013	WestLand Resources
			8 detections 2 probable territories	2014	
Santa Rita Mtns, Wasp Canyon	Semi-desert grassland and Madrean evergreen woodland	Mesquite Walnut Juniper Oak	1 detection	2013	WestLand Resources
Santa Catalina Mtns, Peppersauce Campground	Madrean evergreen woodland	Oak Mesquite Hackberry Sycamore Cottonwood Acacia Graythorn	3 detections 1 breeding territory	2015	Tucson Audubon Society
Santa Catalina Mtns, Geesaman Wash	Madrean evergreen woodland	Oak Juniper Cottonwood Sycamore	1 detection	2015	WestLand Resources

Location	Biotic Community	Vegetation Present	Detections or Breeding	Year	Source
		Willow Sumac			
Santa Rita Mtns, Montosa Canyon	Semi-desert grassland	Oak Mesquite Hackberry Juniper Sycamore Cottonwood Walnut	Nest located	2014	Tucson Audubon Society
Santa Rita Mtns, Montosa Canyon	Semi-desert grassland	Oak Mesquite Hackberry Juniper Sycamore Cottonwood Walnut	19 detections 4 breeding territories	2015	Tucson Audubon Society
Santa Rita Mtns, Proctor Road	Semi-desert grassland	Mesquite Juniper Oak Sycamore Cottonwood	5 detections 1 occupied territory	2015	Tucson Audubon Society
Santa Rita Mtns, Florida Canyon	Semi-desert grassland and Madrean evergreen woodland	Mesquite Juniper Oak	7 detections 2 occupied territories	2015	Tucson Audubon Society
Santa Rita Mtns, Box Canyon	Semi-desert grassland and Madrean evergreen woodland	Sycamore Hackberry Oak	3 detections 1 breeding territory 1 occupied territory	2015	Tucson Audubon Society
Huachuca Mtns, Miller Canyon	Madrean evergreen woodland	Oak Juniper Sycamore Pine	2 detections 1 occupied territory	2015	Tucson Audubon Society
Huachuca Mtns, Hunter Canyon	Madrean evergreen woodland	Mesquite Juniper Oak	1 detection 1 occupied territory	2015	Tucson Audubon Society
Whetstone Mtns, French Joe Canyon	Semi-desert grassland and Madrean evergreen woodland	Mesquite Juniper Oak	5 detections 1 occupied territory	2015	Tucson Audubon Society
Whetstone Mtns, Guidani Canyon	Semi-desert grassland and Madrean evergreen woodland	Mesquite Juniper Oak	3 detections 1 occupied territory	2015	Tucson Audubon Society
Atascosa Highlands, Rock Corral Canyon	Madrean evergreen woodland	Mesquite Juniper Oak	8 detections 1 breeding territory 1 occupied territory	2015	Tucson Audubon Society
Atascosa Highlands, Sycamore Canyon	Madrean evergreen woodland	Mesquite Juniper Oak	7 detections 2 breeding territories 1 occupied territory	2015	Tucson Audubon Society
Atascosa Highlands, Pena Blanca Canyon	Madrean evergreen woodland	Mesquite Juniper Oak	1 detection 1 occupied territory	2015	Tucson Audubon Society
Atascosa Highlands, Pena Blanca Lake	Madrean evergreen woodland	Mesquite Juniper Oak	8 detections 2 breeding territories 1 occupied territory	2015	Tucson Audubon Society

Location	Biotic Community	Vegetation Present	Detections or Breeding	Year	Source
Atascosa Highlands, Arivaca Lake	Semi-desert grassland	Mesquite Willow Cottonwood Ash Hackberry	21 detections 3 breeding territories 4 occupied territories	2015	Tucson Audubon Society
Canelo Hills, Collins Canyon	Madrean evergreen woodland	Oak Juniper Some Cottonwood	4 detections, 1 breeding territory	2015	Tucson Audubon Society
Canelo Hills, Korn Canyon	Madrean evergreen woodland	Oak Sycamore	6 detections 1 breeding territory 1 occupied territory	2015	Tucson Audubon Society
Canelo Hills, Lyle Canyon	Madrean evergreen woodland	Oak Some Cottonwood	9 detections 2 breeding territories	2015	Tucson Audubon Society
Canelo Hills, Merritt Canyon	Madrean evergreen woodland	Oak Juniper Large Ornamental Trees	5 detections 1 occupied territory	2015	Tucson Audubon Society
Moyza Ranch Road, Papalote Wash	Semi-desert grassland	Mesquite Acacia Hackberry	Nests located over 12 years of monitoring	2015 (monitoring occurred for at least 12 years prior to 2015)	USFWS (see **Appendix A)**
Vamori Wash	AZ Upland Sonoran Desertscrub and Semi-desert grassland	Mesquite Palo Verde Willow Acacia Hackberry	12 detections Probable pair	2015	USFWS (see **Appendix A**)

Table 2 YBCU eBird Data[1]

Location[2]	Habitat Description[3]	Detections or Breeding[4]	Year[5]	Source
Guadalupe Canyon, Cochise County, Arizona	Canyon with a narrow band of riparian trees along the bottom. Adjacent vegetation is mapped as Semi-desert grassland	4 detections	2013 2014 2016	eBird
Silver Creek, Cochise County, Arizona	Ephemeral wash with limited riparian vegetation. Adjacent vegetation is mapped as Semi-desert grassland	1 detection	2016	eBird
Whitewater Draw, Cochise County, Arizona	Isolated wetland area with limited riparian tree structure, adjacent vegetation is comprised of Semi-desert grassland and agriculture	3 detections	2001 2011 2016	eBird
Leslie Canyon National Wildlife Refuge, Cochise County, Arizona	Ash, walnut, and cottonwood woodland of limited extent (<10 acres)	2 detections	2006 2008	eBird
Cave Creek Canyon, Chiricahua Mountains Arizona	Narrow mountain canyon that opens into a broad ephemeral drainage. Most detections occurred below the mountains and along the drainage. Riparian habitat is present along the canyon and but becomes sparser as the elevation drops. Chihuahuan desertscrub is adjacent to the drainage.	12 detections	1995 1997 2007 2012 2014 2015 2016	eBird
Silver Creek, Chiricahua Mountains Arizona	Ephemeral canyon wash in the foothills of the Chiricahua Mountains. Riparian vegetation. Limited riparian extent with Madrean evergreen woodland s in the surrounding uplands.	1 detection	2014	eBird
Paradise, Chiricahua Mountains Arizona	Mountain canyon containing Turkey Creek. Riparian vegetation is limited to canyon bottom.	1 detection	2003	eBird
Pinery Canyon, Chiricahua Mountains Arizona	Higher elevation mountain canyon, limited riparian vegetation. Canyon bottoms and uplands are mix of oak and pine. The area is transitional from Petran Montane Conifer Forest to Madrean evergreen woodland at lower elevations,	1 detection	2015	eBird
Whitetail Canyon, Chiricahua Mountains Arizona	Ephemeral canyon wash in the foothills of the Chiricahua Mountains. Riparian vegetation. Limited riparian extent with Madrean evergreen woodlands in the surrounding uplands.	1 detection	2015	eBird
Wilcox Playa, Cochise County Arizona	Large ephemeral playa lake with limited to no riparian edge structure. Surrounding vegetation is a mix of residential and agricultural lands and Semi-desert grasslands.	1 detection	1996	eBird
Bisbee, Cochise County, Arizona	A YBCU was recorded in abandoned mine lands in the Mule Mountains, Bisbee Arizona. The surrounding vegetation is mapped as Madrean evergreen woodland.	1 detection	2009	eBird
Stronghold Canyon West, Dragoon Mountains, Arizona	YBCU was detected along an ephemeral wash limited xeroriparian structure in Semi-desert grassland.	1 detection	2013	eBird

Location[2]	Habitat Description[3]	Detections or Breeding[4]	Year[5]	Source
French Joe Canyon, Whetstone Mountains, Arizona	Mountain canyon with oak, juniper, and mesquite.	2 detections	2002 2016	eBird
Huachuca Canyon, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	5 detections	2012 2013 2015 2016	eBird
Scotia Canyon, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	2 detections	2010 2011	eBird
Scheelite Canyon, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	1 detection	2000	eBird
Garden Canyon, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	2 detections	2010 2016	eBird
Ramsay Canyon, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	3 detections	1997 2014 2016	eBird
Carr Canyon, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	4 detections	2001 2012	eBird
Miller Canyon, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	6 detections	2002 2009 2013 2014 2016	eBird
Hunter Canyon, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	1 detection	2016	eBird
Ash Canyon, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	3 detections	2014 2015	eBird
Copper Canyon, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	1 detection	2016	eBird
Ida Canyon, Huachuca	Mountain canyon mapped as Madrean	1 detection	2016	eBird

Location[2]	Habitat Description[3]	Detections or Breeding[4]	Year[5]	Source
Mountains, Arizona	evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.			
Berar Creek, Huachuca Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	2 detections	2016	eBird
Appleton-Whittell Research Ranch, Santa Cruz County, Arizona	Research ranch located in Plains and Great Basin Grasslands. Limited pockets of riparian vegetation and stringers are present among the grasslands.	8 detections	2014	eBird
Canelo Hills Cienega, Santa Cruz County, Arizona	Isolated cienega with a small wooded area present.	2 detections	1990 1993	eBird
Bog Hole Wildlife Area, Santa Cruz County, Arizona	Isolated wetland within the grasslands of the San Rafael Valley. Limited riparian vegetation surrounding the wetland itself.	2 detections	2009 2015	EBird
Harshaw Creek and Harshaw Road, Santa Cruz County, Arizona	Two roadways following canyons in the northeast portion of the Patagonia Mountains. The canyon also contains Harshaw Creek which has limited intermittent flow in the area. Oak trees are the primary component of the vegetation along the canyon bottom interspersed with sycamores and cottonwood.	35 detections	2000 2002-2004 2009-2016	eBird
Santa Cruz River – Ephemeral section upstream from Rio Rico (excluding Kino Springs Golf Course), Santa Cruz County, Arizona	Broad open ephemeral portion of the Santa Cruz River upstream from the effluent inflow at the Nogales treatment plant. Limited riparian structure surrounded by Semi-desert grassland.	5 detections	1990 1991 2005 2011	eBird
Kino Springs Golf Course, Santa Cruz County, Arizona	Golf course with numerous small ponds and planted trees. Trees are limited to golf course and pond edges are sparse.	60 detections	1990-2002 2004-2016	eBird
Ruby Road, Rio Rico, Santa Cruz, Arizona	Road running through Calabasas Canyon which contains a broad open ephemeral wash with limited xeroriparian habitat containing isolated tall mature trees.	3 detections	2001 2015 2016	eBird
Walker Canyon, Atascosa Highlands, Arizona	Broad mountain canyon with Madrean evergreen woodland vegetation and grassy understory.	1 detection	2014	eBird
Pena Blanca Canyon and Lake, Atascosa Highlands, Arizona	Narrow mountain canyon and lake with limited riparian extent outside of the canyon bottom and lake edge.	27 detections	1992 2006 2008 2010-2014 2016	eBird
Sycamore Canyon, Atascosa Highlands, Arizona	Narrow mountain canyon with limited riparian vegetation outside of the canyon bottom and reservoir edge.	3 detections	2013 2014 2016	eBird
California Gulch, Atascosa Highlands,	Steep canyon consisting of dense thornscrub habitat that is listed as an	43 detections	1992 1996	eBird

