8 February 2014

U.S. Fish and Wildlife Service

Thank you for giving me the opportunity to review the proposed rule to designate the Bi-State population of greater sage-grouse (*Centrocercus urophasianus*) as threatened under the Endangered Species Act and the subsequent proposed rule to designate critical habitat. I focused my review on the scientific rational as presented and the use of supporting science for each of the proposed rules.

I also have appended my CV.

Steve Knick
Research Ecologist

Threatened status for the Bi-State distinct population segment of greater sage-grouse with special rule.

64362. I would like to see better support for your statement that habitat has been reduced by 50% and that sage-grouse abundance also has been decreased by at least 50% over the last 150 years. In particular, the conclusion that habitat quality has decreased should be better supported. You could use nesting success or some measure of fecundity as a metric if you have the historical data.

How was the historical distribution defined for both species and habitat? Were you basing the historical distribution from the Schroeder et al. (2004. Condor) map? More recent population trends for sage-grouse shown in the CDFW (2012) and NDOW (2012) are inconsistent, with fluctuations but generally appear stable within the years surveyed. Similarly, the graphs in Garton et al. (2011, 326) indicate relative stability over the analyses years and no consistent long-term trend for the Mono Lake and South Mono populations (Garton et al. 2011: 324, 325). Again, what were the sources used to document a 50% decline?

64362. This may be semantics but neither Aldridge et al (2008) nor Wisdom et al. (2011) predict a timeline (near or long-term) for the risk of extirpation. Their modeling results simply provide evidence that the environments for these populations are consistent with those populations elsewhere that have been extirpated.

64362. Further support for the isolation from populations in the range-wide interior of the greater sage-grouse range and for limited connectivity within the BiState populations can be found in Knick et al. (2011. Studies in Avian Biology) and Knick et al. (2013. Ecology and Evolution; Fig. 6).

64363. Both Mono Lake (Bodie) and South Mono Lake are predicted to have high probabilities of falling below N_e = 500 in 100 years. This is not surprising given that both populations are already relatively small and yearly fluctuations likely drop below and effective breeding size of 500 individuals (N_e, effective breeding size is different than the total population size). You also note later that there is a lower short-term probability of 38% that the Mono Lake population will fall below N_e =50 and almost no probability (<1%) that the South Mono Lake population will be reduced below an effective breeding population of 50 (Garton et al. 2011:310). Therefore, the long-term projections are that the populations have a high probability of persisting between N_e= 50 and 500. Population data from the other PMUs were not sufficient for trend estimates. As you conclude, their relative isolation and small size will be significant factors in long-term persistence.

64365. I could not find documentation for estimates of sagebrush lost by juniper encroachment although 40-50% is given in the supporting documentation. According to your estimates, approximately 10-32% of the expansion area has been treated. The BiState Sage-Grouse DPS Action plan (2012a:8) gives an estimate of 14,350 acres treated which compares to your figure of 16,000.

Sage-grouse do not use areas near woodlands. A recent paper (Baruch-Mordo et al. 2013. Biological Conservation) estimated that juniper woodlands at <8% cover in the surrounding landscape significantly reduced lek activity. Casazza et al. (2011:159) also report extremely low tolerance for pinyon-juniper although measured at different spatial scales. As you note, there has not been any scientific assessment of the effectiveness of juniper treatments to increase sage-grouse populations even though this program is producing change on a very large scale.

64365. You might clarify that juniper expansion is primarily at higher elevations in mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). These regions typically have higher precipitation, are more resilient, and can recover more quickly than the cheatgrass invasion in lower elevation Wyoming big sagebrush (*A. t.* ssp. *wyomingensis*) (Miller et al. 2011). We are more likely to keep the higher elevation sagebrush in contrast to habitat losses to fire at lower elevations are unlikely to be recovered. What proportion of the Bi-State population exists within each of these two general sagebrush systems (it would also be helpful to have a land cover map or table of estimated areas)?

Here, you state that cheatgrass is likely to increase and become a serious challenge to the sagebrush shrub community. Later (64366), you state that current data do not indicate an increase in wildfires, which would be contrary to expectations if cheatgrass were to become more dominant. Are you referring to the entire region or are your subsequent predictions for increased fire constrained to lower elevation sagebrush-cheatgrass systems? Again, it is important to separate the dynamics of these two primary sagebrush systems as you assess the relative significance of these threats.

