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To: Field Supervisor
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Subject: Request for Peer Review of the October 3, 2013, Proposed Rule to list the western distinct population segment of the yellow-billed cuckoo (*Coccyzus americanus*) as a threatened species

Reference Number: 08ESMF00-2014-TA-0009-5

PEER REVIEW COMMENTS:

I have reviewed the proposed rule to list the western yellow-billed cuckoo (*Coccyzus americanus*) distinct population segment (DPS) as threatened under the federal Endangered Species Act (hereafter referred to as the "the proposed rule"). I concur that listing the western DPS as threatened is warranted. Overall, I found the proposed rule to be scientifically comprehensive, well-justified, and thorough in its evaluation. In my comments I seek to address issues of importance to the USFWS and, where applicable, augment certain aspects of various issues presented in the proposed rule. Please note that I organized my comments in nine parts corresponding to the USFWS peer review request letter's nine areas of concern/questions (see Parts 1-9 below, in bold type).

I have published several articles in peer-reviewed journals or books on the habitat characteristics and habitat dynamics of the yellow-billed cuckoo on the Sacramento River in California, some of which are cited in the proposed rule. A list of the publications that are *not* cited in the proposed rule is in Part 7 (below) and may be of value to an amended version of the proposed rule or future recovery planning documents (if the proposed rule is adopted).

As requested, a copy of my Curriculum Vitae (CV) is attached to this review. In addition, I am willing to serve on a recovery planning team in the future if the western yellow-billed cuckoo DPS is listed as threatened and my services are needed by the USFWS.

Review Issues/Questions Parts 1-9:

1. **Are the Service's descriptions, analyses, biological findings, and conclusions accurate, logical, and supported by the data and information in the proposed rule; especially in regards to the species' biology, habitat use, range and status (current and historical), distribution, population size and trends, and configuration of the DPS boundary?**

   The western yellow-billed cuckoo DPS has clearly experienced a precipitous population decline trend and a severe summer range contraction in the past that continues to the present and is expected to continue in the future in the absence of mitigation measures. The conclusions in the proposed rule are reasonable and logical based on the data presented. The DPS boundary is well-described and defensible.

   In the third paragraph of "Habitat Use and Needs" section (p. 61633), there is an additional reference that could enhance this discussion. We conducted a multi-scale study using a variety of multivariate statistics to analyze characteristics of western yellow-billed cuckoo habitat patches on the Sacramento River in California and found the amount of cottonwood (*Populus fremontii*) to be the single most important determinant of patch occupancy by cuckoos (see Girvetz and Greco 2009; article #2, in part 7, below). That 2009 study made use of a geographic information system (GIS) based patch definition algorithm, called "PatchMorph," to objectively and quantitatively define habitat patch boundaries in a repeatable manner (see Girvetz and Greco 2007; article #4, in part 7, below). PatchMorph is a freely available tool (script) for ArcGIS to define habitat patches based on user-defined patch gap thresholds and spur (patch width) thresholds. This is a valuable conservation planning tool for delineating and monitoring habitat patches over time.

2. **Have we accurately described the biological or ecological requirements of the species and ongoing conservation measures for the species and their habitat? Is the scientific foundation of the proposed rule fundamentally sound? Can the scientific foundation be strengthened, and if so, how?**

   The biological and ecological requirements of the species have been accurately described, as well as most of the conservation measures. The scientific foundation of the proposed rule is sound and below I suggest some ways to strengthen it.

   I would like to offer some additional detail regarding the ecological keystone process of river channel meander on the Sacramento River that *maintains* the feeding and reproductive habitat of the western yellow-billed cuckoos in their summer range, which is applicable to many other low-gradient rivers in western DPS area. The result of river engineering projects, such as water diversions, channelization, and riverbank revetment projects (i.e. riprap), creates an ecological cascade process. This ecological cascade is described in several of my journal articles and book chapters. The essential argument is as follows. Water impoundments from dams and water diversions to irrigation districts alter timing, frequency, and magnitude of river channel flows and ultimately decrease stream power in the channel that reduces the ability of the river channel to erode and deposit along its margins (see Larsen et al. 2007; article #6 in part 7 below); this, in turn, leads to a reduction of new land (floodplain) production through the geomorphic processes of progressive bend migration and channel cut-off (see Greco et al. 2007,

