June 28, 2013

Walt George, Project Manager
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Bureau of Land Management
P.O. Box 20879
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Via email: *Gateway_West_WYMail@blm.gov*

Re: Comments on Proposed Gateway West Transmission Line Project Sage-Grouse Habitat Equivalency Analysis (HEA)

Dear Mr. George:

Thank you for accepting these comments on the greater sage-grouse (sage-grouse) Habitat Equivalency Analysis (HEA) for the Gateway West project, as presented in the Final Environmental Impact Statement (EIS). As noted in comments submitted on both the draft EIS and Sage Grouse Addendum, we remain extremely concerned that the Bureau of Land Management (BLM) and U.S. Fish and Wildlife Service (FWS) are utilizing an opinion-based approach instead of a peer-reviewed,[1] data-driven approach to assess the impacts of development on sage-grouse, habitat services lost, and resulting mitigation needed for the species. Given the BLM's stated intent to use the Gateway West HEA as a template for assessing sage-grouse mitigation for future and ongoing projects, we believe the proposed approach could lead to significant negative impacts on this species.

Sage-grouse are an especially disturbance prone species, with 99% of active leks range-wide in landscapes which have less than 3 percent coverage of developed land types.[2] For this species, accurate assessment of habitat services requires assessment of direct, indirect, and cumulative effects, particularly the effect of tall structures on habitat services. Unfortunately, the Habitat Services Metric model (HSM model) used at Gateway West does not adequately incorporate and assess indirect and cumulative effects when evaluating habitat services—making it unclear how the agencies and developer will mitigate for those effects. In practical terms, this will likely lead to undisturbed habitat being undervalued, disturbed habitat being overvalued, and an overall underestimate of the amount of mitigation necessary and the area over which it is required.

This project comes at a critical time for the conservation of greater sage-grouse. This "warranted but precluded" candidate species requires management and protection focused on ensuring local

[1] A peer review is a documented, critical review performed by peers [defined in the USNRC report as "a person having technical expertise in the subject matter to be reviewed (or a subset of the subject matter to be reviewed) to a degree at least equivalent to that needed for the original work"] who are independent of the work being reviewed. The peer's independence from the work being reviewed means that the peer, a) was not involved as a participant, supervisor, technical reviewer, or advisor in the work being reviewed, and b) to the extent practical, has sufficient freedom from funding considerations to assure the work is impartially reviewed. *See* USNRC.

[2] Knick, S.T., S.E. Hanser, and K.L. Preston. 2013. Modeling ecological minimum requirements for distribution of greater sage-grouse leks- Implications for population connectivity across their western range, U.S.A. DOI-10.1002/ece3.557: Ecology and Evolution, p. online.

conservation success, in conjunction with an overall strategy to incorporate indirect and cumulative effects and to provide for rangewide persistence for the species. The adoption of objective methods based on the most complete and current science is the key component of such a strategy. We are optimistic that further refinement of HEA for sage-grouse can lead to sound development with lasting conservation benefits.

To address and remedy the flaws in the HSM used for Gateway West, we recommended in previous comments that the BLM objectively evaluate the HSM model results against the existing peer-reviewed, data-based greater sage-grouse habitat model created by USGS for the Wyoming Basins Ecoregional Assessment (WBEA).[3] This comprehensive analysis employed sage-grouse habitat use data gathered across the ecoregion to model relative sage-grouse habitat use vs. availability, selecting the best habitat predictors from a large set of candidates using objective methods, incorporating indirect and cumulative effects and scale when estimating habitat services, and making use of improved habitat predictors using readily available data. This model represents the most complete and current habitat suitability analysis for the species.

Our main recommendation in previous comments, that habitat services estimated by the HSM model be compared to the publicly available USGS Wyoming Basins Ecoregional Assessment (WBEA) sage-grouse habitat models by an independent group of experts, was not incorporated into the FEIS, leaving us no basis to conclusively evaluate the HSM model performance. Our prior evaluations of both models are still relevant, however, and are detailed below.

Additional recommendations are summarized in Table 1, below, along with a description of the methods used in the DEIS, Sage-Grouse Addendum, and FEIS. Most of these recommendations—build habitat models based on habitat use, statistically evaluate competing predictors and competing models, objectively test competing models, include all potentially relevant effects—are standard best practices enforced through peer review in the research community, and should be non-controversial.

> **The BLM must adopt a HEA process that models actual sage grouse habitat use to identify the strongest habitat predictors. The attempt to define them a priori through an expert opinion process lacks sufficient biological realism and is inherently inaccurate.**

Table 2, also below, compares the extensive set of predictors used in the WBEA models to those used in the Gateway West HSM model. This comparison highlights the strengths of a model like that used for the WBEA over one based on existing research filtered through expert opinion (e.g. the HSM model used for Gateway West). The WBEA models tested 28 predictors, 19 of these at multiple spatial scales, in order to determine objectively the scale at which both negative and positive impacts on sage grouse habitat influence sage-grouse habitat use. The only predictors

[3] Hanser, S.E., C.L. Aldridge, M. Leu, M.M. Rowland, S.E. Nielsen, and S.T. Knick. 2011. Greater Sage-Grouse: General Use and Roost Site Occurrence with Pellet Counts as a Measure of Relative Abundance Chapter 5 in S.E. Hanser, M. Leu, S.T. Knick, and C.L. Aldridge (editors). Sagebrush ecosystem conservation and management: ecoregional assessment tools and models for the Wyoming Basins. Allen Press, Lawrence, KS.

retained in the final models were those most effective at explaining the patterns in observed sage-grouse habitat use. Short-range, cumulative effects of disturbance were wrapped into evaluation of habitat services through predictors that quantify disturbance density within various spatial neighborhoods. Although this process of formulating and testing competing predictors and competing models to fit observed data represents the standard of modern ecological research, such testing is not even possible with the structure of the HSM model. This leaves no objective basis to evaluate how any given predictor, or the model overall, is performing and no basis to assess the adequacy of proposed mitigation. When uncertainty exists, the agencies need to make decisions based on sound science and proven methodologies that can be independently validated. The BLM and FWS could have done this at Gateway West by adopting the modeling process used to create the WBEA model. Instead, the proposed HEA has developed no data-based, objective assessment of sage-grouse habitat use against which to make this determination.

Two of the 11 predictors included in the HSM model were omitted from testing in some form within the WBEA model framework, and in both cases these omissions are well supported; these predictors should not have been included in the HSM model. First, distance to fences was excluded due to basic inadequacies in existing fence data; deficiencies that were also acknowledged in the Gateway West DEIS meeting notes (see Table 3). As discussed further below, the choice of distance from fences as a predictor of habitat services for the HSM model seems to have been driven primarily by the desire to pursue fence marking as mitigation. Although properly targeted fence marking has been shown to be effective to prevent sage-grouse collision mortality by a preliminary study, the authors caution that direct inferences to population-level benefits resulting from reduced sage-grouse collision risk cannot be made.[4] More fundamentally, fence marking does not provide habitat services; it just potentially removes one source of mortality from fences without affecting increased mortality risk due to providing predator perches or any disturbance effects of fences. Similarly, in the WBEA model distance to occupied leks was also excluded, and lek data were instead used as a means to independently validate the models. Areas with high predicted habitat value in the final WBEA brood and general habitat use models overlapped lek locations with greater than 75% accuracy. A strong argument can be made that it is far more useful to have a model that is predictive of leks than one which includes leks as a predictor; since lek locations are generally known, it is always possible to overlay lek data to modify habitat suitability predictions, and it is a very desirable trait of a model to be able to make accurate predictions about potential sage-grouse habitat services beyond some proximity of known leks.