Location[2]	Habitat Description[3]	Detections or Breeding[4]	Year[5]	Source
Arizona	Important Bird Area. Riparian vegetation is limited to the canyon bottom.		2001-2006 2008-2016	
Ruby Road and Oro Blanco Wash, Santa Cruz County, Arizona	Broad valley containing Oro Blanco Wash. The area contains numerous cattle tanks and a small pond, but has limited riparian vegetation and is transitional between Madrean evergreen woodland and Semi-desert grassland.	8 detections	2004 2011-2014 2016	eBird
Puerto Canyon, Tumacacori Mountains, Arizona	Narrow canyon with limited riparian vegetation surrounded by Semi-desert grassland vegetation.	2 detections	2014 2016	eBird
Grosvenor Hills and Salero Ranch	Large ranch southwest of the Santa Rita Mountains. Contains a few ephemeral drainages and stock tanks with limited riparian vegetation. The surrounding areas are mapped as Semi-desert grasslands in the low areas transitioning to Madrean evergreen woodlands in the Grosvenor Hills and Santa Rita Mountains.	33 detections	2005 2007-2010 2013-2016	eBird
Josephine Canyon, Santa Rita Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	1 detection	2016	eBird
Montosa Canyon, Santa Rita Mountains, Arizona	Mountain Canyon bisected by an ephemeral wash with limited riparian vegetation and surrounded by Semi-desert grassland.	33 detections	2005 2011-2014 2016	eBird
Agua Caliente Canyon, Santa Rita Mountains, Arizona	Mountain Canyon bisected by an ephemeral wash with limited riparian vegetation and surrounded by Semi-desert grassland.	1 detection	2001	eBird
Chino Canyon, Santa Rita Mountains, Arizona	Steep mountain canyon with dense but limited riparian vegetation along the canyon bottom.	3 detections	2011 2015 2016	eBird
Madera Canyon, Santa Rita Mountains, Arizona	Mountain canyon with oak, sycamore, and pine.	69 detections	1990 1998 2001 2003 2004 2006 2008-2014 2016	eBird
Box Canyon, Santa Rita Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	3 detections	2009 2014 2016	eBird
Kentucky Camp, Santa Rita Mountains, Arizona	Small drainage mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	2 detections	2016	eBird
Gardner Canyon,	Mountain canyon mapped as Madrean	2 detections	2001	eBird

Location[2]	Habitat Description[3]	Detections or Breeding[4]	Year[5]	Source
Santa Rita Mountains, Arizona	evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.		2016	
Cave Canyon, Santa Rita Mountains, Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	2 detections	2016	eBird
Casa Blanca, Santa Rita Mountains, Arizona	Open canyon in the foothills of the adjacent Santa Rita Mountains. There is limited riparian vegetation and the surrounding vegetation is a transitional zone between Madrean evergreen woodland and Semi-desert grassland.	1 detection	2010	eBird
Wood Canyon, Santa Rita Mountains, Arizona	Open canyon in the foothills of the adjacent Santa Rita Mountains. There is limited riparian vegetation and the surrounding vegetation is a transitional zone between Madrean evergreen woodland and Semi-desert grassland.	1 detection	2011	eBird
Davidson Canyon, Santa Rita Mountains, Arizona	Incised canyon with limited riparian vegetation. YBCU detections were near a highway and residential neighborhood.	1 detection	2016	eBird
Arivaca Road, Santa Cruz County, Arizona	Broad ephemeral wash with limited riparian structure. Adjacent uplands consist of Semi-desert grasslands.	4 detections	2010-2012 2016	eBird
Paige Creek, Pima County, Arizona	Broad wash basin with riparian structure limited to the basin bottom. Surrounding habitat is grassland transitioning to Madrean evergreen woodland at higher elevations.	5 detections	2015 2016	eBird
Sabino Canyon, Santa Catalina Mountains Arizona	Mountain canyon with transitional habitat as elevation increases from desertscrub to Semi-desert grassland to Madrean evergreen woodland.	3 detections	2005 2013	eBird
Ventana Canyon, Santa Catalina Mountains Arizona	Steep mountain canyon with limited riparian vegetation surrounded by desertscrub habitat,	1 detection	2014	eBird
Bear Canyon, Mount Lemmon, Santa Catalina Mountains Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found on larger drainages.	1 detection	2014	eBird
Peppersauce Canyon, Santa Catalina Mountains Arizona	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found along large riverine systems.	2 detections	2016	eBird
Tanque Verde Wash and Wentworth Road, Tanque Verde, Arizona	Ephemeral drainage adjacent to the Santa Rita Mountains within a suburb of the Tucson Metropolitan Area.	5 detections	2009 2010 2013 2016	eBird
Avra Valley Waste	Water treatment ponds with limited	3 detections	2002	eBird

Location[2]	Habitat Description[3]	Detections or Breeding[4]	Year[5]	Source
Treatment Plant	vegetation surrounded by desertscrub, residential areas, and an airport.			
Kellner Canyon and Russel Gulch, Pinal Mountains, Arizona	Mountains canyon with riparian vegetation limited to the canyon bottom.	5 detections	2011 2016	eBird
Cottonwood Wash, Navajo County, Arizona	Broad wash with patchy riparian structure surrounded by grasslands. YBCU detections occurred in an area with residential and agricultural disturbance.	3 detections	2015 2016	eBird
Sycamore Creek, Foothills of the Mazatzal Mountains, Arizona	Mountain canyon with a thin stringer of riparian vegetation along the canyon bottom.	3 detections	2009 2013 2016	eBird
Clanton Cienega, Animas Valley, New Mexico	Isolated cienega with surface water and limited riparian vegetation surrounding the wetlands. The surrounding habitat is grassland.	5 detections	1991 1992 1994 1996	eBird
Arroyo Santa Barbara, Sonora, Mexico	Mountainous area as as Madrean **e**vergreen **w**oodland and Petran Montane Conifer Forest. Detection is mapped as occurring at the transition zone between the two vegetation types.	1 detection	2010	eBird
Camino Santa Rosa, Sonora, Mexico	Hilly region mapped as Sinaloan Thornscrub and lacking any extensive canyons or drainages with increased canopy.	1 detection	2011	eBird
Camino Tarachi-Arivechi, Sonora, Mexico	Mountain canyon mapped as Madrean **e**vergreen **w**oodland bottoms typically have larger trees than uplands, but lack dense riparian structure found on larger drainages	1 detection	2015	eBird
Carretera 16/La Colorada, Sonora, Mexico	Small mountain canyon mapped as Sinaloan Thornscrub. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found on larger drainages	1 detection	2015	eBird
Cerro Pietro, Sonora, Mexico	Mountain residence where the vegetation is mapped as Sinoloan Thornscrub.	1 detection	2002	eBird
Huachinera Ranch, Sonora, Mexico	Mountain canyon mapped as Madrean **e**vergreen **w**oodland bottoms typically have larger trees than uplands, but lack dense riparian structure found on larger drainages.	1 detection	2012	eBird
Hwy 16 between Hermosillo and Yecora, Sonora, Mexico	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found on larger drainages	1 detection	2006	eBird
Palm-Fig Canyon, Sonora, Mexico	Mountain canyon mapped as Sinaloan Thornscrub. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found on larger drainages.	1 detection	1995	eBird
La Primavera, Sonora,	Mountainside mapped as Sinaloan	1 detection	2014	eBird

Location[2]	Habitat Description[3]	Detections or Breeding[4]	Year[5]	Source
Mexico	Thornscrub. A town and open pit mining facility are nearby.			
Lo de Campo, Sonora, Mexico	Mountain valley with patchy forest structure mapped as Sinaloan Thornscrub.	1 detection	1995	eBird
Pilares de Nacozari, Sonora, Mexico	Mostly abandoned historic mining village. Surrounding vegetation is mapped as Madrean evergreen woodland, but contains areas that remain disturbed from historic mining activities.	1 detection	2015	eBird
Sierra El Tigre Canyon, Sonora, Mexico	Broad valley bottom consisting of grasslands with trees on the valley edge and in a narrow band along an ephemeral drainage. Surrounding vegetation is mapped as Madrean Evergreen Woodland.	1 detection	2015	eBird
Carretera Hermosillo, Sonora, Mexico	Mountain canyon mapped as Sinaloan Thornscrub. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found on larger drainages.	1 detection	2015	eBird
Rancho Betania, Sonora, Mexico	Broad ephemeral wash with thin strands of riparian vegetation along the wash edges. Surrounding vegetation is mapped as Sonoran Desertscrub.	1 detection	2008	eBird
Rancho El Aribabi, Sonora, Mexico	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found on larger drainages	5 detections	2013 2014 2015 2016	eBird
Rancho Santa Barbara, Sonora, Mexico	Cleared valley bottom consisting of grasslands with trees on the valley edge. Surrounding vegetation is mapped as Madrean evergreen woodland.	1 detection	2010	eBird
Canyon de la Uvalama, Sonora, Mexico	Ephemeral wash with small patches of riparian vegetation. Surrounding vegetation is mapped as Sinaloan Thornscrub.	1 detection	2016	eBird
Reserva Monte Mojino, Sonora, Mexico	Densely wooded mountain canyon. Surrounding vegetation is mapped as Madrean evergreen woodland and Sinaloan Conifer Forest.	8 detections	2014 2015 2016	eBird
Sierra de los Ajos-Lagos, Sonora, Mexico	Two small ponds with limited adjacent riparian structure. Surrounding vegetation is mapped as Madrean evergreen woodland.	1 detection	2014	eBird
Palo Injerto, Sonora, Mexico	Densely wooded mountain canyon. Surrounding vegetation is mapped as Madrean evergreen woodland.	1 detection	2012	eBird
Wash along Route 89, Sonora, Mexico	Ephemeral wash with small patches of riparian vegetation. Surrounding vegetation is mapped as Semidesert Grassland and contains cleared areas likely associated with ranching.	1 detection	2016	eBird
Evans Canyon, Sonora Mexico	Ephemeral wash with small patches of riparian vegetation. Surrounding vegetation is mapped as Plains and Great Basin	1 detection	2016	eBird

Location[2]	Habitat Description[3]	Detections or Breeding[4]	Year[5]	Source
	Grassland.			
Sierra Buenos Aires Aguaje de la Capilla, Sonora Mexico	Mountain canyon mapped as Madrean evergreen woodland. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found on larger drainages.	1 detection	2016	eBird
Sierra Buenos Aires El Capulin, Sonora, Mexico	Broad valley bottom consisting of grasslands with trees on the valley edge and in a narrow band along an ephemeral drainage. Surrounding vegetation is mapped as Madrean evergreen woodland.	1 detection	2016	eBird
Sierra de Los Ajos, Sonora, Mexico	Mountain canyon mapped as Madrean evergreen woodland and Petran Montane Conifer Forest. Canyon bottoms typically have larger trees than uplands, but lack dense riparian structure found on larger drainages.	1 detection	2014	eBird
Tarachi, Sonora, Mexico	Small town adjacent to a river with a limited riparian vegetation. Adjacent lands are a mixture of Madrean evergreen woodland and agriculture.	1 detection	2015	eBird