article #3 in part 7 below; and Greco and Plant 2003, article #7 in part 7 below; and Vaghti and Greco 2007, article #5 in part 7 below) that, hence, either precludes the existence of or reduces the extent of new pioneer plant communities (such as the willow-cottonwood plant association) that through primary succession colonize the newly established floodplain lands; this then results in a reduction of critical feeding and reproductive habitat important to the survival of western yellow-billed cuckoos (see Greco 2013; article #1 in part 7 below). This ecological cascade is especially pronounced in portions of the river where channelization and bank revetment (i.e. riprap) is pervasive, which is increasing every year. The cumulative impacts of each aspect of this ecological cascade (the topic of a paper in preparation by Fremier et al. [article #11 in part 7 below]; also described in Fremier 2007 [article #14, in part 7, below]) contributes to the degradation of western yellow-billed cuckoo habitat. As such, even if natural flows are restored to create stream power, the presence of riprap will still disrupt the geomorphic processes that creates new land for the habitat to form upon. The key to sustaining the habitat for the western yellow-billed cuckoo is maintaining an on-going process of new land creation and flow patterns conducive to colonization of willow and cottonwood. The issue of flows and vegetation recruitment is reviewed in a report by CALFED (2000; article #13, in part 7, below). Another key aspect of habitat formation is the concept of the "recruitment box" for cottonwood and willow as described by Mahoney and Rood (1998; see article #15, in part 7, below).

Given the discussion above, conservation reserve areas on the Sacramento River and elsewhere need to target land acquisition on both sides of the river channel constituting both cut banks and the laterally adjacent point bars to allow for the keystone process of river meander to operate (see Greco et al. 2002; article #9, in part 7, below). Unfortunately, the parcels owned by the USFWS that make up much of the Sacramento River National Wildlife Refuge (NWR) are located on just one side of the river thus preventing conservation of the meander belt which is so crucially important to conservation of the western yellow-billed cuckoo habitat and maintenance of the habitat over time.

3. **Are there instances in the proposed rule where a different, yet equally reasonable and scientifically-sound conclusion might be drawn? If any instances are found where this is the case, please provide specifics.**

I found no instances in the proposed rule where another reasonable conclusion could have been drawn, given the scientific evidence presented.

4. **Does the proposed rule provide accurate and balanced reviews and analyses of the threats to the species (at the time of listing and in the future) in the five listing factors? Are the Service's findings regarding threats biologically sound and supportable based on the information and data presented in the proposed rule?**

The five listing factors (A-E) appear to be thoroughly investigated and described. Factor A is the predominant area of threat and is well-described. Given that the primary historical threats continue into the present (today) and are expected to increase in intensity in the future, the listing of the western yellow-billed cuckoo DPS is highly justified. Below I make some suggestions to help strengthen the arguments.

In the middle of the second paragraph of the Factor A section that lacks any citations (after the words "...habitat becomes degraded and is eventually lost"), it would be appropriate to cite a recent study I conducted on cuckoo habitat dynamics (see Greco 2013; article #1, in part 7, below), since it examines and demonstrates this phenomenon.

A pervasive threat on many river systems throughout the developed world, including but not limited to the Sacramento River in California, is the routine design of open channel flood control channels with inappropriately smooth roughness coefficients (i.e. Manning's n values that are too small). Flood control engineers minimize flood control channel footprints by maximizing channel depth (with high levees or flood walls), minimizing channel width, and minimizing roughness coefficients. The effects of this approach are to over-scour floodplains (due to high flow velocities from increased depth and decreased width) and to require systematic removal of woody riparian vegetation that regenerates on floodplains to maintain excessively "smooth" roughness coefficients. This translates into floodplains devoid of riparian vegetation that could be used for habitat. This is the topic of a paper I recently co-authored and is currently in review (see Greco and Larsen, In review; article #11, in part 7, below). The proposed rule does not address this issue as a threat despite its ubiquitous nature in highly-engineered river systems; however, it could be a highly technical topic that is more appropriate to recovery planning.

5. Are there additional current or planned activities in the areas occupied by the species and what are the possible impacts of these activities on this species?

Below I describe two types of planned infrastructure projects on the Sacramento River in California. One type negatively impacts the habitat of the western yellow-billed cuckoo and the other type of project positively impacts (i.e. improves) habitat for the cuckoo.