Most of the predictors used in both the HSM and WBEA analyses were quantified in a more effective manner in the final WBEA models. Some of the predictors used in the HSM model, such as slope, were insignificant in the WBEA models in their raw form, but were significant when used in a composite index more predictive of habitat use (Topographic Ruggedness Index). Other HSM predictors, such as sagebrush canopy size, were implied in the more detailed vegetation layers used for the WBEA models, which split sagebrush vegetation into different classes (the HSM model considered all sagebrush types as suitable for sage-grouse, a

[4] Stevens, B. S., D.E. Naugle, B. Dennis, B., J.W. Connelly, T. Griffiths, and K.P. Reese. (2013), Mapping sage-grouse fence-collision risk: Spatially explicit models for targeting conservation implementation. Wildlife Society Bulletin. doi: 10.1002/wsb.273

biologically invalid assumption). Still other predictors used in the HSM model, such as distance to nearest sage or shrub-dominated area, were quantified using metrics more consistent with landscape ecology best practices (sage edge density, patch size, and contagion) but when tested still had little or no ability to predict observed habitat use. The key point again is that with the WBEA model this fine tuning to increase performance can be done, but with the HSM model there's no ability to objectively gauge the effectiveness of any model predictors since variables were chosen based on judgment, not data.

Table 3 summarizes predictors used in the Gateway HSM model itself, followed by comments from the meeting notes/FEIS that relate to the choice of each predictor and decisions on scoring, as well as our recommendations for improvement. The most obvious conclusion that can be drawn from reading the "BLM Comment" field in Table 3 is that there's actually little basis in the published literature to construct an opinion based model that would accurately estimate sage-grouse habitat services, reinforcing the need for a data-driven model and approach; Table 3 details multiple instances where decisions were made based on incomplete information and group consensus, often with the acknowledgement that scores were not supported by peer-reviewed literature and were being made on a heuristic basis. In these situations, multiple sources of bias can strongly influence outcomes, as detailed by Martin et al (2012):[5]

> Humans are susceptible to a range of subjective and psychological biases (overview in Supporting Information), often unknowingly (Slovic 1999; Kynn 2008; McBride & Burgman 2011). Motivational biases arise from the context of the expert, personal beliefs, and from the personal stake one might have in a decision. Accessibility biases arise when information that comes more easily to the mind of an expert exerts a disproportionate influence on an expert's judgments. Anchoring and adjustment biases occur when an expert anchors an estimate on a benchmark and then is unable to adjust this estimate much above or below the benchmark. Overconfidence bias arises when the confidence of experts in their judgments is higher than is warranted by the accuracy of their estimates (McKenzie et al. 2008). This bias sometimes results in systematic underestimation, in which experts fail to express the extent of uncertainty (O'Hagan et al. 2006).

In the context of evaluating habitat services, these sources of bias are best avoided by use of an objective modeling process driven by observed species use of habitat in relation to a broad set of predictors, including all relevant types of disturbance and quantified across a range of scales. When a full suite of predictors is tested against the data, predictors that are not useful and their associated biases drop out due to their negative impacts on predictive power. The HSM model, since it is entirely expert opinion-based and has not been objectively verified by any independent data, cannot be disentangled from these biases due to its basic structure. Previous comments detail the extreme influence that inaccuracy and bias can have in HEA model results when projected out over time[6], and how this can result in grossly inadequate mitigation.[7] With the

[5] Martin, T. G., M.A. Burgman, F. Fidler, F., P.M. Kuhnert, S. Low-Choy, M. Mcbride, and K. Mengersen, K. 2012. Eliciting Expert Knowledge in Conservation Science. Conservation Biology, 26: 29–38. doi: 10.1111/j.1523-1739.2011.01806.x

[6] Dunford, R.W., T.C. Ginn, and W.H. Desvousges. 2004. The use of habitat equivalency analysis in natural resource damage assessments. Ecological Economics 48: 49-70.

proposed HSM model, there are no analytical safeguards to prevent this from happening, and in fact, as noted in most detail in previous comments by The Nature Conservancy, the model scoring is structured so that restoration of poor quality habitat as mitigation for the loss or impairment of high quality habitat is likely. In other words, all information indicates the HSM model is biased, and that these biases in the model will lead to inadequate mitigation.

The HEA fails to include any predictor of disturbance effects of tall structures, including transmission lines, on the species

Overall, the WBEA models tested a wide range of thoughtfully constructed predictors against sage-grouse habitat use data. Of the variables tested and found to be highly effective in the WBEA models that were not used in the HSM model, the most important omission was any predictor to assess disturbance effects from power lines and tall structures themselves, . The meeting notes state that decay distance from power lines was not included in the HSM model due to the consensus of the interagency group that existing research is not sufficient to show power lines have an impact on the species. This conclusion is at odds with the findings of a recent, rigorously designed study that found greater sage-grouse avoid areas within 600 m of transmission lines,[8] and also conflicts with numerous studies that, although they were not able to completely control for other disturbance effects to isolate the effects of tall structures themselves, strongly associated negative impacts on greater sage-grouse with human disturbance and with transmission infrastructure[9,10]. The group's conclusion is also at odds with the FWS[11] assertion that avoidance impacts of transmission lines on prairie grouse species are essentially the same; if the FWS is correct, the multiple studies that have documented negative effects on lesser prairie chicken are also relevant. Finally, decay distance from power lines within a half kilometer was highly predictive as a negative influence on sage-grouse habitat use in the WBEA models. The fact that a key conclusion of the data-based WBEA approach, which as detailed above represents the best available analysis for over 50% of the project area, is directly at odds with assumptions made for the Gateway West HEA on the basis of expert opinion indicates that this assumption of the HSM model is not supported by the most current, peer-reviewed science.

The BLM's responses in Appendix L note that while the WBEA model is useful for characterizing habitat quality and quantifying habitat injury, it was not designed to specifically address power line impacts, particularly in terms of being able to quantify the benefit of

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[7] Efroyemson, R.A., M.J. Peterson, C.J. Welsh, D.L. Druckenbrod, M.G. Ryon, J.G. Smith, W.R. Hargrove, N.R. Giffen, W. Kelley Roy, and H.D. Quarles. 2008. Investigating habitat value to inform contaminant remediation options: approach. Journal of Environmental Management 88: 1436-1451.

[8] Gillan, J. K., Strand, E. K., Karl, J. W., Reese, K. P. and Laninga, T. (2013), Using spatial statistics and point-pattern simulations to assess the spatial dependency between greater sage-grouse and anthropogenic features. Wildlife Society Bulletin, 37: 301–310. doi: 10.1002/wsb.272

[9] Ellis, K.L. 1985. Effects of a new transmission line on distribution and aerial predation of breeding male sage-grouse. Report for Deseret Generation and Transmission Cooperative, Sandy, Utah.

[10] Rodgers, R. 2003. Wind Power Generation: Biological Concerns. Wind Energy Symposium April 10, 2003. Ft. Hays State University, Hays, Kansas

[11] Manville, A.M., II. 2004. Prairie grouse leks and wind turb ines: U.S. Fish and Wildlife Service justification for a 5 -mile buffer from leks ; additional grassland songbird recommendations. Division of Migratory Bird Management, USFWS, Arlington, VA, peer -reviewed briefing paper. 17 pp.

proposed mitigation projects with respect to the habitat lost or degraded through development. This is a key point, and there are several valid counter-responses. The most obvious is that equivalency has not been established for most of the proposed mitigation methods, as discussed further below, and that is the exact reason why the current Habitat Equivalency Analysis for Gateway West, which is entirely based on assumptions, represents such an unacceptable risk at this time. Second, it was notable that the final WBEA models both contained the predictor "decay distance to transmission lines within 0.5 km" as a highly significant predictor. Although the models were not specifically designed for a transmission project, they are clearly sensitive enough to detect impacts of existing transmission on sage grouse habitat use, and as repeatedly stated, the approach of testing variables rather than excluding them based on inadequate support in the literature is the one that needs to be taken over the approach taken of modeling only those habitat service losses that could be defensively quantified using existing literature, literature which everybody agrees is not adequate. It's true that revisiting the WBEA model process for Gateway West and other potential projects that affect sage-grouse within the ecoregion would produce a more accurate result tailored to the specific development context. This is not a full re-invention of a process, however, but rather an iteration of an existing process with modified inputs and possibly a few new ones.