64366. Reference Pyke (2011. Studies in Avian Biology) for information on restoring sagebrush.

64367. Kolada et al. 2009. studied the relationship of nest success to shrub cover and not predator abundance. They speculated in the Discussion that predation could be a factor in the different rates of nest success because predation is a primary cause of nest failure. They stated (p. 1344) that no there "are currently no data on predator abundance in Mono County." There were no direct links to a landfill facility and subsidized nest predators. Clarifying this relationship is important because the landfill and its associated predator community are given a significant concern at multiple points in the proposed rule. Predation may be high but it also is important to consider that a high predation rate may be offset by higher reproduction. Cazazza et al. (2011. Studies in Avian Biology, p163-164) reported that reproductive rates were higher than other parts of the sage-grouse range and that conditions in the Mono Lake region contributed to the high fecundity.

64367. Reviews of livestock grazing by Beck and Mitchell (2000. Wildlife Society Bulletin), Jones (2000. Western North American Naturalist), and Crawford et al. (2004. Journal of Range Management) should be included here.

64368. Clarify that population size and fitness have been linked, but that the references (Keller and Waller 2002; Reed 2005) are general reviews and are not specific to the Bi-State population for which you have no evidence of the relationship between population size and fitness.

64370. Climate change may most affect the southern part of the Bi-State population where warmer,

drier conditions are predicted to facilitate shrubs from the Mojave region moving up elevation and expanding northerward. Earlier summers will result in longer periods of cheatgrass senescence, thus increasing the fire period. Warmer temperatures also are likely to reduce juniper expansion but at the trade-off of expanding the cheatgrass zone (Miller et al. 2011). You might also note that climate change was one of the primary factors identified by the structured analysis group assembled for the 2005 range-wide decision.

64371. You might also consider that any hunting, whether within some "generally accepted guidelines" creates a conflict in perception with your proposed listing.

64372. How are the BLM land-use planning, the BiState DPS Action Plan (2012a), and the plans developed by the Los Angeles Department of Water and Power used in evaluating existing regulatory mechanisms. It also would be helpful to have table with summary information on the proportion of private versus public lands, and if possible, within seasonal ranges.

64373. Note my earlier comment that none of these juniper treatments have been documented to have increased sage-grouse populations. By extension, simply reporting acres treated is not a true metric for conservation effectiveness. Further, many of these treatment areas are beginning to have junipers reestablish within 5-10 years. Simply treating an area is not a one-time event that will convert everything to sagebrush.

64373. Reference my earlier comment on the need to document how habitat loss has be estimated. Current mapping can give the land cover distribution and various metrics for fragmentation, but comparison to previous maps is not valid due to differences in mapping methods. How is the current rate of habitat loss being estimated and can you provide a graph or table of changes?

64374(12) Previous comment that the effects of this land fill needs better documentation

64377. Proposed Special Rule. Much of the proposed listing decision is based on cumulative, rather than single effects. The cumulative effect of these excepted takings could be as significant as the other threats causing the population to be considered for threatened status. Will there be a concerted effort to document the take that will be permitted? Will monitoring programs be implemented to track trends in both sagebrush habitat and sage-grouse populations?

Designation of critical habitat for the Bi-State distinct population segment of greater sage-grouse
64330. What was the basis (genetic) for the statement that populations were demographically independent. Did you consider that isolation alone was enough so that each functioned independently? Support from genetic analyses conducted in this region would be helpful for this conclusion.

64332. Fedy et al. (2012. J.Wildlife Management) present a model of sage-grouse migration behavior and should be referenced here.

64333. Clarify that the percent cover of sagebrush is a ground or canopy cover and not landscape cover of sagebrush. Ground cover (measured at a site location) is very different from landscape cover (percent of a region dominated by a land cover type). This distinction becomes important later when you present the resource selection function and model critical habitat based on landscape cover.

64334. The importance of shrub canopy cover relative to grass and forb cover for nesting presents and interesting challenge. If understory cover is not as important, then grazing management to retain grass and forb cover for nesting may not be as significant an impact as suggested earlier.