On the Sacramento River there are at least two on-going projects that potentially will negatively affect the viability of habitat for the western yellow-billed cuckoo on the river that were not mentioned in the proposed rule. The first is the US Army Corps of Engineers "Sacramento River Bank Protection Project" which has been channelizing and riprapping the banks of the Sacramento River for many decades. This is an on-going project with various types of impacts that should be mentioned in the section in Factor A on "Encroachment of Levees and Flood Control and Bank Stabilization Structures Into the River Channel and Floodplain" (on p. 61646-61647). The other project is a proposed off-stream water storage reservoir being planned by the California Department of Water Resources called "Sites Reservoir." The Sites Reservoir project would be a series of major water diversions along the main stem of the river that seeks to fill a large reservoir (west of Colusa in the foothills) through the use of existing and newly constructed canals. These diversions would further degrade stream power on the Sacramento River and contribute to the ecological cascade effect described above (in Part 2 of these comments). I am a co-author of a paper addressing process-based mitigation for this project's impacts; it is nearing completion and will soon be ready for journal submission (see Fremier et al., In preparation; article #12, in part 7, below).

There are two projects on the Sacramento River that I am aware of that will potentially benefit western yellow-billed cuckoo habitat in the future, if the projects are implemented. Both involve intentionally creating several-mile-long channel cutoffs to create oxbow lakes that will gradually become terrestrialized to create excellent feeding and reproductive habitat dominated by

willow and cottonwood trees. The first of these projects is upstream of a major bridge at a California State Recreation Area called "Woodson Bridge SRA" (see Larsen and Greco 2002; article #8, in part 7, below). The second (similar) project is upstream of a major pumping facility across from the Llano Seco unit of the Sacramento River NWR (see MBK Engineers 2005; article #15, in part 7, below).

6. **Did the Service accurately describe the analyses, studies, and literature that are referenced in the proposed rule, and did the Service use the best available science to support its assumptions, arguments, and biological conclusions? If any instances are found where the best available science was not used, please provide the specifics.**

Yes, in the proposed rule the Service accurately described the analyses in scientific studies and in the literature. In my comments I have sought to enhance some of the discussions with literature from my own work and others. It might be possible that my suggestions go beyond the necessary detail needed for the proposed rule and thus may be in conflict with the "Clarity of the Rule" section of the proposed rule on p. 61665 (also see part 8 comments, below) and may be more appropriate at the stage of recovery planning if the proposed rule is adopted.

7. **Are there any significant peer-reviewed scientific papers that the proposed rule omits from consideration that would enhance the scientific quality of the document? Please identify any such papers.**

There are several papers I have authored or co-authored that are applicable to the proposed rule that were not cited (with one exception) and may be of value to adding to the proposed rule where appropriate, or used in recovery planning documents if the proposed rule is adopted. The one exception in the list below is the first paper listed which is cited in the proposed rule as "Greco 2012" that was an on-line version of the article that subsequently was published in 2013 in a volume of the journal (*River Research and Applications*) and now has specific journal page numbers. I recommend conducting a search and replace of the proposed rule to update the citation's status. Upon request I would be glad to send (pdf) copies of any of the articles listed below.

(1) Greco, S. E. 2013. Patch Change and the Shifting Mosaic of an Endangered Bird's Habitat on a Large Meandering River. *River Research and Applications* 29(6): 707-717.

is cited as:
Greco, S. E. 2012. Patch Change and the Shifting Mosaic of an Endangered Bird's Habitat on a Large Meandering River. *River Research and Applications* DOI 10.1002/rra2568.

(2) Girvetz, E. H., and S. E. Greco. 2009. Multi-scale predictive habitat suitability modeling based on hierarchically delineated patches: an example for yellow-billed cuckoos nesting in riparian forests, California, USA. *Landscape Ecology* 24(10): 1315–1329.

(3) Greco, S.E., A.K. Fremier, E.W. Larsen, and R.E. Plant. 2007. A Tool for Tracking Floodplain Age Land Surface Patterns on a Large Meandering River with Applications for Ecological Planning and Restoration Design. *Landscape and Urban Planning* 81(4): 354-373.

(4) Girvetz, E. H., and S. E. Greco. 2007. How to Define a Patch: A Spatial Model for Hierarchically Delineating Organism-Specific Habitat Patches. *Landscape Ecology* 22(8): 1131-1142.

(5) Vaghti, M. G. and S. E. Greco. 2007. Riparian Vegetation of the Great Valley. IN: Barbour, M. G., T. Keeler-Wolf and A. Schoenherr (Eds.) *Terrestrial Vegetation of California*, 3rd ed., UC Press, Berkeley, CA, pp. 425-455.

(6) Larsen, E.W., A. K. Fremier, and S. E. Greco. 2006. Cumulative Effective Stream Power and Bank Erosion on the Sacramento River, California. *Journal of the American Water Resources Association* 42(4): 1077-1097.