Habitat Services Cannot be Defined for Experimental Restoration or Fence Marking

As mentioned above, some predictors in the HSM model either have no relationship with habitat services or a relationship that cannot be defined based on current research. We assert that such predictors fundamentally have no place in a model to evaluate habitat services for a HEA. In particular, fence marking, conifer removal, and bunchgrass/forb seeding were chosen because they mirror ongoing priority habitat restoration efforts, and they are chosen in the FEIS as the preferred mitigation approaches for the project. No relationship is explained between how many marked spans of fence, removed conifers, or seed applications equates to each acre of habitat developed. As a result, we see no basis to make these judgments, making these predictors unsuitable for use in determining habitat equivalency until such relationships are established. This would require linking this proposed mitigation to sage-grouse productivity and survivorship through well-designed research. Some of this is ongoing through the NRCS Sage-Grouse Initiative, but is still in initial stages.

The emphasis of a HEA, as typically formulated, is on establishing equivalency between impacts and mitigation used to compensate for those impacts. In the cold desert sagebrush ecosystem where this mitigation approach is currently being implemented, however, this equivalency of x units of effort producing x units of sage-grouse habitat services has not been established at all, or is at best very tenuous. In addition, restoration in these water-limited areas is inherently risky, and it's uncertain how successful restoration can be at the landscape scale given climate change and drought. Wisdom et al (2003)[12] assert that retaining and protecting high quality sagebrush habitat is more effective, efficient, and economical than attempting to restore habitats already

[12] Wisdom, M. J., M. M. Rowland, L. H. Suring, L. Schueck, C. Wolff Meinke, B. C. Wales, and S. T. Knick. 2003. Procedures for regional assessment of habitats for species of conservation concern in the sagebrush ecosystem. March 2003 Report, Version 1, Pacific Northwest Research Station, La Grande, Oregon.

degraded by cheatgrass invasion, fire, and juniper encroachment. Given this uncertainty in the equivalency and projected benefits, the emphasis in sage-grouse HEA analyses should be on identifying and protecting intact habitat and on evaluating habitat value in both development and mitigation areas with the highest level of accuracy possible, not on specifying restoration to offset impacts. The approaches above are promising and should be pursued, but until equivalency with respect to habitat loss and degradation can be firmly established for sage-grouse, these types of mitigation are inappropriate in the context of mitigation used to provide habitat services for a Habitat Equivalency Analysis. A HEA for this candidate species should focus on precise evaluation of habitat services to be developed with respect to habitat used for mitigation. We strongly support the full development of such an approach.

Conclusion

As previously stated, this project comes at a critical time for the conservation of greater sage-grouse. This "warranted but precluded" candidate species requires management and protection focused on ensuring local conservation success, in conjunction with an overall strategy to incorporate indirect and cumulative effects and to provide for rangewide persistence for the species. The adoption of objective methods based on the most complete and current science is the key component of such a strategy. We are optimistic that further refinement of HEA for sage-grouse can lead to sound development with lasting conservation benefits.

If the tools needed to implement sage-grouse HEA are not developed to their full potential, however, and the HEA approach used for Gateway West is allowed to become a template for future projects, agencies will be missing a huge opportunity to contribute to sage-grouse conservation. It is vital for the recovery of this candidate species to set a high bar in terms of scientific credibility and conservation effectiveness. Adaptive management with a focus on preserving high-quality habitat is the key to effective conservation of sage-grouse and other sagebrush obligate species. To accomplish the ambitious conservation goals required of this analysis, HEA must be finely honed tool with the level of precision and accuracy needed to be responsive to changes in habitat that are meaningful to the species itself.

We are available to clarify these comments and would be happy to meet with you to learn what steps the BLM and the proponents are taking to address our concerns. Thank you for the opportunity to comment on this precedent-setting analysis, which we believe must continue to evolve to make it an effective tool for both conservation and development.

Sincerely,

Jon Belak, Wildlife Biologist, Renewable Energy

Defenders of Wildlife

Erin Lieberman, National Renewable Energy Policy Analyst
Defenders of Wildlife

Daly Edmunds, Regional Policy Coordinator
Audubon Rockies

Alex Daue, Renewable Energy Associate
The Wilderness Society

Table 1: Summary of Past Recommendations

Recommendation	Gateway West DEIS Methods	Gateway West FEIS Methods
Incorporate all relevant indirect effects possible at the appropriate scale when estimating habitat quality of areas proposed for development.	Only noise, human presence, fences, and roads were incorporated in the impacts analysis, and only proxies for these effects as represented by distance from nearest feature were used in the HSM model.	No change. Baseline habitat service level does not account for all habitat service losses associated with existing environmental disturbances, and the FEIS states that omission of these disturbances is a conservative approach to the analysis of Project-related habitat service losses since the analysis assumes that the habitats affected by the Project are of higher-quality than they actually are, and so requires a greater amount of mitigation to offset Project-related habitat service losses.
When using distance-based predictors, instead of using distance to nearest feature as a predictor, use feature density within a set of spatial neighborhoods and test the predictive power of each to determine which is most predictive for sage grouse habitat use.	5/11 predictors in the model were based upon distance to the nearest feature (highway, road/well pad/mine, fence, occupied lek, and sage/shrub dominant vegetation). Predictors that instead incorporated feature density per unit area were discussed but not used.	No change
Include all relevant indirect and cumulative effects when evaluating habitat services; Disturbance has a strong effect on sage-grouse habitat selection, and the indirect and cumulative effects of disturbance must be incorporated into evaluation of habitat services; the absence of published studies on disturbance effects does not justify excluding them from consideration, it means that these relationships must be modeled using the best available data. We recommend use or adaptation of the model developed for the USGS WBEA that used sage-grouse pellet counts as a proxy for habitat use and tested the influence of disturbance on habitat use over various spatial extents.	The DEIS Supplemental states HEA is a method to quantify loss of habitat services and define mitigation rather than an impacts analysis. The Framework for Sage-Grouse Impacts Analysis for Interstate Transmission developed limits disturbance to one per 640 acre section to justify not considering cumulative impacts, and includes only noise and human presence as potential indirect impacts to habitat services. Transmission structures, while present, are assumed to only affect habitat quality in terms of habitat removed by tower foundations; the ROW is assumed to return to 95.8% of the original habitat service value. Tertiary roads were not included by group consensus. Disturbance-based predictors do not express disturbance density and were assigned values through expert opinion. The meeting notes detail the group's explicit decision to exclude indirect impacts from the HEA (DEIS page F-15), and also note that this change allowed the study corridor width to be decreased from 18 km to 9 km (F-24).	No change

Table 2: Comparison of Wyoming Basins Ecoregional Assessment Sage-Grouse Model with Habitat Services Metric Model