1. There were over 7000 eBird records for YBCU in the defined range over a period from 1964 to August of 2016. WestLand removed all records prior to 1990, duplicate records, records within 3 days of each other, records within proposed critical habitat and major drainages, records outside of the breeding period of June through August, and records where locations could not be verified based on discrepancies in the data reporting. Those records that were clearly in areas that are strikingly different than the large riverine systems described as habitat for the DPS by USFWS are included in this table.
2. eBird location data is reported as a single point in the database, however the reporting individual may have collected data over a much larger area. For this report location data was matched with location descriptions as reported to the eBird database. eBird location data that were too broad to ascertain habitat information (i.e. Coronado National Forest) or where the description did not match the plotted location were omitted.
3. Habitat descriptions are based on review of freely available aerial imagery and mapping of biotic communities provided by Brown and Lowe (1980).
4. Some detections associated surveys depicted in **Table 1** are likely also reported in EBird, as such we have omitted all eBird detections that could potentially be associated with those reported in **Table 1** from **Table 2**.
5. eBird contains YBCU detections beginning in 1964, for the purposes of this report only recent YBCU detections were used and all detections prior to 1990 were omitted. All detections occurring within a 3-day period within the same area were considered a single detection. This prevents double counting, but may underestimate the number of detected birds.

These new data extend YBCU habitat in the Southwest to biotic communities, following Brown and Lowe (1980), not considered by USFWS in its analysis of threats to the habitat for YBCU: Semi-desert grassland, Madrean evergreen woodland, Sinaloan thornscrub, and Plains and Great Basin grassland. In fact, in training material provided to YBCU surveyors, USFWS explicitly considers areas within Semi-desert grassland and Madrean evergreen woodland to be habitat for YBCU (**Appendix A**). YBCU have also been detected in areas that were formerly Sinaloan thornscrub, but have now been converted for agricultural uses (Rhower et al. 2015). The consistent occupancy of these locations across a relatively large area of southern Arizona and northern Mexico illustrate that these data are not isolated occurrences and that ephemeral drainages throughout these biotic communities in the Southwest and Mexico are suitable habitat for YBCU. Given the relatively few locations surveyed across southern Arizona and northern Mexico, it is reasonable to conclude that the number and distribution of YBCU known to occur in these biotic communities will continue to increase with survey effort.

The most fundamental implication of the extension of YBCU habitat to drainages throughout Semi-desert grassland, Madrean evergreen woodland, and Sinaloan thornscrub is that USFWS severely underestimated the amount of suitable habitat for YBCU in the Southwest and Mexico in its analysis that concluded that listing the purported western DPS was necessary. For example, the acreage of proposed critical habitat for the purported DPS totals approximately 335,000 acres. Although we realize that not all areas that USFWS (2014b) considered suitable for YBCU were included in the proposed designation, these areas can be used as a reasonable estimate of what USFWS determined as suitable habitat for YBCU in the Southwest for its threats analysis in the listing decision. The inclusion of Semi-desert grassland and Madrean evergreen woodland in Arizona alone increased this estimate to over 9 million acres. The inclusion of Sinaloan thornscrub, Semi-desert grassland, and Madrean evergreen woodland in New Mexico and northern Mexico within the boundaries of the purported DPS (**Figure 1**) increases this estimate of suitable habitat to over 65 million acres. While we acknowledge that not all of the areas mapped as these biotic communities constitutes suitable habitat for YBCU, the implication is clear; YBCU habitat in the Southwest is far more prevalent and widespread than USFWS (2013, 2014a,b) suggest.

Another consequence of this extension of habitat is that YBCU are clearly not restricted to rare riparian habitats along major drainages that are relatively isolated from each other. The populations of the species in the Southwest are likely more connected to each other than is alleged by USFWS (2013, 2014a), as these biotic communities are considerably more common and widespread across the Southwest and northern Mexico than large riverine systems (see **Figure 1**).

Finally, these data challenge the appropriateness of the conclusion by USFWS (2013, 2014b) that the western populations of YBCU are in severe decline. This conclusion was based entirely on data from large riverine systems that contained large blocks of riparian woodland (see WestLand 2013b for a complete discussion). Obviously, the lack of survey data from the considerable amount of suitable habitat that drainages within Semi-desert grassland, Madrean evergreen woodland, and Sinaloan thornscrub biotic communities renders this conclusion meaningless; there is a considerable amount of suitable habitat that remains unsurveyed. The reliance by USFWS on data from only larger river systems severely biases any inference of population dynamics of the purported western DPS as a whole. Consequently, USFWS' analysis of the population status of western YBCU, the trend of western YBCU populations, and the implications of perceived threats to the habitat of western YBCU on the DPS is biased. This bias calls into question the validity and appropriateness of USFWS' analysis of the threats to the purported DPS and conclusion that the DPS requires protection under the ESA.

6. THE PURPORTED WESTERN DPS OF YBCU IS NOT A LISTABLE ENTITY

USFWS' determination that western population of YBCU is a discrete and significant DPS relied heavily on the assumption that western populations are genetically different from eastern populations of YBCU. USFWS (2013, 2014b) created the impression that these populations actually are genetically distinct, but that genetic studies have simply failed to use the appropriate genetic markers to detect this difference. USFWS (2013, 2014b) also used perceived conflicts in genetic studies as justification to rely on behavioral and morphological traits to conclude that eastern and western populations differ *markedly* in their genetic characteristics. Moreover, USFWS (2014b) explicitly attempts to link genetic data to morphological and behavioral characters to further justify the reliance on these traits to conclude that western populations of YBCU constitute a DPS that is discrete from and significant to other populations of YBCU found east of the Rocky Mountains.

New information and analysis of genetic data provided by McNeil (2015) clearly show that there is no conflict among genetic studies regarding whether the eastern and western populations of YBCU are genetically distinct. Multiple studies with a variety of genetic markers have shown that there is simply no genetic differentiation between eastern and western population of YBCU (see **Section 5.1**.). These new genetic studies also undermine USFWS' reliance on genetic data to justify the conclusion that perceived morphological and behavioral differences between eastern and western populations of YBCU reflect true genetic differences; in the face of overwhelming genetic evidence that is available, it is inappropriate to assume that morphological and behavioral traits can only have arisen from evolved differences between populations.

New data and analyses on wing length in YBCUs provide evidence that undermines USFWS' conclusion that western populations of YBCU are discrete from and significant to other populations of YBCU. Wing length is a major component of the body size metrics that were relied upon extensively by USFWS (2013, 2014b) to conclude that eastern and western populations differ *markedly* in genetic characteristics. New data provided by McNeil (2015) indicate that wing length varies along a cline across the boundary of the purported DPS rather than abruptly changing at the purported DPS boundary as is erroneously assumed by USFWS (2013, 2014b). Reanalysis of data collected by Banks (1988) illustrates that wing length in YBCU does indeed vary along a longitudinal cline across North America. These findings indicate that body size, using wing length as a proxy, changes gradually across the range of the species and that this metric cannot be used as strong evidence that eastern and western populations of YBCU differ *markedly* in genetic characteristics.

Together the new genetic and morphological data and analyses presented in the petition provide strong evidence that demonstrate that the purported western DPS of YBCU is not a valid entity for listing under the ESA.

7. LISTING FACTORS DO NOT RISE TO A LEVEL THAT LISTING THE PURPORTED WESTERN DPS OF YBCU UNDER THE ESA IS WARRANTED

The USFWS listed the purported western DPS of YBCU based on two of the five ESA listing factors:

1) the present or threatened destruction, modification, or curtailment of its habitat or ranges; and
2) other natural or manmade factors affecting its continued existence.

Both of these listing factors rely on the assumption that YBCU habitat requirements in the Southwest and northern Mexico are largely restricted to areas with expansive tracts of riparian vegetation along major riverine systems. The striking disconnect between USFWS' description of habitat for the western DPS of YBCU in its conclusion to list the species and the types of drainages proposed for consideration as critical habitat alone warrants a reanalysis of the listing decision to take into account the expansion of what is considered suitable habitat for western populations of YBCU as brought forth by the proposed designation of critical habitat. The new data collected subsequent to the listing of the purported DPS provide additional evidence that USFWS' assumption of what is habitat for western YBCUs is incorrect and that the threats to the species analyzed by USFWS (2013, 2014b) do not rise to the level that listing the DPS under the ESA is necessary.

7.1. LISTING FACTOR A: THE PRESENT OR THREATENED DESTRUCTION, MODIFICATION, OR CURTAILMENT OF HABITAT OR RANGE

As discussed throughout this petition, in its analysis of whether or not the purported western DPS of YBCU warranted listing, USFWS restricted suitable habitat to those areas "consist[ing] of expansive blocks of riparian vegetation" (USFWS 2013, pg. 61643) largely along large riverine systems in the Southwest (USFWS 2013, 2014b). USFWS claimed that these types of habitat in the Southwest have been subject to substantial losses: "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" (USFWS 2013, pg. 61643). The principal causes of these losses focus on factors that are threats to large, low elevation, perennial rivers and streams and include: "altered 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" (USFWS 2013, pg. 61643). Those threats that exacerbate these principal causes include "conversion of floodplains for agricultural uses, such as crop and livestock grazing" (USFWS 2013, pg. 61643). The examples used by USFWS to illustrate these are large riverine systems, such as the Bill Williams River, the Yaqui and Sonora rivers in Mexico, and the Santa Clara River in California (USFWS 2013, pgs. 61643-61655). USFWS did not contemplate that suitable habitat for YBCU includes smaller drainages throughout three main biotic communities in the Southwest and northern Mexico.

Survey data and new information on habitat use by YBCUs indicate that the threats enumerated and discussed by USFWS (2013) as threat Factor A are minimal when one considers the expansion of what is understood to be YBCU habitat in the Southwest and northern Mexico. Many of the drainages where recent surveys have detected YBCU are not under threat from dams, channelization, bank stabilization, or conversion to agriculture use.

As a result of the substantial expansion of known YBCU habitat due to new data, much of suitable habitat in the range of the proposed western DPS of YBCU is outside of large, bottomland riverine systems that are subject to these threats.

