November 27, 2013

NEPA Coordinator
Bureau of Land Management, Northwest Colorado District
2815 H Road
Grand Junction, CO 81506

Re: 1610 (COS050) – Comments on Northwest Colorado Greater Sage-Grouse Draft Land Use Amendment and Environmental Impact statement

Attached you will find our comments on the Northwest Colorado Greater Sage-Grouse Draft Lane Use Amendment and Environmental Impact Statement.

We request that you withhold from public review our personal identifying information.

Very truly yours,

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Re: 1610 (COS050) – Comments on Northwest Colorado Greater Sage-Grouse Draft Land Use Amendment and Environmental Impact statement

Overview

We believe we represent a unique perspective on the desirability of achieving the appropriate balance between responsible oil and gas development and the conservation of sage grouse. As significant owners of interests in U.S. oil and gas exploration and production companies, we understand and appreciate the need to have responsible oil and gas development in the U.S. for many reasons, including energy independence, a thriving domestic economy and jobs. However, as owners of a large Colorado ranch in Grand County with significant sage brush and sage grouse on BLM split-estate and leased acreage, we are also very supportive of preserving ranching operations and conserving this unique wildlife for future generations. Over the past years, we have been very active in cooperating with federal agencies in major programs to conserve the sage brush and sage grouse on our ranch – e.g. -

- Multi-year contract with the Natural Resources Conservation Service regarding a variety of range improvement projects over large areas of the ranch to benefit sage grouse.
- Several contracts with the U.S. Fish & Wildlife Service regarding sage grouse habitat improvement, most recently a pinion/juniper removal project that was also funded by the Colorado Parks & Wildlife
- Multi-year Conservation Program Contract with the Natural Resources Conservation Service under the Sage Grouse Initiative for the bulk of the ranch

In addition, we have engaged in numerous privately supported and funded projects to

enhance the conservation of sage grouse on our ranch.

The Report on National Greater Sage-Grouse Conservation Measures produced by the Sage-Grouse National Technical Team dated December 21, 2011 ("NTT Report") presents reasoned and compelling analyses and recommendations for the conservation of sage grouse. Since this team was established and supported by the BLM and had nationally recognized and respected members and consultants opining on the best and relevant available science to conserve the sage grouse, it is difficult, if not impossible, to disagree with the conclusions and recommendations of the NTT Report. As the BLM states in its National Greater Sage-Grouse Planning Strategy – "the National Technical Team (NTT) serves as an independent, technical and science-based team to ensure the best information related to greater sage-grouse management is fully reviewed, evaluated and provided to the BLM with the objective to identify science-based management considerations for the greater sage-grouse (e.g. conservation measures) that are necessary to promote sustainable sage grouse populations." The most significant statements and conclusions of the NTT Report are as follows:

A. "This document (the NTT Report) provides the latest science and best biological judgment to assist in making management decisions" (p. 5 of NTT Report)
B. "Conservation measures and strategies that follow assume the goal and objectives below.

   GOAL

   Maintain and/or increase sage grouse abundance and distribution by conserving, enhancing or restoring the sage brush ecosystem upon which populations depend in accordance with other conservation partners.

   OBJECTIVES

   The overall objective is to protect priority sage-grouse habitats from anthropogenic disturbances that will reduce distribution or abundance of sage-grouse.
   Priority habitat designations must reflect the vision, goals and objectives of this overall plan if the conservation measures are to be effective.
   To reach this objection, it will be necessary to achieve the following sub-objectives for priority habitat:

   "Manage priority sage grouse habitats so that discrete anthropogenic disturbances cover less than 3% of the total sage-grouse habitat regardless of ownership."
   (pp. 6-7 of NTT Report. Emphasis Added)
C. "Oil/gas wells…are discrete disturbances. Sage-grouse are extremely sensitive to discrete disturbance…Large-scale disturbances that impact sage grouse distribution and abundance will not be permitted within priority areas (subject to valid existing rights). Other, smaller scale proposed anthropogenic disturbances will not disturb more than a total of 3% of the acreage within each priority area.

(p. 8 of NTT Report. Emphasis Added).