	Spatial Scale of Measurement (km)						
Predictor	**Plot Center**	**0.25**	**0.5**	**1**	**3**	**5**	**18**
All big sagebrush	n/a	x	x	o	x	x	x
All sagebrush	n/a	x	x	o	x	x	x
Big sagebrush	n/a	x	x	x	x	x	x
Coniferous forest	n/a	x	x	x	o	x	x
Grassland	n/a	x	x	x	x	x	x
Mixed shrubland	n/a	x	x	x	o	x	x
Riparian	n/a	x	x	o	x	x	x
Salt-desert shrubland	n/a	x	x	x	x	x	x
Decay distance from intemittent water	n/a	x	x	x	n/a	n/a	n/a
Decay distance from permanent water	n/a	x	x	x	n/a	n/a	n/a
Decay distance from agricultural land	n/a	x	x	x	n/a	n/a	n/a
Decay distance from highways	n/a	x	x	o	n/a	n/a	n/a
Decay distance from pipelines	n/a	x	x	x	n/a	n/a	n/a
Decay distance from power lines	n/a	x	o	x	n/a	n/a	n/a
Decay distance from secondary roads	n/a	x	x	x	n/a	n/a	n/a
Decay distance from oil and gas wells	n/a	x	x	o	n/a	n/a	n/a
Density of all roads	n/a	x	x	x	n/a	n/a	n/a
Normalized Difference Veg. index	x	x	x	x	x	x	x
Topographic Ruggedness Index	x	o	x	x	x	x	x
Compound Topographic Index	x	n/a	n/a	n/a	n/a	n/a	n/a
Elevation	o	n/a	n/a	n/a	n/a	n/a	n/a
Slope	x	n/a	n/a	n/a	n/a	n/a	n/a
Solar radiation index	x	n/a	n/a	n/a	n/a	n/a	n/a
Mean annual maximum temperature	x	n/a	n/a	n/a	n/a	n/a	n/a
Mean annual minimum temperature	o	n/a	n/a	n/a	n/a	n/a	n/a
All sage species contagion	x	n/a	n/a	n/a	n/a	n/a	n/a
All sage species edge density	x	n/a	n/a	n/a	n/a	n/a	n/a
All sage species patch size	x	n/a	n/a	n/a	n/a	n/a	n/a

Legend	
x	Tested but not significant
o	Tested and significant
	Positive relationship with sage-grouse general and roost habitat
	Positive relationship with sage-grouse roost habitat
	Positive relationship with sage-grouse general habitat
	Negative relationship with sage-grouse general and roost habitat
	Included in the HSM model only as a "nearest feature" predictor
	Included in both models

Table 3: Summary of HSM Model Predictors and Recommendations

Predictor	Predictor Value				BLM Comment	Recommendation
(blue=additive, yellow=multiplicative)	3	2	1	0		
Distance to interstate or US highway (m)	> 5000	700-5000	100-700	< 100	Scoring "not perfectly supported in the peer-reviewed literature" (FEIS App J)	Retain distance to nearest roads, but also use road density and test this within various spatial neighborhoods
Distance to county highway, surfaced high-use road, well pad, or mine footprint (m)	> 200	50-200	25-50	< 25	Scoring "not perfectly supported in the peer-reviewed literature" (FEIS App J)	Retain distance to nearest roads, but also use road density and test this within various spatial neighborhoods
Distance to fence (km)	> 2	0.4-2	< 0.4	NA	The minimum value of 0.4 km was based on preliminary results of an ongoing fence marking study that did not examine strikes vs. distance to lek. The highest values in were based on guidelines from two general sage-grouse management papers. The middle value was assigned using a linear relationship. The meeting notes detail problems with this predictor (effects are site specific and close range, fence data are generally inaccurate and incomplete) and suggestions to use fence density in place of distance to nearest fence, but there were no changes.	This predictor reflects the relatively recent interest in using fence marking for mitigation, an approach that makes intuitive sense and has been shown to be effective in reducing collision mortality when properly targeted, but provides no sage-grouse habitat services and has an unknown equivalency with respect to habitat loss and/or degradation; determining the number of spans to mark to offset each unit area of habitat lost or degraded is not possible to address given current knowledge, as acknowledged in Stevens et al. (2013). Given that, this form of mitigation should be pursued in contexts other than HEA.
Distance to occupied lek (km)	0-5	5-8.5	.8.5	NA	Current sage-grouse habitat management guidance uses occupied leks as focal points for nesting habitat management, so distance to lek was used as a variable in the Habitat Services Metric.	BLM uses recommended guidelines for lek protection along with three different radio collar studies to arrive at distance values for scoring. Instead, use observed grouse use data to test the ability of distance to the nearest lek and lek density within various neighborhoods to predict sage-grouse habitat use.
Distance to sage or shrub dominant area (m)	< 90	90-275	> 275	NA	This was included since sage-grouse use other shrub types for excape cover during brood rearing, and the values were derived from loosely applying guidelines and recommendations from two sources (Lincoln County s-g technical team and Stiver et al. 2010).	As above, generate multiple versions of the predictor and test their ability to predict observed grouse habitat use, as has been already done already in the WBEA sage-grouse model.
% slope	< 10	10-30	30-40	> 40	Areas less than 5% slope were assigned the high score, with those exceeding 10% intervals subjectively assigned after that and areas with greater than 40% unsuitable (0).	Slope was tested in the WBEA model and had no power to predict observed sage-grouse habitat use, but Topographic Ruggedness Index, a neighborhood-based index more typical of modern GIS-based predictors, was significant.

Predictor	Predictor Value				BLM Comment	Recommendation
% sagebrush cover	15-25	5-15 or > 25	< 5	NA	In general, the recommended sagebrush cover for nesting habitats was intermediate to and overlapped that of brood-rearing and winter habitats. Thus, favorable conditions for nesting were given the highest scores for percent sagebrush cover in the sage-grouse habitat services metric. The sagebrush cover scores assigned for nesting habitat in the sage-grouse habitat assessment framework by Stiver et al. (2010) to different sagebrush cover categories were assigned to this variable.	This metric has the strongest link to sage-grouse habitat services based on existing research, but nesting habitat requirements were subjectively prioritized in the scoring based on conjecture about seasonal habitat overlap. Variables should be tested for their power to predict different types of habitat use.
% bunchgrass cover	5-15	2-5 or > 15	< 2	NA	Literature reviewed defined an optimum range of bunchgrass cover for nesting and brood rearing; above and below this ideal range, lower scores were assigned subjectively with no support.	The WBEA study methods define separate models for brood/nesting habitat and general habitat since brood pellets are easily differentiated from general habitat use pellets due to clustering. The brood/nesting habitat model would be ideal for exploring bunchgrass as a habitat predictor.
Sagebrush patch size (ha)	> 130	10-130	< 10	NA	A 130-hectare (ha) patch size for sagebrush was used as the recommended service condition (score of 3) based on professional judgment. Professional judgment was used because "conclusive data are unavailable on minimum patch sizes necessary to support viable populations of sage-grouse" (Connelly et al. 2011).	As above, generate multiple versions of the vegetation predictors and test their ability to predict observed grouse habitat use, as has been already done already in the WBEA sage-grouse model.
Sagebrush canopy height (cm)	30-80	20- < 30 or > 80	< 20	NA	The sagebrush canopy heights that provided high quality nesting habitat generally also provided high quality winter habitat, thus favorable conditions for nesting were given the highest scores overall.	As with sagebrush cover, although values are based on research, nesting habitat requirements were subjectively prioritized in the scoring based on conjecture about seasonal habitat overlap. Variables should be tested for their power to predict different types of habitat use
Vegetation	NA	NA	All Other Veg Types	Forested Open Water Roads Well pads Mine Footprints	Habitats typically avoided by sage-grouse (roadways, urban, open water, forest) were scored zero to give them no habitat service value in the output.	This layer was included as a screen and basically contributes nothing to the scoring beyond eliminating areas known to be unsuitable.

From: jmclain@blm.gov on behalf of Gateway_West_Trans_Line, BLM_WY [blm_wy_gateway_west_trans_line@blm.gov]
Sent: Monday, July 01, 2013 10:21 AM
To: blm@gwcomment.com
Subject: Fwd: Gateway West FEIS comments attached
Attachments: Joint DoW-Audubon-TWS Gateway West FEIS HEA Recommendations.pdf

---------- Forwarded message ----------
From: **Jon Belak** <JBELAK@defenders.org>
Date: Fri, Jun 28, 2013 at 2:53 PM
Subject: Gateway West FEIS comments attached
To: "Gateway_West_WYMail@blm.gov" <Gateway_West_WYMail@blm.gov>

Attached are comments by Defenders of Wildlife, Audubon Rockies, and The Wilderness Society concerning the Habitat Equivalency Analysis for the Gateway West transmission line. We look forward to discussing our concerns with you, and thank you for the opportunity to comment.