64335. Your conclusion on cheatgrass relative to climate change presented here is counter to your projection in the proposed rule to list the Bi-State DPS as threatened (p. 64365). Bradley (2009. Global Change Biology) discusses the complexity of modeling cheatgrass response because of different predictions relative to precipitation and temperature. She concludes (p. 205) that much of the Bi-State region would experience a contraction in cheatgrass distribution.

64335. Recent sources (Baruch-Murdo. 2013, Biol. Conservation; Aldridge et al. 2008. Div. Distributions; Wisdom et al. 2013 Studies in Avian Biology; Knick et al. 2013, Ecol. Evolution) are leading to thresholds of approximately 25% and 65% landscape cover of sagebrush as indicators of population persistence. Long-term persistence of sage-grouse populations is not likely in landscapes with <25% landscape cover of sagebrush. In contrast, sage-grouse populations are likely to persist in landscape with >65% landscape cover of sagebrush.

64336. Again, these structural components are based on canopy cover, which not accurately measured in the remote sensing data used to designate land cover type over broad regions.

64337. I recommend that a more detailed description of the data and modeling process beyond what is available in the Bi-State Technical Advisory Committee white paper (2012b). Spatially explicit maps of resource selection functions involve many decisions that can influence the outcome. For example, what were the multiple scales that reflected movement patterns of the Bi-State DPS? As you note later, your final map at 1-km resolution may not be able to capture finer-scale features such as the meadows or riparian areas used during brood-rearing.

64338. (4) What were the threshold values used to convert the continuous probability into a binary used/ unused surface and how were these determined?

Table 3. I think it would be helpful to have the percentages by land ownership both here and in the subsequent descriptions of each unit to better understand how much public/private lands are included in this designation of critical habitat.

64361. Sage-grouse are extremely sensitive to developed land. Ninety-nine percent of active leks in the western portion of the greater sage-grouse range were in areas containing <3% developed land cover (the Landfire Existing Vegetation mapped categories for Developed) (Knick et al. 2013. Ecol. Evolution).

Table 4. Again, I find percentages easier to understand when accompanied by the summary data. But I also recognize that you may need to follow a particular format in publishing these rules.

64349 (I). Previously commented. Landscape thresholds have been identified for maintaining sage-grouse populations (Aldridge et al. 2008, Wisdom et al. 2011, Knick and Hanser 2011, Knick et al. 2013).

February 2014

Steven Knick

Present Position (since 1990): Research Ecologist
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Education

B.S. Wildlife Ecology, 1977, University of Minnesota, St. Paul, MN
M.S. Wildlife Biology, 1980, Washington State University, Pullman, WA Thesis: Factors influencing low density bobcat populations in southeastern Washington.
Ph.D. Zoology, 1987, University of Montana, Missoula, MT Dissertation: Ecology of bobcats in southeastern Idaho.

Research

My research has focused on the role of human and natural disturbance in shaping bird communities living in shrub steppe systems. More recently, I have been modeling structural and functional connectivity within sage-grouse populations across their range, and migratory connectivity of passerine birds between breeding and wintering ranges. I developed the SAGEMAP website, the primary web-based portal for spatial data and information for research and management of sagebrush ecosystems. I was one of the primary authors on the 2004 conservation assessment used by the U.S. Fish and Wildlife Service as part of their decision on an ESA listing for greater sage-grouse in 2005 and lead editor for the recent Studies in Avian Biology volume used in their 2010 decision. I have given briefings on sagebrush issues to state and federal agencies, U.S. Department of Interior, and U.S. Congressional committees.

Current Projects

A regional experiment to evaluate effects of fire and fire surrogate treatments in sagebrush-woodland ecotones
Ecological drivers shaping shrubsteppe communities in the Owyhee Uplands
Environmental correlates of greater sage-grouse and shrubsteppe birds
Genetic connectivity across the range-wide distribution of greater sage-grouse
Linking wintering and breeding ranges of shrubsteppe birds using stable isotope analyses
Migration dynamics and pathways of shrub steppe birds

Professional Affiliations

American Ornithological Union (Elected Fellow), Cooper Ornithological Society, The Wildlife Society, Wilson Ornithological Society

Website

SAGEMAP: http://sagemap.wr.usgs.gov

Publications

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