D. "Lands/Realty
Rights of Way
Priority sage-grouse habitat areas
Make priority sage-grouse habitat areas exclusion areas for new ROWs permits"
(p. 12 of NTT Report)

E. "Minerals
The primary potential risks to sage-grouse from energy and mineral development are:
1) Direct disturbance, displacement or mortality of grouse;
2) Direct loss of habitat or loss of effective habitat through fragmentation and reduced habitat patch size and quality; and
3) Cumulative landscape – level impacts.

There is strong evidence from the literature to support that surface disturbing energy or mineral development within priority sage-grouse habitats is not consistent with a goal to maintain or increase populations or distribution.

...Findings suggest that impacts (from energy development) are UNIVERSALLY NEGATIVE and typically SEVERE"

(pp 18-19 of NTT Report. Emphasis Added)

F. "Negative responses of sage-grouse to energy development were consistent among studies regardless of whether they examined lek dynamics or demographic rates of specific cohorts within populations."
(p. 19 of NTT Report)

G. "Given impacts of large scale disturbances (from energy development) described above that occur across seasons and impact all demographic rates, APPLYING NSO OR OTHER BUFFERS AROUND LEKS AT ANY DISTANCE IS UNLIKELY TO BE EFFECTIVE."
(p. 20 of NTT Report. Emphasis added)

H. "WE RECOMMEND EXCLUDING MINERAL DEVELOPMENT AND OTHER LARGE SCALE DISTURBANCES FROM PRIORITY HABITATS...WE BELIEVE THE CONSERVATION STRATEGY MOST LIKELY TO MEET THE OBJECTIVE OF MAINTAINING OR INCREASING SAGE GROUSE DISTRIBUTION AND ABUNDANCE IS TO EXCLUDE ENERGY DEVELOPMENT FROM PRIORITY HABITATS."
(p. 21 of NTT Report. Emphasis added)

I. "FLUID MINERALS/Unleased Federal Fluid Mineral Estate (conclusion)

- CLOSE PRIORITY SAGE-GROUSE HABITAT AREAS TO FLUID MINERAL LEASING.

(p. 22 of NTT Report. Conclusion Emphasis added)

Given the foregoing strong and unequivocal conclusions and recommendations of the BLMs experts and consultants - the "conservation derived from interpretation of the best available scientific studies using our best professional judgment," - the BLM's position that resource balance and prioritization dictate a preferred alternative directly conflicting with the NTT Report's recommendations and statement of conclusions as to actions that will be effective in conserving the sage-grouse is untenable and fatally deficient. This position, if maintained, will result in continued legal challenges to the EIS and the listing of the sage grouse by the U.S. Fish and Wildlife Service.

BLM does not state any science based justification for ignoring the NTT Report's recommended actions and conclusions – nor does it cite any best available science or best professional judgment in response and counter-argument to the NTT Report. At a minimum, if the BLM is to reach recommendations and conclusions directly contrary to its own NTT Report there must be some science based justification and response.

"Although the Court must defer to an agency's expertise, it must do so only to the extent that the agency utilizes, rather than ignores, the analysis of its experts." Defenders of Wildlife v. Babbitt, 958 F. Supp. 670, 685 (D.D.C. 1997); citing Northern Spotted Owl v. Hodel, 716 F. Supp. 478, 483 (W.D. Wash. 1988)).

An EIS that fails to respond to "the opinions held by well respected scientists concerning the hazard of the proposed action is fatally deficient." Friends of the Earth v. Hall, 693 F. Supp. 904, 934 (W.D. Wash 1988). The Tenth Circuit has noted that: "a reviewing court may properly be skeptical as to whether an EIS's conclusions have a substantial basis in fact if the responsible agency has apparently ignored the conflicting views of other agencies having pertinent expertise." Davis v. Mineta, 302 F. 2d 1104, 1123 (10th Cir. 2002). Here there is no question that the experts and consultants who prepared the NTT Report are "well respected." Indeed, they were chosen and commissioned by the BLM itself to conduct the research and issue the recommended measures to conserve sage grouse populations. Although the BLM's compliance with the NTT Report may not be mandatory, BLM is under an obligation under NEPA to respond to the positions of their own leading scientific experts on the sage grouse. The EIS presents no science based views, opinions or analysis conflicting with those of the NTT. To comply with the judicial decisions BLM would be forced to criticize their own experts and consultants. Therefore, the following statement of the Supreme Court would dictate that any court reviewing this matter should find the NTT views more persuasive and the EIS fatally defective – See Marsh v. Oregon National Resources Council, 490 U.S. 360, 378 (1989) ("When specialists express conflicting views, an agency must have discretion to rely on the reasonable

opinions of its own experts, even if...a court may find contrary views more persuasive."). In this case, the agency is forced to rely on its own experts on the NTT or disavow the conclusions of its experts, which it has not done. See letter of Paul Zogg, Esq. attached as Appendix B ("Zogg Letter").