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

As Listing Factor E, USFWS (2013, 2014b) considered the impacts to the purported western DPS of YBCU from manmade factors such as small and widely separated habitat patches and pesticides as threat factors that warrant listing of the DPS. USFWS' analysis of the threats premised upon small, separated habitat patches relies exclusively on: (1) the assumption that western population of YBCU require large tracts of riparian woodland; and (2) examples of habitat fragmentation along major river systems, such as the Colorado, Gila, and Rio Grande rivers (USFWS 2013, pg. 61659). The discussion of impacts to YBCUs as a result of pesticide use contemplate effects from "intentional aerial spraying of habitat for mosquito or forest pest control, or from overspray when foraging habitat is located next to agricultural fields" (USFWS 2013, pg. 61660). The examples provided by USFWS to illustrate effects from pesticides are again of major, low-elevation rivers, such as the Colorado, Gila, Rio Grande, and Sonora rivers (USFWS 2013, pg. 61660). USFWS did not take into account that habitat outside of these large riverine systems constitute a considerable portion of suitable habitat for YBCU in the Southwest and northern Mexico.

New survey data and information on habitat use by YBCU indicate that the threats enumerated and discussed by USFWS (2013) as threat Factor E are minimal when one considers the expansion of YBCU habitat in the Southwest and northern Mexico. These data illustrate that YBCU regularly occupy and breed in small habitat patches along ephemeral drainages throughout semi-desert grassland, Madrean evergreen woodland, and Sinaloan thornscrub biotic communities, indicating that fragmentation of large tracts of low-elevation riparian woodland is not a threat to birds that inhabit much of the suitable habitat throughout the Southwest and northern Mexico. Moreover, pesticide use near agricultural fields and other areas of human habitation is minimal in both extent and impact when one considers the substantial amount of suitable habitat for YBCU in the Southwest and northern Mexico that is demonstrated by the results of new survey data. Little of this suitable habitat is affected by agricultural activities.

8. CONCLUSION

This petition provides strong evidence for delisting the purported western DPS of YBCU. Strong evidence for delisting, however, is not necessary in order to require the USFWS to make a positive 90-day finding that the petitioned action may be warranted. Indeed, it is not even necessary that a petition present the bare minimum of evidence necessary to support a decision to implement the petitioned action. Therefore, USFWS could not legally deny this or any other petition on the basis that it fails to present the scientific evidence and analysis needed to justify a decision to implement the petitioned action. Rather, pursuant to ESA section 4(b)(3)(A), the question USFWS must determine at this stage is "whether the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted." This is a relatively low-threshold burden of proof. As USFWS has explained, for the purposes of this decision, "substantial scientific or commercial information' refers to credible scientific or commercial information in support of the petition's claims such that a reasonable person conducting an impartial scientific review would conclude that the action proposed in the petition may be warranted." 50 C.F.R. § 424.14(h)(1)(i). Given the information and analysis presented in this petition, no reasonable person could conclude otherwise—the delisting of the western DPS of YBCU unquestionably *may* be warranted. Hence, even if USFWS believes the petition has not presented sufficient support for that ultimate action, USFWS must open a status review of the species in connection with the required process for making a 12-month finding under ESA section 4(b)(3)(B).

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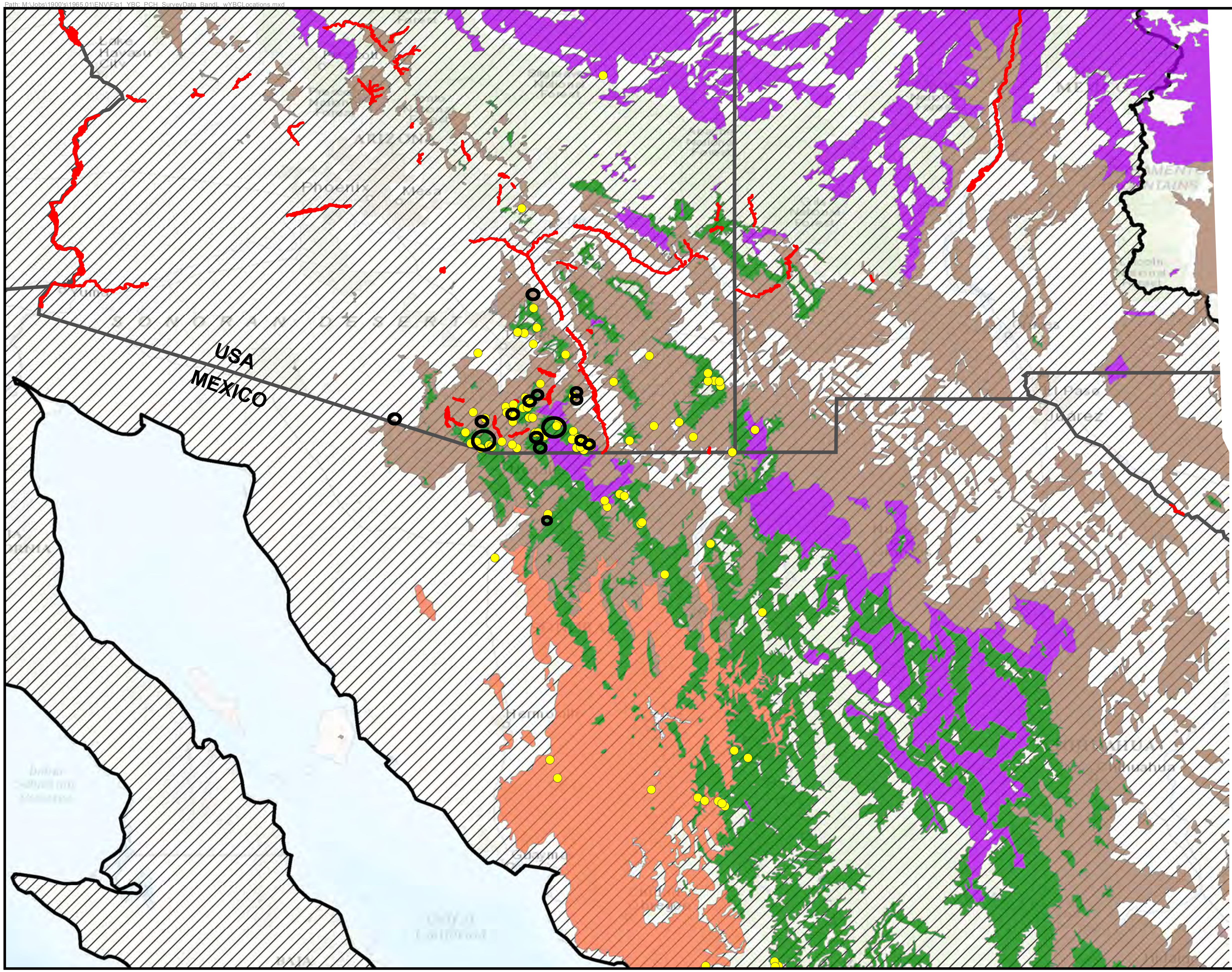
FIGURES



Approximate Location of YBCUs Detected During Recent Surveys in the Breeding Season in Semi-desert Grassland and Madrean Evergreen Woodland

Recent YBCU detections during the breeding season in the Southwest in the biotic communities listed below (Ebird data)

Approximate Range of the Proposed Western DPS of YBCU

Brown and Lowe's Biotic Communities of the Southwest (1980)

123.3 Madrean Evergreen Woodland

134.3 Sinaloan Thornscrub

142.1 Plains and Great Basin Grassland

143.1 Semidesert Grassland

YBCU Proposed Critical Habitat (USFWS 2013)

N

0 50 100 Miles

WestLand Resources

Technical Analysis for the Petition to Delist the Western District Population Segment of the Yellow-billed Cuckoo

YBCU PROPOSED CRITICAL HABITAT, NEW SURVEY DATA, AND BIOTIC COMMUNITIES

Figure 1

APPENDIX A

USFWS
YBCU Habitat
Atypical Habitat

U.S. Fish and Wildlife Service

Yellow-billed Cuckoo Habitat Atypical Habitat

Susan Sferra

U.S. Fish & Wildlife Service

Arizona Ecological Services Office

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http://www.fws.gov/southwest/es/arizona

Atypical YBCU Habitat Characteristics in AZ (southeastern AZ south of Gila River)

- May be less than 200 ac (81 ha) in size, narrower than 325 ft (100 m), and in drainages > 3% slope (different than critical habitat proposed rule). May include:
  - Stringers of trees in drainages
  - Scattered trees in drainages and adjacent hillsides
  - Mosaics of dense vegetation with open areas and/or shorter-stature vegetation in drainages and adjacent hillsides
- Composed of hydro- and/or xeroriparian species
- Drainages with ephemeral, intermittent, or permanent flow
- High monsoonal humidity in SE AZ
- Variety of elevations (below 7000 ft); in SE AZ as low as 2300 ft
- Often with dense grass or herbaceous growth within or adjacent to habitat

Trees in Atypical YBCU Habitat in AZ

Cottonwood
Willow
Mesquite
Oak
Tamarisk
Hackberry
Sycamore
Walnut
Boxelder

Alder
Acacia
Ash
Soapberry
Elderberry
Juniper
Desert willow
Russian olive

Photo by Jennie MacFarland, Tucson Audubon

Nest Trees in Atypical YBCU Habitat in AZ

Cottonwood
Willow
Mesquite
Oak
Tamarisk
Hackberry
Sycamore
Walnut
Boxelder

Alder
Acacia
Ash
Soapberry
Elderberry
Juniper
Desert willow
Russian olive
Seep willow (baccharis)

Photo by Jennie MacFarland, Tucson Audubon

Atypical YBCU Habitat Types in AZ

- **Riparian woodland** with narrow stringers of trees or scattered trees
- **Mesquite-dominated woodland**
- **Madrean evergreen woodland** with mixed oak assemblages, often interspersed with riparian vegetation, in and adjacent to drainages in the foothills and mountains of SE AZ
- **Semi-desert grassland** drainages with narrow stringers of trees or scattered trees

Adjacent Foraging Habitat is Important

Part of Home Range

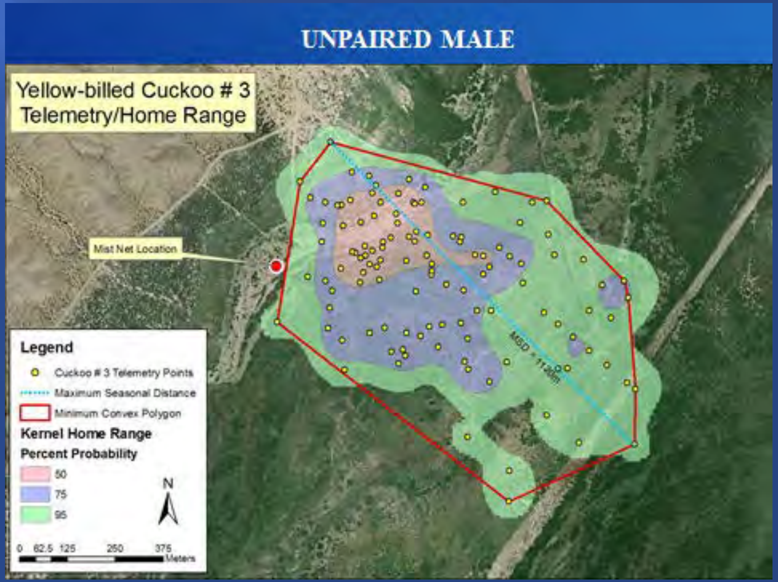
East side of Santa Rita Mountains
Coronado National Forest and private land
Semi-desert Grassland and Madrean Evergreen Woodland
Breeding and foraging habitat