(7) Greco, S. E., and R. E. Plant. 2003. Temporal Mapping of Riparian Landscape Change on the Sacramento River, Miles 196-218, California, USA. Landscape Research 28(4): 405-426.

(8) Larsen, E. W., and S. E. Greco. 2002. Modeling Channel Management Impacts on River Migration: a Case Study of Woodson Bridge State Recreation Area, Sacramento River, California. Environmental Management 30(1): 209-244.

(9) Greco, S. E., R. E. Plant, and R. H. Barrett. 2002. Geographic modeling of temporal variability in habitat quality of the yellow-billed cuckoo on the Sacramento River, miles 196-219, California. IN: J. M. Scott, P. J. Heglund, F. Samson, J. Haufler, M. Morrison, M. Raphael, and B. Wall (eds). *Predicting Species Occurrences: Issues of Accuracy and Scale*. Island Press, Covelo, CA, pp. 183-196.

In-press article:

(10) Holmes, K. A., S. E. Greco, and A. M. Berry. In-press. Pattern and Process of Fig (*Ficus carica*) Invasion in a California Riparian Forest. *Invasive Plant Science and Management*.

In review article:

(11) Greco SE, Larsen EW. In review. Ecological design of multifunctional open channels for flood control and conservation planning. *River Research and Applications.*

In preparation article:

(12) Fremier AK, Girvetz EH, Greco SE, Larsen EW. In preparation. Quantifying process-based mitigation strategies in historical context: separating multiple cumulative effects on river meander migration.

Other articles and reports important for the proposed rule (not authored by the reviewer):

(13) CALFED (CALFED Bay-Delta Program). 2000. *Flow regime requirements for habitat restoration along the Sacramento River between Colusa and Red Bluff*. CALFED Bay Delta Program, Integrated Storage Investigation: Sacramento

(14) Fremier AK. 2007. *Restoration of floodplain landscapes: analysis of physical process and vegetation dynamics in the Central Valley, California*. PhD Dissertation. University of California, Davis.

(15) MBK Engineers. 2005. *Llano Seco Unit Sacramento River Mile 178 Pumping Plant Protection Feasibility Study*. Report by MBK Engineers: Sacramento

(16) Mahoney JM, Rood SB. 1998. Streamflow requirements for cottonwood seedling recruitment—an integrative model. Wetlands 18: 634–645.

(17) Beechie TJ, Sear DA, Olden JD, Pess GR, Buffington JM, Moir H, Roni P, Pollock MM. 2010. Process-based principles for restoring river ecosystems. *BioScience* 60: 209-222.

8. Are there parts of the proposed rule that need additional detail or explanation? Are there parts that are superfluous, or that could be condensed?

Various portions of the proposed rule could be enhanced with additional explanation and detail, however, this may conflict with the "Clarity of the Rule" section of the proposed rule on p. 61665. Throughout these comments I have suggested various areas where additional explanation could be added (for example in my part 2 comments, above, on the ecological cascade processes that prevents western yellow-billed cuckoo habitat from forming due to disruptions in the hydrologic and geomorphic river processes). I saw no areas of the proposed rule that were superfluous or would benefit from being condensed.

In the discussion of Factor E, in the section "Conservation Efforts to Reduce Other Natural or Manmade Factors Affecting Its Continued Existence" a distinction should be made between active restoration efforts versus process-based restoration efforts. "Active" restoration is typically thought of as a horticulture-based approach to re-establishing natural plant communities, where people design and install propagated plants to recreate a desired plant community. Alternatively, "process-based" restoration (see Beechie et al. 2010; article #17, in part 7, above) is an approach that seeks to re-establish natural processes to establish natural plant communities, using techniques such as naturalized flow regimes, channel meander processes, and natural plant recruitment timing/events that are commensurate with a site's potential. Although active restoration can "jump start" succession and achieve desired states rapidly, in the long-term this is an unsustainable approach to solely rely upon. In the long-term process-based restoration should be sought to continually create the habitats required by the western yellow-billed cuckoo.

9. Are scientific uncertainties clearly identified and characterized, and are the potential implications of the uncertainties for the technical conclusions clear?

Yes, the proposed rule clearly identifies and characterizes scientific uncertainties and the potential implications of those uncertainties. Some good examples are described in the sections on climate change, the winter range of the yellow-billed cuckoo, and pesticide exposure both in the summer range and the winter range (described in Factor E).