Jon Belak
Wildlife Biologist, Renewable Energy
Tel: 720-203-1964 | **Fax:** 720-491-3637
jbelak@defenders.org | www.defenders.org

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June 28, 2013

Walt George, Project Manager
Gateway West Transmission Project EIS
Bureau of Land Management
P.O. Box 20879
Cheyenne, Wyoming 82003
Via email: *Gateway_West_WYMail@blm.gov*

Re: Comments on Proposed Gateway West Transmission Line Project Sage-Grouse Habitat Equivalency Analysis (HEA)

Dear Mr. George:

Thank you for accepting these comments on the greater sage-grouse (sage-grouse) Habitat Equivalency Analysis (HEA) for the Gateway West project, as presented in the Final Environmental Impact Statement (EIS). As noted in comments submitted on both the draft EIS and Sage Grouse Addendum, we remain extremely concerned that the Bureau of Land Management (BLM) and U.S. Fish and Wildlife Service (FWS) are utilizing an opinion-based approach instead of a peer-reviewed,[1] data-driven approach to assess the impacts of development on sage-grouse, habitat services lost, and resulting mitigation needed for the species. Given the BLM's stated intent to use the Gateway West HEA as a template for assessing sage-grouse mitigation for future and ongoing projects, we believe the proposed approach could lead to significant negative impacts on this species.

Sage-grouse are an especially disturbance prone species, with 99% of active leks range-wide in landscapes which have less than 3 percent coverage of developed land types.[2] For this species, accurate assessment of habitat services requires assessment of direct, indirect, and cumulative effects, particularly the effect of tall structures on habitat services. Unfortunately, the Habitat Services Metric model (HSM model) used at Gateway West does not adequately incorporate and assess indirect and cumulative effects when evaluating habitat services—making it unclear how the agencies and developer will mitigate for those effects. In practical terms, this will likely lead to undisturbed habitat being undervalued, disturbed habitat being overvalued, and an overall underestimate of the amount of mitigation necessary and the area over which it is required.

This project comes at a critical time for the conservation of greater sage-grouse. This "warranted but precluded" candidate species requires management and protection focused on ensuring local

[1] A peer review is a documented, critical review performed by peers [defined in the USNRC report as "a person having technical expertise in the subject matter to be reviewed (or a subset of the subject matter to be reviewed) to a degree at least equivalent to that needed for the original work"] who are independent of the work being reviewed. The peer's independence from the work being reviewed means that the peer, a) was not involved as a participant, supervisor, technical reviewer, or advisor in the work being reviewed, and b) to the extent practical, has sufficient freedom from funding considerations to assure the work is impartially reviewed. *See* USNRC.

[2] Knick, S.T., S.E. Hanser, and K.L. Preston. 2013. Modeling ecological minimum requirements for distribution of greater sage-grouse leks- Implications for population connectivity across their western range, U.S.A. DOI-10.1002/ece3.557: Ecology and Evolution, p. online.

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conservation success, in conjunction with an overall strategy to incorporate indirect and cumulative effects and to provide for rangewide persistence for the species. The adoption of objective methods based on the most complete and current science is the key component of such a strategy. We are optimistic that further refinement of HEA for sage-grouse can lead to sound development with lasting conservation benefits.

To address and remedy the flaws in the HSM used for Gateway West, we recommended in previous comments that the BLM objectively evaluate the HSM model results against the existing peer-reviewed, data-based greater sage-grouse habitat model created by USGS for the Wyoming Basins Ecoregional Assessment (WBEA).[3] This comprehensive analysis employed sage-grouse habitat use data gathered across the ecoregion to model relative sage-grouse habitat use vs. availability, selecting the best habitat predictors from a large set of candidates using objective methods, incorporating indirect and cumulative effects and scale when estimating habitat services, and making use of improved habitat predictors using readily available data. This model represents the most complete and current habitat suitability analysis for the species.

Our main recommendation in previous comments, that habitat services estimated by the HSM model be compared to the publicly available USGS Wyoming Basins Ecoregional Assessment (WBEA) sage-grouse habitat models by an independent group of experts, was not incorporated into the FEIS, leaving us no basis to conclusively evaluate the HSM model performance. Our prior evaluations of both models are still relevant, however, and are detailed below.

Additional recommendations are summarized in Table 1, below, along with a description of the methods used in the DEIS, Sage-Grouse Addendum, and FEIS. Most of these recommendations—build habitat models based on habitat use, statistically evaluate competing predictors and competing models, objectively test competing models, include all potentially relevant effects—are standard best practices enforced through peer review in the research community, and should be non-controversial.

> **The BLM must adopt a HEA process that models actual sage grouse habitat use to identify the strongest habitat predictors. The attempt to define them a priori through an expert opinion process lacks sufficient biological realism and is inherently inaccurate.**

Table 2, also below, compares the extensive set of predictors used in the WBEA models to those used in the Gateway West HSM model. This comparison highlights the strengths of a model like that used for the WBEA over one based on existing research filtered through expert opinion (e.g. the HSM model used for Gateway West). The WBEA models tested 28 predictors, 19 of these at multiple spatial scales, in order to determine objectively the scale at which both negative and positive impacts on sage grouse habitat influence sage-grouse habitat use. The only predictors

[3] Hanser, S.E., C.L. Aldridge, M. Leu, M.M. Rowland, S.E. Nielsen, and S.T. Knick. 2011. Greater Sage-Grouse: General Use and Roost Site Occurrence with Pellet Counts as a Measure of Relative Abundance Chapter 5 in S.E. Hanser, M. Leu, S.T. Knick, and C.L. Aldridge (editors). Sagebrush ecosystem conservation and management: ecoregional assessment tools and models for the Wyoming Basins. Allen Press, Lawrence, KS.

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retained in the final models were those most effective at explaining the patterns in observed sage-grouse habitat use. Short-range, cumulative effects of disturbance were wrapped into evaluation of habitat services through predictors that quantify disturbance density within various spatial neighborhoods. Although this process of formulating and testing competing predictors and competing models to fit observed data represents the standard of modern ecological research, such testing is not even possible with the structure of the HSM model. This leaves no objective basis to evaluate how any given predictor, or the model overall, is performing and no basis to assess the adequacy of proposed mitigation. When uncertainty exists, the agencies need to make decisions based on sound science and proven methodologies that can be independently validated. The BLM and FWS could have done this at Gateway West by adopting the modeling process used to create the WBEA model. Instead, the proposed HEA has developed no data-based, objective assessment of sage-grouse habitat use against which to make this determination.

Two of the 11 predictors included in the HSM model were omitted from testing in some form within the WBEA model framework, and in both cases these omissions are well supported; these predictors should not have been included in the HSM model. First, distance to fences was excluded due to basic inadequacies in existing fence data; deficiencies that were also acknowledged in the Gateway West DEIS meeting notes (see Table 3). As discussed further below, the choice of distance from fences as a predictor of habitat services for the HSM model seems to have been driven primarily by the desire to pursue fence marking as mitigation. Although properly targeted fence marking has been shown to be effective to prevent sage-grouse collision mortality by a preliminary study, the authors caution that direct inferences to population-level benefits resulting from reduced sage-grouse collision risk cannot be made.[4] More fundamentally, fence marking does not provide habitat services; it just potentially removes one source of mortality from fences without affecting increased mortality risk due to providing predator perches or any disturbance effects of fences. Similarly, in the WBEA model distance to occupied leks was also excluded, and lek data were instead used as a means to independently validate the models. Areas with high predicted habitat value in the final WBEA brood and general habitat use models overlapped lek locations with greater than 75% accuracy. A strong argument can be made that it is far more useful to have a model that is predictive of leks than one which includes leks as a predictor; since lek locations are generally known, it is always possible to overlay lek data to modify habitat suitability predictions, and it is a very desirable trait of a model to be able to make accurate predictions about potential sage-grouse habitat services beyond some proximity of known leks.