Cuckoos Can Travel over a Mile a Day within Home Range

- ❑ Individual Greatest Distance Traveled within Home Range
  - Seasonal = 2.0 miles (3143 meters)
  - Daily = 1.1 miles (1716 meters)

- ❑ Average Greatest Distance Traveled (n=10) within Home Range
  - Seasonal = 0.9 miles (1460 meters)
  - Daily = 0.5 miles (786 meters)

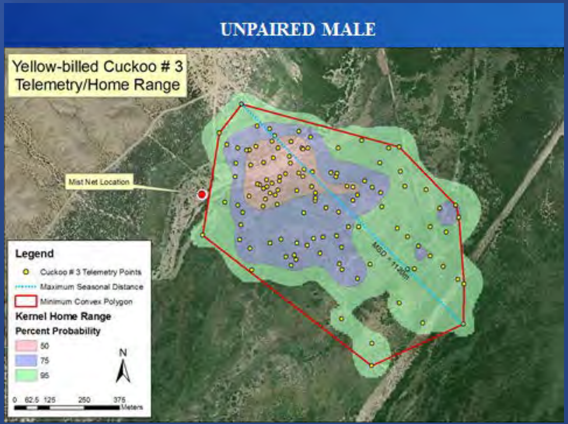
- ❑ Adjacent non-riparian foraging habitat is part of home range



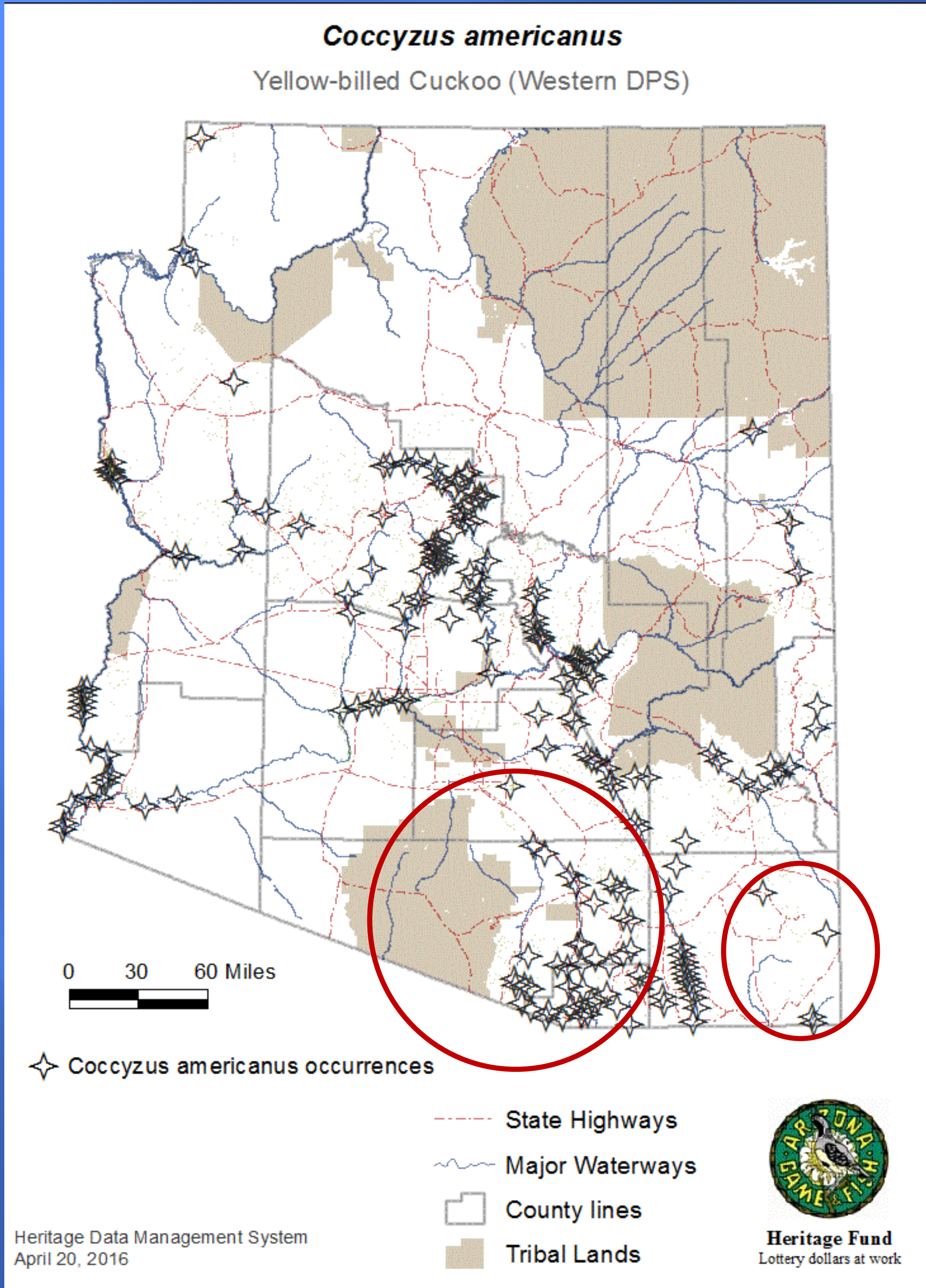
Movement Study, Rio Grande NM
Sechrist et al. (2009)

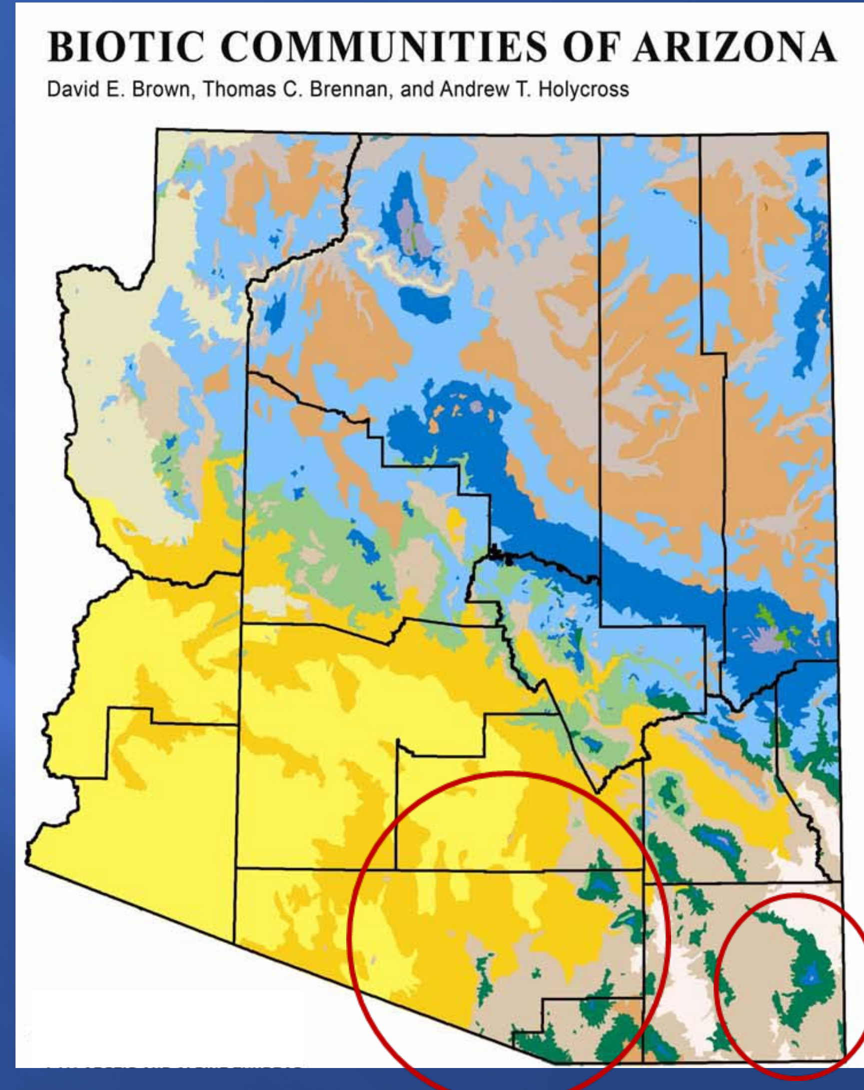
Home Range Size Varies

- Home range averages > 100 ac (40 ha)
  - Laymon et al. 1993, Laymon et al. 1997, Laymon and Williams 2002; Halterman 2009; McNeil et al. 2010, 2011, 2012
- Home range varies from 12 to 697 ac (5 to 282 ha) , averaging 202 ac (82 ha) (Minimum Convex Polygon)
  - Sechrist et al. 2009
- Large expanses of habitat are better for cuckoos, but small habitat patches should not be overlooked when considering areas to survey and habitat management



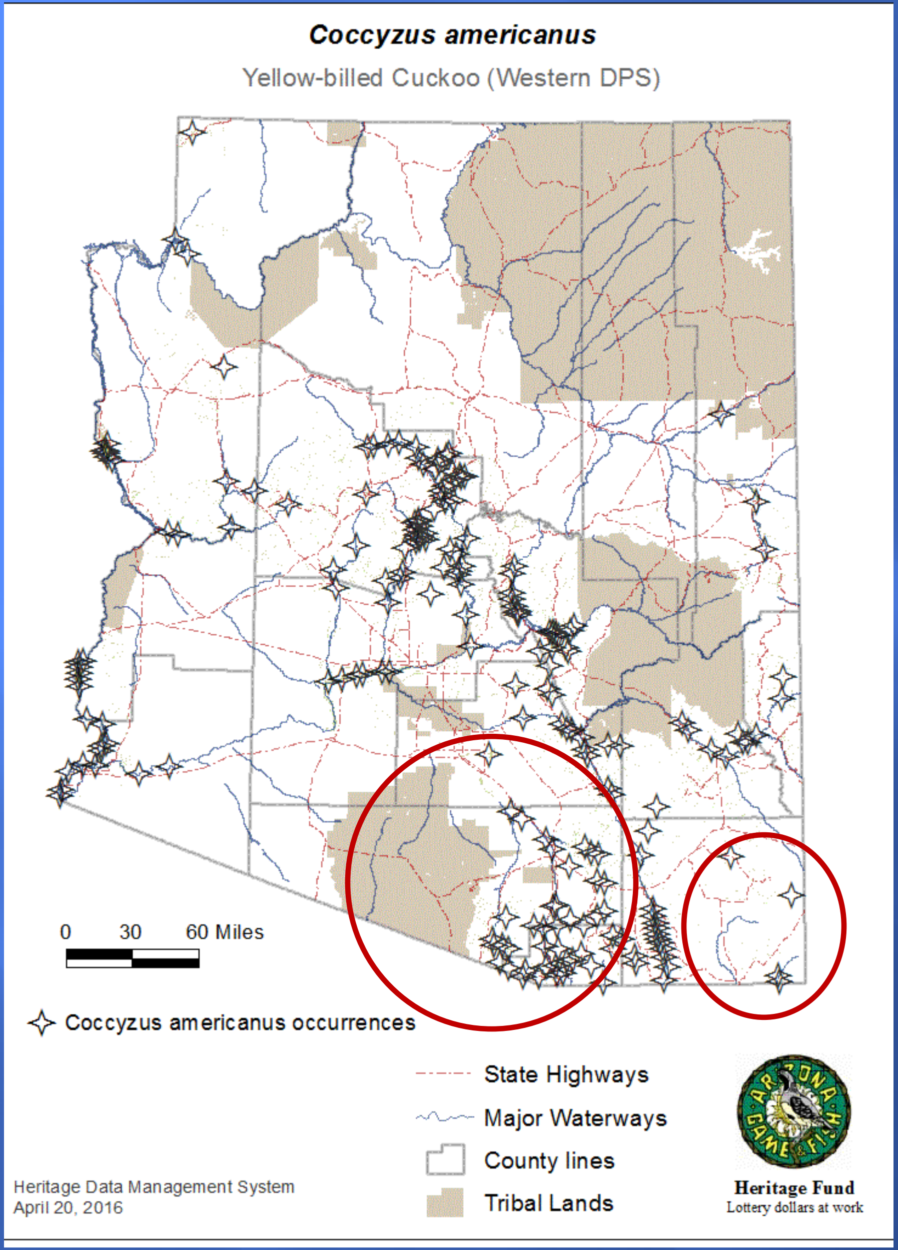
Movement Study, Rio Grande NM
Sechrist et al. (2009)

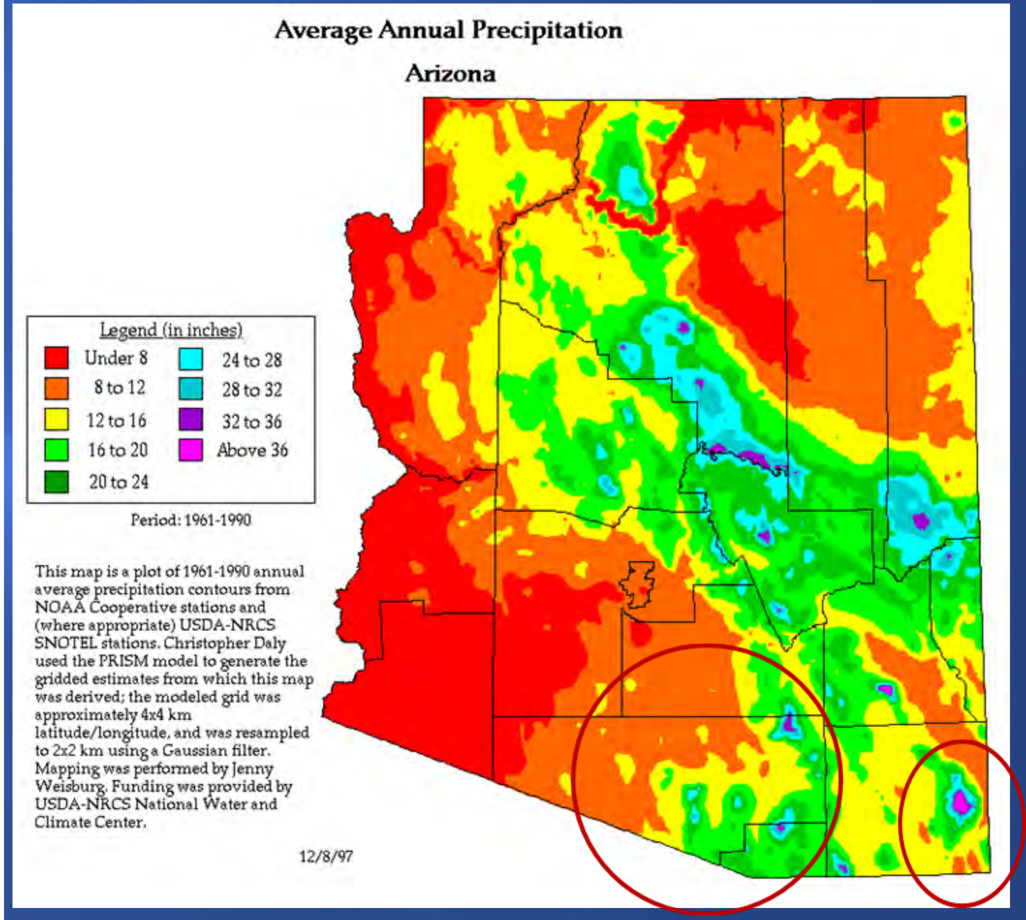




Atypical habitat is most common in SE AZ

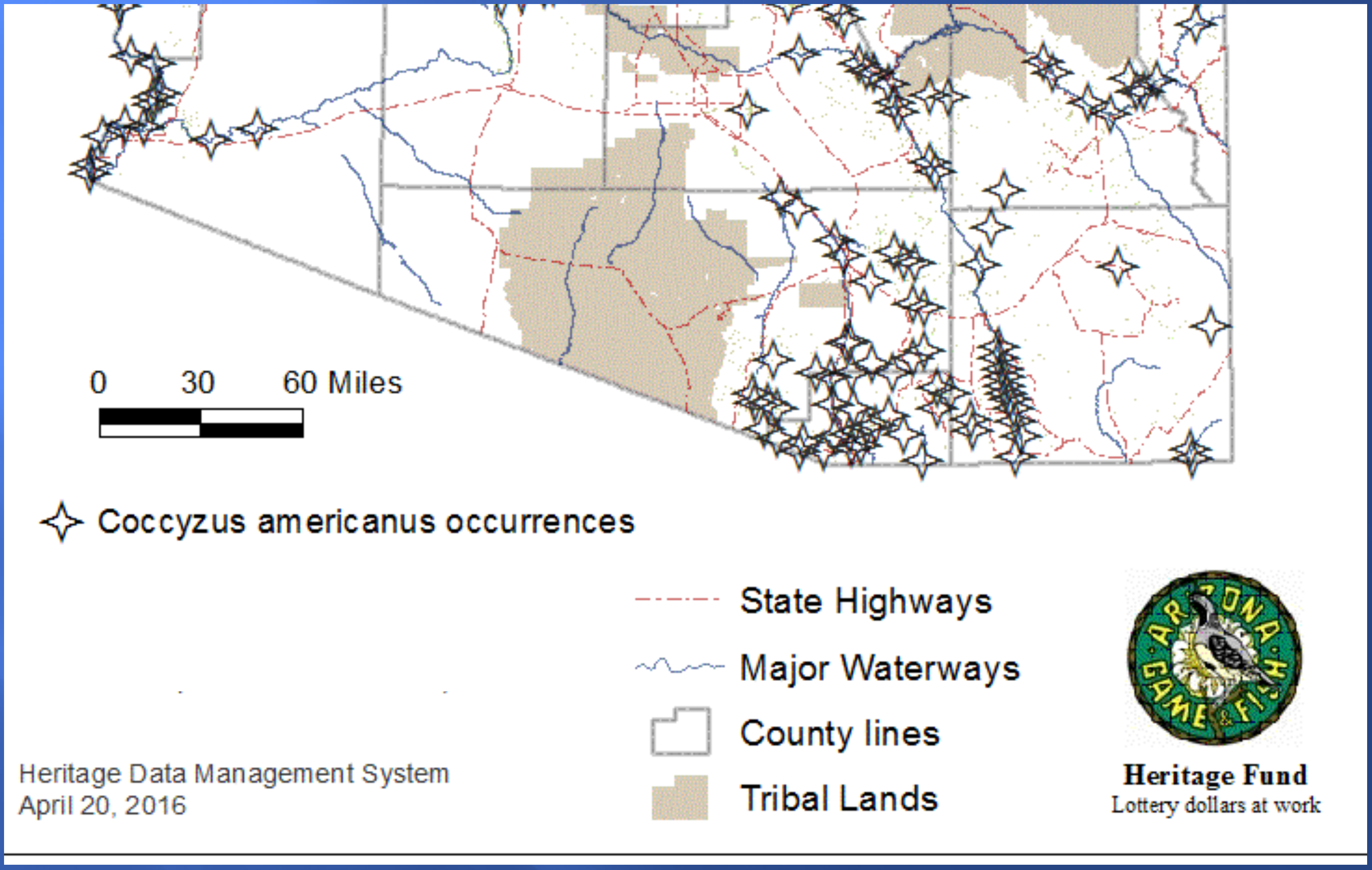
Cuckoo Detections and Precipitation





Cuckoo breeding in SE AZ likely triggered by summer rains

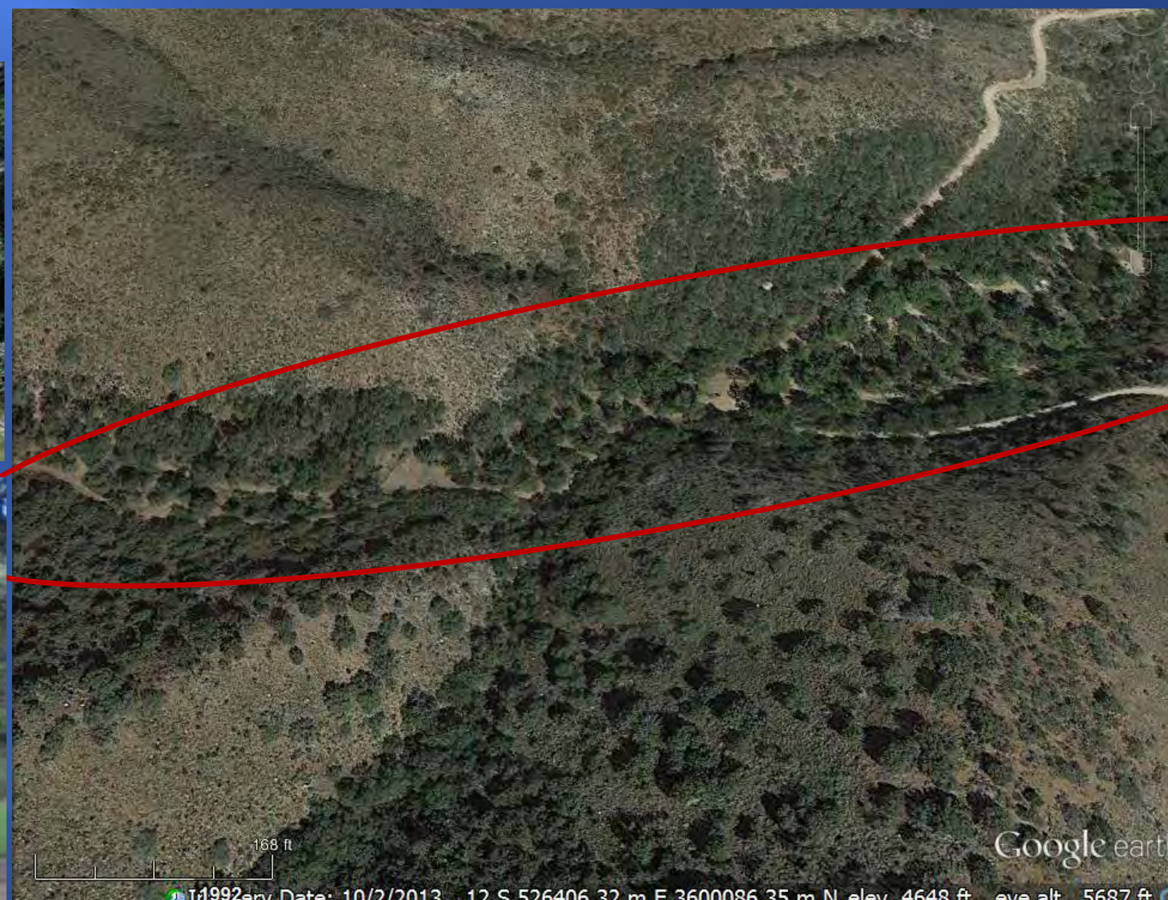
Atypical Habitat at Individual Sites



Peppersauce Canyon, Santa Catalina Mountains
Coronado National Forest
4500-5000 ft

oak, mesquite, hackberry, sycamore, cottonwood, acacia, greythorn

Pair in Aug 2015



Moyza Ranch Rd, Papalote Wash (w of I-19 between Tucson & Nogales) 3500 ft

- 12 yrs monitoring
- Nests found in June, July, Aug, Sept
- mesquite, acacia, hackberry
- Dense herbaceous growth