Most of the predictors used in both the HSM and WBEA analyses were quantified in a more effective manner in the final WBEA models. Some of the predictors used in the HSM model, such as slope, were insignificant in the WBEA models in their raw form, but were significant when used in a composite index more predictive of habitat use (Topographic Ruggedness Index). Other HSM predictors, such as sagebrush canopy size, were implied in the more detailed vegetation layers used for the WBEA models, which split sagebrush vegetation into different classes (the HSM model considered all sagebrush types as suitable for sage-grouse, a

[4] Stevens, B. S., D.E. Naugle, B. Dennis, B., J.W. Connelly, T. Griffiths, and K.P. Reese. (2013), Mapping sage-grouse fence-collision risk: Spatially explicit models for targeting conservation implementation. Wildlife Society Bulletin. doi: 10.1002/wsb.273

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biologically invalid assumption). Still other predictors used in the HSM model, such as distance to nearest sage or shrub-dominated area, were quantified using metrics more consistent with landscape ecology best practices (sage edge density, patch size, and contagion) but when tested still had little or no ability to predict observed habitat use. The key point again is that with the WBEA model this fine tuning to increase performance can be done, but with the HSM model there's no ability to objectively gauge the effectiveness of any model predictors since variables were chosen based on judgment, not data.

Table 3 summarizes predictors used in the Gateway HSM model itself, followed by comments from the meeting notes/FEIS that relate to the choice of each predictor and decisions on scoring, as well as our recommendations for improvement. The most obvious conclusion that can be drawn from reading the "BLM Comment" field in Table 3 is that there's actually little basis in the published literature to construct an opinion based model that would accurately estimate sage-grouse habitat services, reinforcing the need for a data-driven model and approach; Table 3 details multiple instances where decisions were made based on incomplete information and group consensus, often with the acknowledgement that scores were not supported by peer-reviewed literature and were being made on a heuristic basis. In these situations, multiple sources of bias can strongly influence outcomes, as detailed by Martin et al (2012):[5]

> Humans are susceptible to a range of subjective and psychological biases (overview in Supporting Information), often unknowingly (Slovic 1999; Kynn 2008; McBride & Burgman 2011). Motivational biases arise from the context of the expert, personal beliefs, and from the personal stake one might have in a decision. Accessibility biases arise when information that comes more easily to the mind of an expert exerts a disproportionate influence on an expert's judgments. Anchoring and adjustment biases occur when an expert anchors an estimate on a benchmark and then is unable to adjust this estimate much above or below the benchmark. Overconfidence bias arises when the confidence of experts in their judgments is higher than is warranted by the accuracy of their estimates (McKenzie et al. 2008). This bias sometimes results in systematic underestimation, in which experts fail to express the extent of uncertainty (O'Hagan et al. 2006).

In the context of evaluating habitat services, these sources of bias are best avoided by use of an objective modeling process driven by observed species use of habitat in relation to a broad set of predictors, including all relevant types of disturbance and quantified across a range of scales. When a full suite of predictors is tested against the data, predictors that are not useful and their associated biases drop out due to their negative impacts on predictive power. The HSM model, since it is entirely expert opinion-based and has not been objectively verified by any independent data, cannot be disentangled from these biases due to its basic structure. Previous comments detail the extreme influence that inaccuracy and bias can have in HEA model results when projected out over time[6], and how this can result in grossly inadequate mitigation.[7] With the

[5] Martin, T. G., M.A. Burgman, F. Fidler, F., P.M. Kuhnert, S. Low-Choy, M. Mcbride, and K. Mengersen, K. 2012. Eliciting Expert Knowledge in Conservation Science. Conservation Biology, 26: 29–38. doi: 10.1111/j.1523-1739.2011.01806.x

[6] Dunford, R.W., T.C. Ginn, and W.H. Desvousges. 2004. The use of habitat equivalency analysis in natural resource damage assessments. Ecological Economics 48: 49-70.

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proposed HSM model, there are no analytical safeguards to prevent this from happening, and in fact, as noted in most detail in previous comments by The Nature Conservancy, the model scoring is structured so that restoration of poor quality habitat as mitigation for the loss or impairment of high quality habitat is likely. In other words, all information indicates the HSM model is biased, and that these biases in the model will lead to inadequate mitigation.

The HEA fails to include any predictor of disturbance effects of tall structures, including transmission lines, on the species

Overall, the WBEA models tested a wide range of thoughtfully constructed predictors against sage-grouse habitat use data. Of the variables tested and found to be highly effective in the WBEA models that were not used in the HSM model, the most important omission was any predictor to assess disturbance effects from power lines and tall structures themselves, . The meeting notes state that decay distance from power lines was not included in the HSM model due to the consensus of the interagency group that existing research is not sufficient to show power lines have an impact on the species. This conclusion is at odds with the findings of a recent, rigorously designed study that found greater sage-grouse avoid areas within 600 m of transmission lines,[8] and also conflicts with numerous studies that, although they were not able to completely control for other disturbance effects to isolate the effects of tall structures themselves, strongly associated negative impacts on greater sage-grouse with human disturbance and with transmission infrastructure[9,10]. The group's conclusion is also at odds with the FWS[11] assertion that avoidance impacts of transmission lines on prairie grouse species are essentially the same; if the FWS is correct, the multiple studies that have documented negative effects on lesser prairie chicken are also relevant. Finally, decay distance from power lines within a half kilometer was highly predictive as a negative influence on sage-grouse habitat use in the WBEA models. The fact that a key conclusion of the data-based WBEA approach, which as detailed above represents the best available analysis for over 50% of the project area, is directly at odds with assumptions made for the Gateway West HEA on the basis of expert opinion indicates that this assumption of the HSM model is not supported by the most current, peer-reviewed science.

The BLM's responses in Appendix L note that while the WBEA model is useful for characterizing habitat quality and quantifying habitat injury, it was not designed to specifically address power line impacts, particularly in terms of being able to quantify the benefit of

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[7] Efroyemson, R.A., M.J. Peterson, C.J. Welsh, D.L. Druckenbrod, M.G. Ryon, J.G. Smith, W.R. Hargrove, N.R. Giffen, W. Kelley Roy, and H.D. Quarles. 2008. Investigating habitat value to inform contaminant remediation options: approach. Journal of Environmental Management 88: 1436-1451.

[8] Gillan, J. K., Strand, E. K., Karl, J. W., Reese, K. P. and Laninga, T. (2013), Using spatial statistics and point-pattern simulations to assess the spatial dependency between greater sage-grouse and anthropogenic features. Wildlife Society Bulletin, 37: 301–310. doi: 10.1002/wsb.272

[9] Ellis, K.L. 1985. Effects of a new transmission line on distribution and aerial predation of breeding male sage-grouse. Report for Deseret Generation and Transmission Cooperative, Sandy, Utah.