Montosa Canyon, Santa Rita Mountains
Coronado National Forest
4300-5300 ft

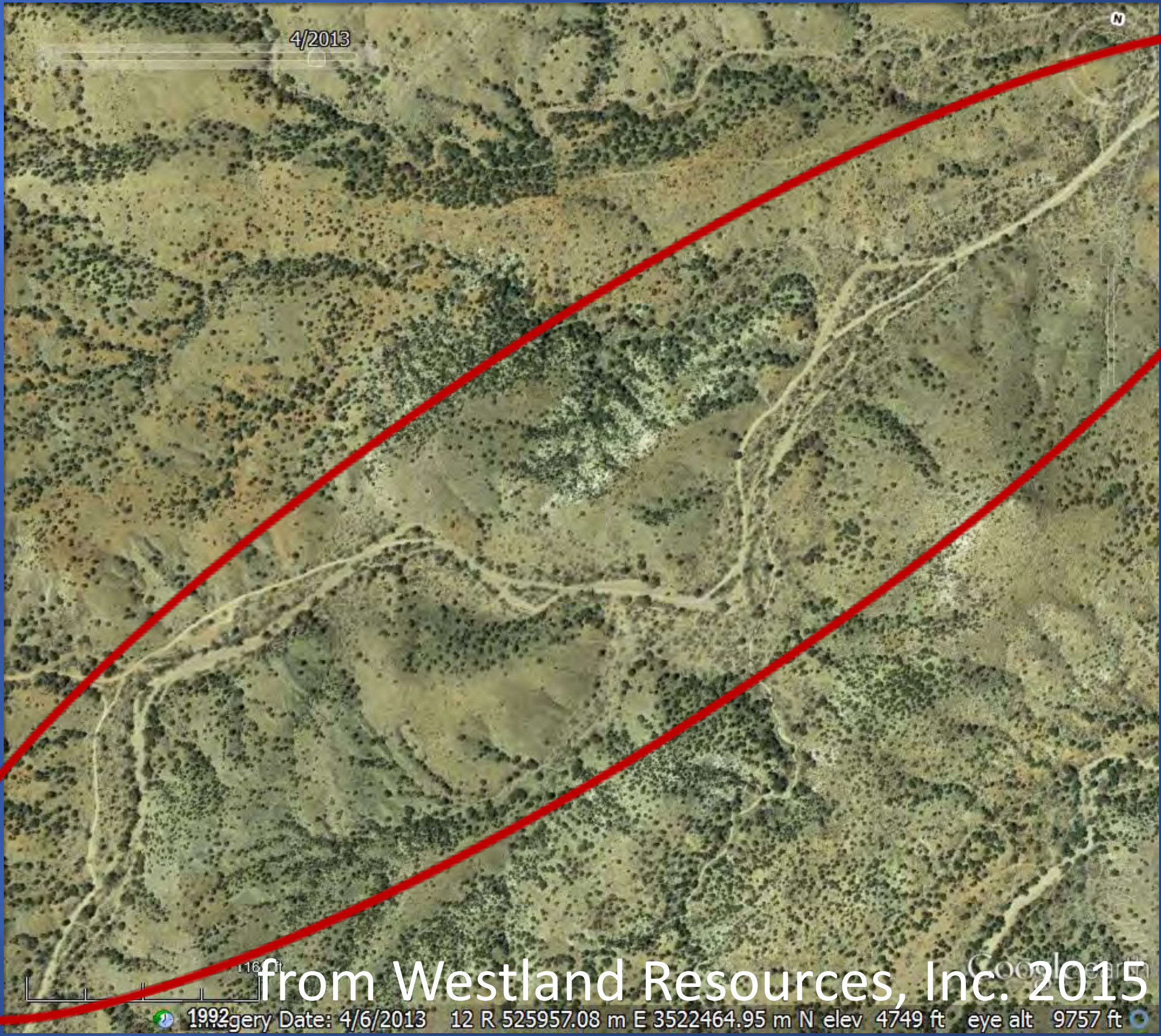
Aug 2014 oak nest, 4 pairs in 2015 (July 15-Aug 24)

- oak
- mesquite
- hackberry
- juniper
- sycamore
- cottonwood
- walnut

Barrel Canyon, Santa Rita Mountains
Coronado National Forest
4600 – 4800 ft

Pairs 2014, 2015; Jul, Aug

- oak
- desert willow
- mesquite
- juniper
- walnut



Patagonia Mountains, Coronado National Forest
4000-5000 ft

Pairs in 2013, June 24-Aug 16; pairs in 2015 in August

sycamore, oak, juniper, hackberry, walnut, mesquite, ash, cottonwood

Lyle Canyon, Canelo Hills
Audubon Research Ranch
4850-5000 ft

Primarily oak
Some cottonwood

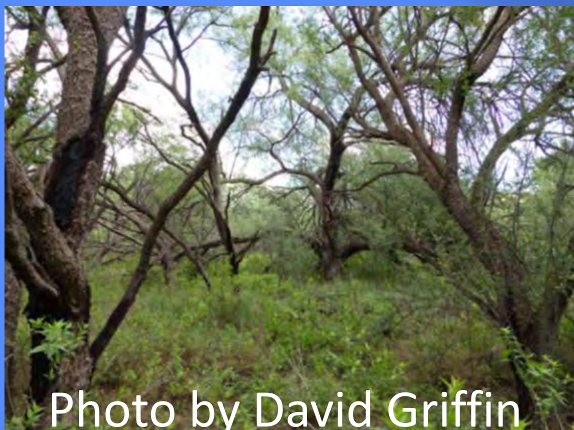
Pr pairs 2015 June 29-Aug 5

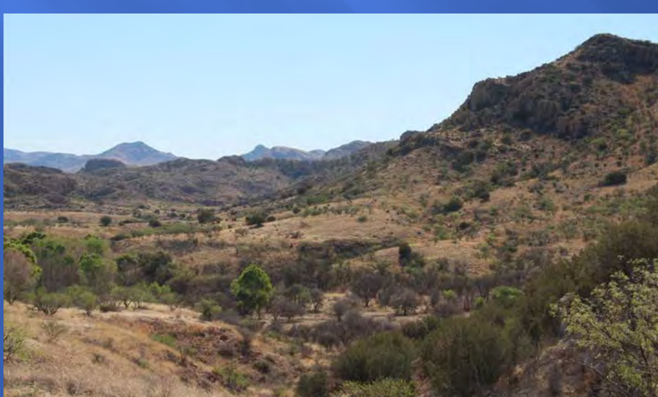
Arivaca Cienega, Arivaca Lake, Penitas Wash

Atascosa Highlands

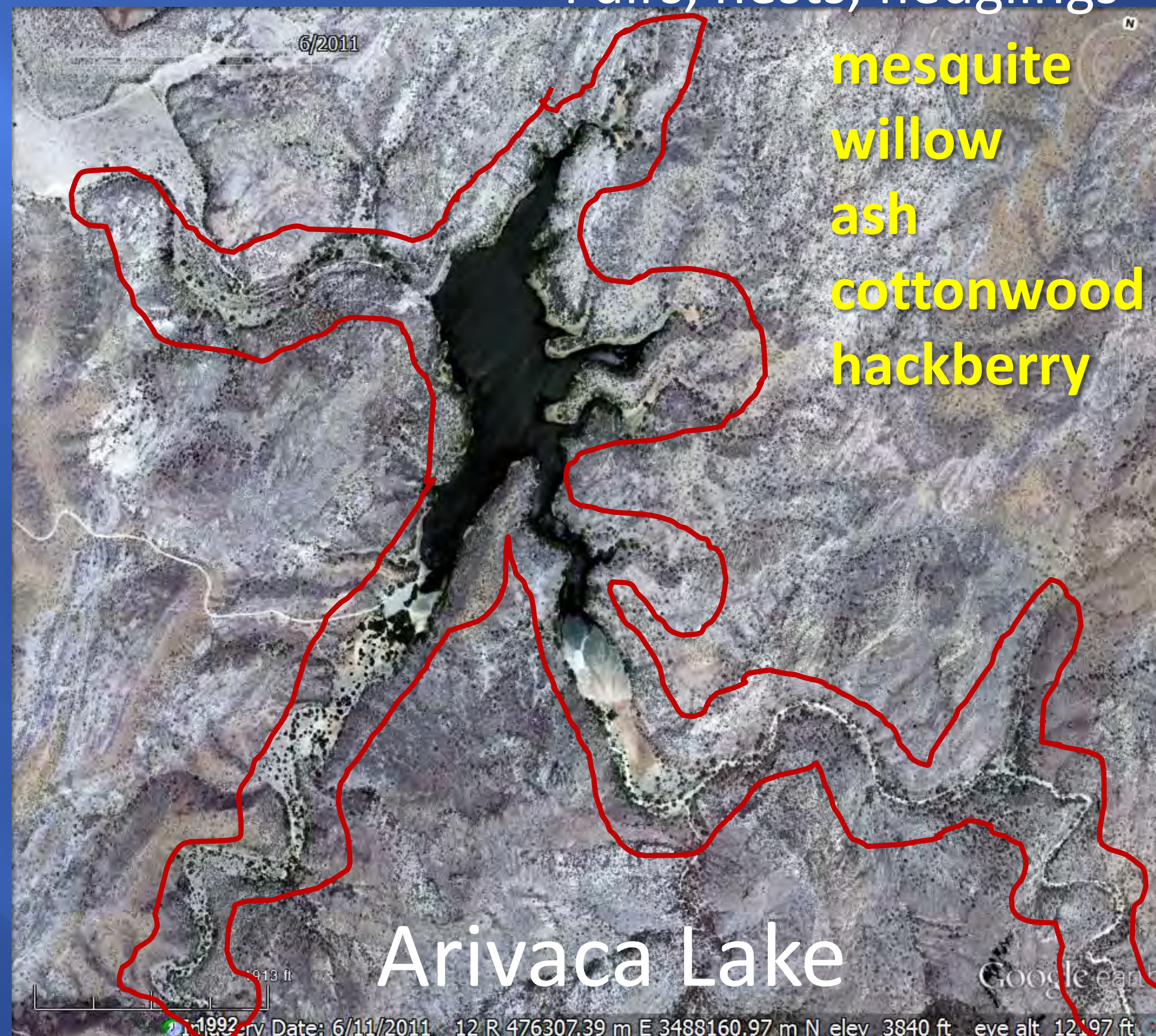
Coronado NF, Buenos Aires NWR, state, private

3100-4000 ft





Pairs, nests, fledglings

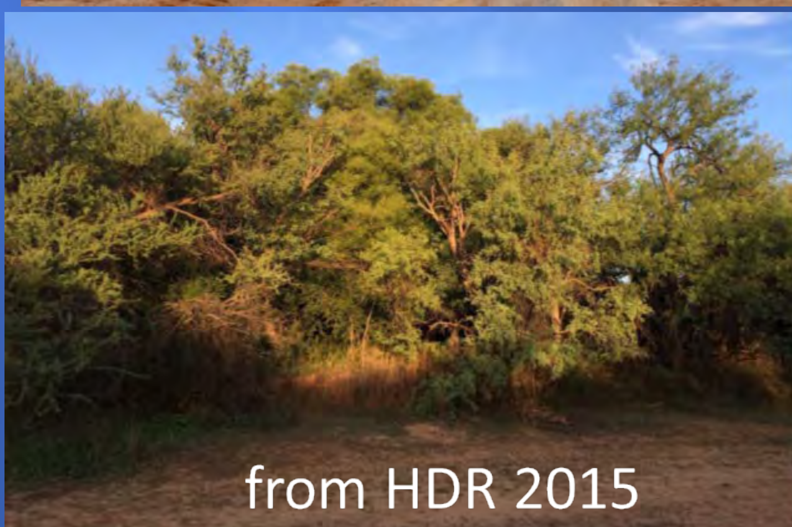


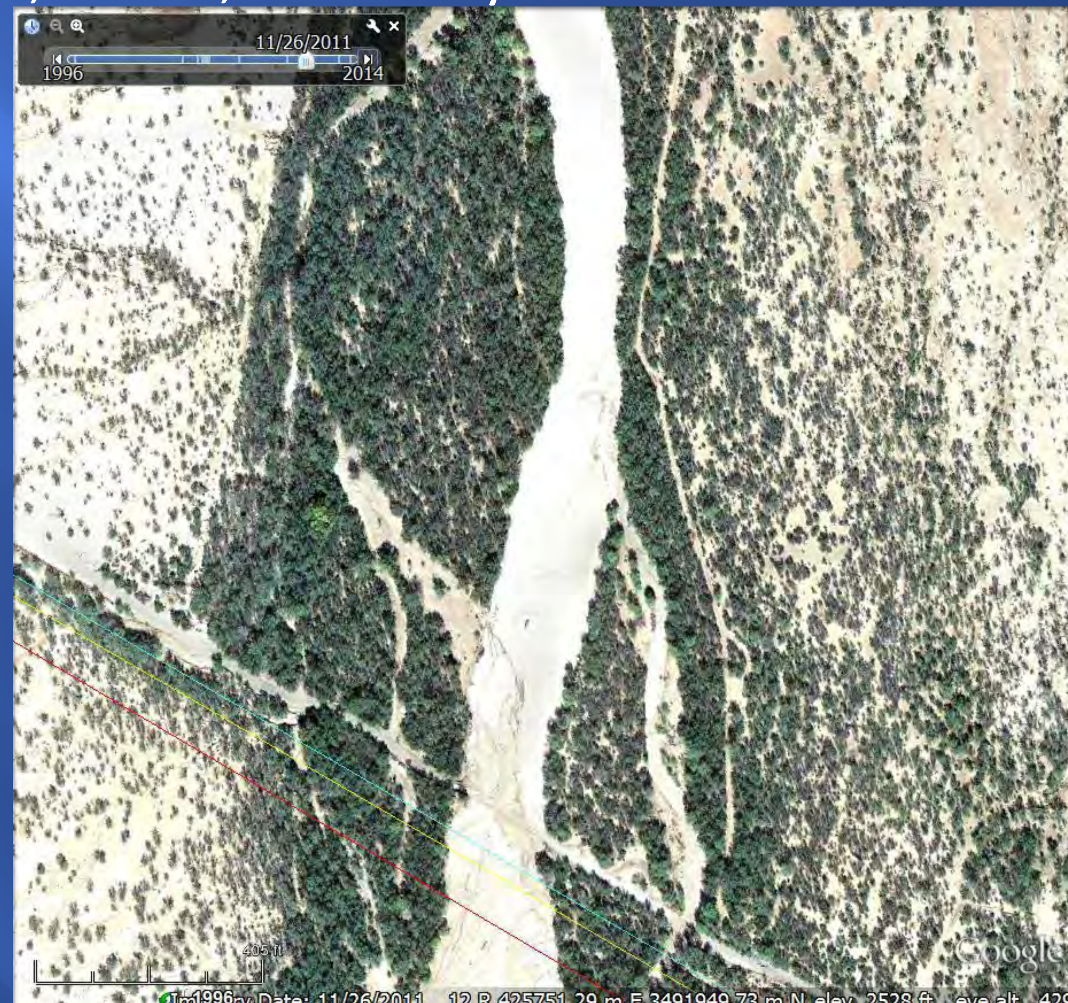
Vamori Wash (border of US and Mexico)

2500 ft

Pr pair; 12 detections Jul 1-Aug 14, 2015, on each of 4 surveys

mesquite, palo verde, willow, acacia, hackberry

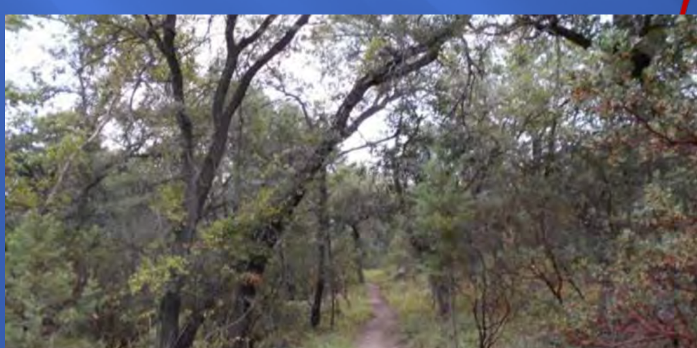




Miller Canyon
Huachuca Mountains, Coronado NF
5000-7000 ft

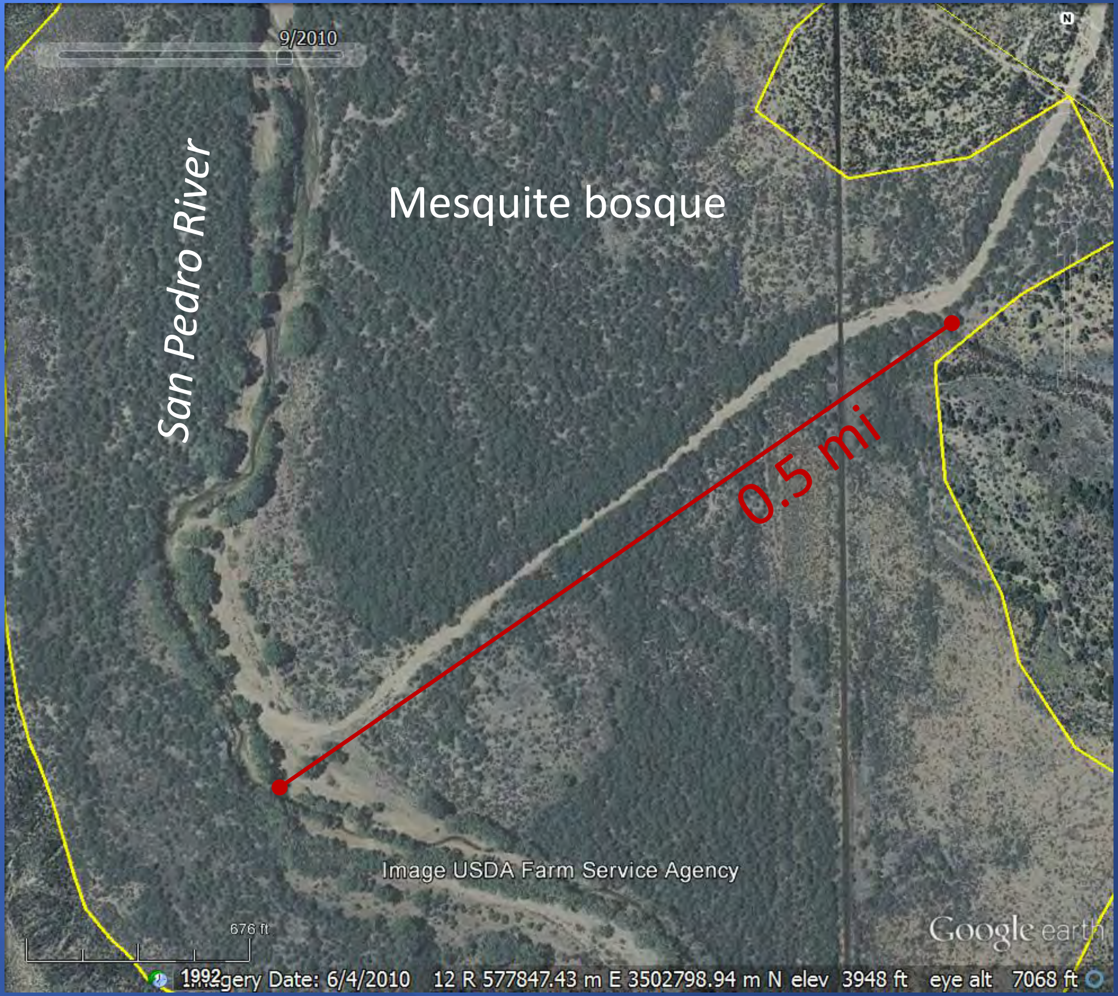
oak
juniper
sycamore
pine

- ❑ Detected in 3 yrs; 2 times in 2015 during 5 surveys
- ❑ Pairs not confirmed



San Pedro River National Conservation Area
near Charleston
wide mesquite bosque bordering cottonwood and willow

San Pedro River National Conservation Area
near Charleston
wide mesquite bosque bordering cottonwood and willow
3948 ft



Conclusion

- We are just beginning to understand cuckoo presence in atypical habitat
- Protocol surveys are needed in a variety of habitats
- When in doubt as to whether habitat is suitable, do surveys