[10] Rodgers, R. 2003. Wind Power Generation: Biological Concerns. Wind Energy Symposium April 10, 2003. Ft. Hays State University, Hays, Kansas

[11] Manville, A.M., II. 2004. Prairie grouse leks and wind turb ines: U.S. Fish and Wildlife Service justification for a 5 -mile buffer from leks ; additional grassland songbird recommendations. Division of Migratory Bird Management, USFWS, Arlington, VA, peer -reviewed briefing paper. 17 pp.

proposed mitigation projects with respect to the habitat lost or degraded through development. This is a key point, and there are several valid counter-responses. The most obvious is that equivalency has not been established for most of the proposed mitigation methods, as discussed further below, and that is the exact reason why the current Habitat Equivalency Analysis for Gateway West, which is entirely based on assumptions, represents such an unacceptable risk at this time. Second, it was notable that the final WBEA models both contained the predictor "decay distance to transmission lines within 0.5 km" as a highly significant predictor. Although the models were not specifically designed for a transmission project, they are clearly sensitive enough to detect impacts of existing transmission on sage grouse habitat use, and as repeatedly stated, the approach of testing variables rather than excluding them based on inadequate support in the literature is the one that needs to be taken over the approach taken of modeling only those habitat service losses that could be defensively quantified using existing literature, literature which everybody agrees is not adequate. It's true that revisiting the WBEA model process for Gateway West and other potential projects that affect sage-grouse within the ecoregion would produce a more accurate result tailored to the specific development context. This is not a full re-invention of a process, however, but rather an iteration of an existing process with modified inputs and possibly a few new ones.

Habitat Services Cannot be Defined for Experimental Restoration or Fence Marking

As mentioned above, some predictors in the HSM model either have no relationship with habitat services or a relationship that cannot be defined based on current research. We assert that such predictors fundamentally have no place in a model to evaluate habitat services for a HEA. In particular, fence marking, conifer removal, and bunchgrass/forb seeding were chosen because they mirror ongoing priority habitat restoration efforts, and they are chosen in the FEIS as the preferred mitigation approaches for the project. No relationship is explained between how many marked spans of fence, removed conifers, or seed applications equates to each acre of habitat developed. As a result, we see no basis to make these judgments, making these predictors unsuitable for use in determining habitat equivalency until such relationships are established. This would require linking this proposed mitigation to sage-grouse productivity and survivorship through well-designed research. Some of this is ongoing through the NRCS Sage-Grouse Initiative, but is still in initial stages.

The emphasis of a HEA, as typically formulated, is on establishing equivalency between impacts and mitigation used to compensate for those impacts. In the cold desert sagebrush ecosystem where this mitigation approach is currently being implemented, however, this equivalency of x units of effort producing x units of sage-grouse habitat services has not been established at all, or is at best very tenuous. In addition, restoration in these water-limited areas is inherently risky, and it's uncertain how successful restoration can be at the landscape scale given climate change and drought. Wisdom et al (2003)[12] assert that retaining and protecting high quality sagebrush habitat is more effective, efficient, and economical than attempting to restore habitats already

[12] Wisdom, M. J., M. M. Rowland, L. H. Suring, L. Schueck, C. Wolff Meinke, B. C. Wales, and S. T. Knick. 2003. Procedures for regional assessment of habitats for species of conservation concern in the sagebrush ecosystem. March 2003 Report, Version 1, Pacific Northwest Research Station, La Grande, Oregon.

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degraded by cheatgrass invasion, fire, and juniper encroachment. Given this uncertainty in the equivalency and projected benefits, the emphasis in sage-grouse HEA analyses should be on identifying and protecting intact habitat and on evaluating habitat value in both development and mitigation areas with the highest level of accuracy possible, not on specifying restoration to offset impacts. The approaches above are promising and should be pursued, but until equivalency with respect to habitat loss and degradation can be firmly established for sage-grouse, these types of mitigation are inappropriate in the context of mitigation used to provide habitat services for a Habitat Equivalency Analysis. A HEA for this candidate species should focus on precise evaluation of habitat services to be developed with respect to habitat used for mitigation. We strongly support the full development of such an approach.

Conclusion

As previously stated, this project comes at a critical time for the conservation of greater sage-grouse. This "warranted but precluded" candidate species requires management and protection focused on ensuring local conservation success, in conjunction with an overall strategy to incorporate indirect and cumulative effects and to provide for rangewide persistence for the species. The adoption of objective methods based on the most complete and current science is the key component of such a strategy. We are optimistic that further refinement of HEA for sage-grouse can lead to sound development with lasting conservation benefits.

If the tools needed to implement sage-grouse HEA are not developed to their full potential, however, and the HEA approach used for Gateway West is allowed to become a template for future projects, agencies will be missing a huge opportunity to contribute to sage-grouse conservation. It is vital for the recovery of this candidate species to set a high bar in terms of scientific credibility and conservation effectiveness. Adaptive management with a focus on preserving high-quality habitat is the key to effective conservation of sage-grouse and other sagebrush obligate species. To accomplish the ambitious conservation goals required of this analysis, HEA must be finely honed tool with the level of precision and accuracy needed to be responsive to changes in habitat that are meaningful to the species itself.

We are available to clarify these comments and would be happy to meet with you to learn what steps the BLM and the proponents are taking to address our concerns. Thank you for the opportunity to comment on this precedent-setting analysis, which we believe must continue to evolve to make it an effective tool for both conservation and development.

Sincerely,

Jon Belak, Wildlife Biologist, Renewable Energy

Defenders of Wildlife

Erin Lieberman, National Renewable Energy Policy Analyst
Defenders of Wildlife

Daly Edmunds, Regional Policy Coordinator
Audubon Rockies

Alex Daue, Renewable Energy Associate
The Wilderness Society

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Table 1: Summary of Past Recommendations

Recommendation	Gateway West DEIS Methods	Gateway West FEIS Methods
Incorporate all relevant indirect effects possible at the appropriate scale when estimating habitat quality of areas proposed for development.	Only noise, human presence, fences, and roads were incorporated in the impacts analysis, and only proxies for these effects as represented by distance from nearest feature were used in the HSM model.	No change. Baseline habitat service level does not account for all habitat service losses associated with existing environmental disturbances, and the FEIS states that omission of these disturbances is a conservative approach to the analysis of Project-related habitat service losses since the analysis assumes that the habitats affected by the Project are of higher-quality than they actually are, and so requires a greater amount of mitigation to offset Project-related habitat service losses.
When using distance-based predictors, instead of using distance to nearest feature as a predictor, use feature density within a set of spatial neighborhoods and test the predictive power of each to determine which is most predictive for sage grouse habitat use.	5/11 predictors in the model were based upon distance to the nearest feature (highway, road/well pad/mine, fence, occupied lek, and sage/shrub dominant vegetation). Predictors that instead incorporated feature density per unit area were discussed but not used.	No change
Include all relevant indirect and cumulative effects when evaluating habitat services; Disturbance has a strong effect on sage-grouse habitat selection, and the indirect and cumulative effects of disturbance must be incorporated into evaluation of habitat services; the absence of published studies on disturbance effects does not justify excluding them from consideration, it means that these relationships must be modeled using the best available data. We recommend use or adaptation of the model developed for the USGS WBEA that used sage-grouse pellet counts as a proxy for habitat use and tested the influence of disturbance on habitat use over various spatial extents.	The DEIS Supplemental states HEA is a method to quantify loss of habitat services and define mitigation rather than an impacts analysis. The Framework for Sage-Grouse Impacts Analysis for Interstate Transmission developed limits disturbance to one per 640 acre section to justify not considering cumulative impacts, and includes only noise and human presence as potential indirect impacts to habitat services. Transmission structures, while present, are assumed to only affect habitat quality in terms of habitat removed by tower foundations; the ROW is assumed to return to 95.8% of the original habitat service value. Tertiary roads were not included by group consensus. Disturbance-based predictors do not express disturbance density and were assigned values through expert opinion. The meeting notes detail the group's explicit decision to exclude indirect impacts from the HEA (DEIS page F-15), and also note that this change allowed the study corridor width to be decreased from 18 km to 9 km (F-24).	No change

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Table 2: Comparison of Wyoming Basins Ecoregional Assessment Sage-Grouse Model with Habitat Services Metric Model

	Spatial Scale of Measurement (km)						
Predictor	**Plot Center**	**0.25**	**0.5**	**1**	**3**	**5**	**18**
All big sagebrush	n/a	x	x	o	x	x	x
All sagebrush	n/a	x	x	o	x	x	x
Big sagebrush	n/a	x	x	x	x	x	x
Coniferous forest	n/a	x	x	x	o	x	x
Grassland	n/a	x	x	x	x	x	x
Mixed shrubland	n/a	x	x	x	o	x	x
Riparian	n/a	x	x	o	x	x	x
Salt-desert shrubland	n/a	x	x	x	x	x	x
Decay distance from intemittent water	n/a	x	x	x	n/a	n/a	n/a
Decay distance from permanent water	n/a	x	x	x	n/a	n/a	n/a
Decay distance from agricultural land	n/a	x	x	x	n/a	n/a	n/a
Decay distance from highways	n/a	x	x	o	n/a	n/a	n/a
Decay distance from pipelines	n/a	x	x	x	n/a	n/a	n/a
Decay distance from power lines	n/a	x	o	x	n/a	n/a	n/a
Decay distance from secondary roads	n/a	x	x	x	n/a	n/a	n/a
Decay distance from oil and gas wells	n/a	x	x	o	n/a	n/a	n/a
Density of all roads	n/a	x	x	x	n/a	n/a	n/a
Normalized Difference Veg. index	x	x	x	x	x	x	x
Topographic Ruggedness Index	x	o	x	x	x	x	x
Compound Topographic Index	x	n/a	n/a	n/a	n/a	n/a	n/a
Elevation	o	n/a	n/a	n/a	n/a	n/a	n/a
Slope	x	n/a	n/a	n/a	n/a	n/a	n/a
Solar radiation index	x	n/a	n/a	n/a	n/a	n/a	n/a
Mean annual maximum temperature	x	n/a	n/a	n/a	n/a	n/a	n/a
Mean annual minimum temperature	o	n/a	n/a	n/a	n/a	n/a	n/a
All sage species contagion	x	n/a	n/a	n/a	n/a	n/a	n/a
All sage species edge density	x	n/a	n/a	n/a	n/a	n/a	n/a
All sage species patch size	x	n/a	n/a	n/a	n/a	n/a	n/a

Legend	
x	Tested but not significant
o	Tested and significant
	Positive relationship with sage-grouse general and roost habitat
	Positive relationship with sage-grouse roost habitat
	Positive relationship with sage-grouse general habitat
	Negative relationship with sage-grouse general and roost habitat
	Included in the HSM model only as a "nearest feature" predictor
	Included in both models

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Table 3: Summary of HSM Model Predictors and Recommendations

Predictor	Predictor Value				BLM Comment	Recommendation
(blue=additive, yellow=multiplicative)	3	2	1	0		
Distance to interstate or US highway (m)	> 5000	700-5000	100-700	< 100	Scoring "not perfectly supported in the peer-reviewed literature" (FEIS App J)	Retain distance to nearest roads, but also use road density and test this within various spatial neighborhoods
Distance to county highway, surfaced high-use road, well pad, or mine footprint (m)	> 200	50-200	25-50	< 25	Scoring "not perfectly supported in the peer-reviewed literature" (FEIS App J)	Retain distance to nearest roads, but also use road density and test this within various spatial neighborhoods
Distance to fence (km)	> 2	0.4-2	< 0.4	NA	The minimum value of 0.4 km was based on preliminary results of an ongoing fence marking study that did not examine strikes vs. distance to lek. The highest values in were based on guidelines from two general sage-grouse management papers. The middle value was assigned using a linear relationship. The meeting notes detail problems with this predictor (effects are site specific and close range, fence data are generally inaccurate and incomplete) and suggestions to use fence density in place of distance to nearest fence, but there were no changes.	This predictor reflects the relatively recent interest in using fence marking for mitigation, an approach that makes intuitive sense and has been shown to be effective in reducing collision mortality when properly targeted, but provides no sage-grouse habitat services and has an unknown equivalency with respect to habitat loss and/or degradation; determining the number of spans to mark to offset each unit area of habitat lost or degraded is not possible to address given current knowledge, as acknowledged in Stevens et al. (2013). Given that, this form of mitigation should be pursued in contexts other than HEA.
Distance to occupied lek (km)	0-5	5-8.5	.8.5	NA	Current sage-grouse habitat management guidance uses occupied leks as focal points for nesting habitat management, so distance to lek was used as a variable in the Habitat Services Metric.	BLM uses recommended guidelines for lek protection along with three different radio collar studies to arrive at distance values for scoring. Instead, use observed grouse use data to test the ability of distance to the nearest lek and lek density within various neighborhoods to predict sage-grouse habitat use.
Distance to sage or shrub dominant area (m)	< 90	90-275	> 275	NA	This was included since sage-grouse use other shrub types for excape cover during brood rearing, and the values were derived from loosely applying guidelines and recommendations from two sources (Lincoln County s-g technical team and Stiver et al. 2010).	As above, generate multiple versions of the predictor and test their ability to predict observed grouse habitat use, as has been already done already in the WBEA sage-grouse model.
% slope	< 10	10-30	30-40	> 40	Areas less than 5% slope were assigned the high score, with those exceeding 10% intervals subjectively assigned after that and areas with greater than 40% unsuitable (0).	Slope was tested in the WBEA model and had no power to predict observed sage-grouse habitat use, but Topographic Ruggedness Index, a neighborhood-based index more typical of modern GIS-based predictors, was significant.

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Predictor	Predictor Value				BLM Comment	Recommendation
% sagebrush cover	15-25	5-15 or > 25	< 5	NA	In general, the recommended sagebrush cover for nesting habitats was intermediate to and overlapped that of brood-rearing and winter habitats. Thus, favorable conditions for nesting were given the highest scores for percent sagebrush cover in the sage-grouse habitat services metric. The sagebrush cover scores assigned for nesting habitat in the sage-grouse habitat assessment framework by Stiver et al. (2010) to different sagebrush cover categories were assigned to this variable.	This metric has the strongest link to sage-grouse habitat services based on existing research, but nesting habitat requirements were subjectively prioritized in the scoring based on conjecture about seasonal habitat overlap. Variables should be tested for their power to predict different types of habitat use.
% bunchgrass cover	5-15	2-5 or > 15	< 2	NA	Literature reviewed defined an optimum range of bunchgrass cover for nesting and brood rearing; above and below this ideal range, lower scores were assigned subjectively with no support.	The WBEA study methods define separate models for brood/nesting habitat and general habitat since brood pellets are easily differentiated from general habitat use pellets due to clustering. The brood/nesting habitat model would be ideal for exploring bunchgrass as a habitat predictor.
Sagebrush patch size (ha)	> 130	10-130	< 10	NA	A 130-hectare (ha) patch size for sagebrush was used as the recommended service condition (score of 3) based on professional judgment. Professional judgment was used because "conclusive data are unavailable on minimum patch sizes necessary to support viable populations of sage-grouse" (Connelly et al. 2011).	As above, generate multiple versions of the vegetation predictors and test their ability to predict observed grouse habitat use, as has been already done already in the WBEA sage-grouse model.
Sagebrush canopy height (cm)	30-80	20- < 30 or > 80	< 20	NA	The sagebrush canopy heights that provided high quality nesting habitat generally also provided high quality winter habitat, thus favorable conditions for nesting were given the highest scores overall.	As with sagebrush cover, although values are based on research, nesting habitat requirements were subjectively prioritized in the scoring based on conjecture about seasonal habitat overlap. Variables should be tested for their power to predict different types of habitat use
Vegetation	NA	NA	All Other Veg Types	Forested Open Water Roads Well pads Mine Footprints	Habitats typically avoided by sage-grouse (roadways, urban, open water, forest) were scored zero to give them no habitat service value in the output.	This layer was included as a screen and basically contributes nothing to the scoring beyond eliminating areas known to be unsuitable.

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