The EIS makes the following statements on the adverse effects of Energy Development on the sage-grouse which unambiguously conflict with the provisions in Alternative D in the EIS under the section NTT Report No. 46 applicable to Unleased Fluid Minerals. These statements which follow are nowhere contested or criticized in the EIS (EIS pp. 951-953):

"Major Threat: Energy"

"Development can result in direct habitat loss; fragmentation of important habitats by roads, pipelines, and power lines; noise; and direct human disturbance. There are currently approximately 5,500 acres of wells on federal mineral estate within the planning area. The effects of energy development often add to the impacts from other human development and result in GRSG population declines. Population declines associated with energy development result from the abandonment of leks, decreased attendance at leks that persist, lower nest initiation, poorer nest success, decreased yearling survival, and avoidance of energy infrastructure in important wintering habitat areas (Holloran 205; Aldridge and Boyce 2007)."

"Nonrenewable (oil and gas) energy development impacts GRSG and sagebrush habitats through direct disturbance and habitat loss from well pads, access construction, seismic surveys, roads, power lines, and pipeline corridors; indirectly from noise, gaseous emissions, changes in water availability and quality, and human presence. The interaction and intensity of effects could cumulatively or individually lead to habitat fragmentation in the long term (Connelly et al. 2004; Holloran 2005)."

"All studies which assessed impacts of energy development on GRSG found negative effects; no studies reported a positive influence of development on populations or habitats (Naugle et al. 2011). Studies consistently reported that breeding populations of GRSG were negatively impacted at conventional well pad densities, with declines in lek attendance by male GRSG ranging from 13 to 79 percent associated with these well densities. A recent summary of studies investigating GRSG response to natural gas development reported impacts on leks from energy development were most severe when infrastructure occurred near leks and that impacts remained discernible at distances up to 4 miles from the lek (Naugle et al. 2011)." "Annual survival of individuals reared near gas field infrastructure (yearling females and males) was significantly lower than control individuals not reared near infrastructure (Holloran 2005)."

"Given the high numbers of projected new wells and coal mines, wind farms, transmission lines and ROWs, energy development will likely remain a threat to GRSG under any of the alternatives throughout the Management Zones."

(EIS pp 951-53. Emphasis Added)

The table in the EIS entitled Comparison of Alleviated Threats by Alternative in Order of USFWS Importance (EIS Table 2.6 p. 188) clearly demonstrates that the proposed Alternative D does not adequately address USFWS concerns for the USFWS Highest Importance Alleviated Threat (namely, oil and gas development) in that the glaring comparison of Areas closed to fluid mineral leasing (100,200 acres - "this represents only 7.7 percent of the total of currently unleased fluid mineral in the 21 Colorado MZs" EIS p. 644) is the same for both Alternatives A and D and represents only a very small percentage of the total of currently unleased fluid minerals in the 21 Colorado MZs. Clearly, the USFWS considers Oil and Gas Development the most important threat to sage-grouse. Thus, with respect to the primary recommendation of the NTT Report and the most important threat to sage grouse according to USFWS, there is no improvement in Alternative D over existing conditions (Alternative A). The existing conditions (Alternative A) have resulted in the USFWS conclusion that the sage grouse is warranted for listing as a threatened or endangered species. Therefore, it is difficult, if not impossible, to argue that Alternative D makes a positive contribution to conserving the sage grouse. Listing of the sage grouse will be extremely harmful to the future effective and responsible development of oil and gas, as well as other resource activities such as ranching and recreation, on BLM administered lands.

The tangential references to the failure to follow the findings and recommendations of the NTT Report are the statement on page xv of the EIS – "Alternative D describes management actions developed by adapting the National Technical Team measures to Northwest Colorado" and the statement on pg. xxxiv – "Alternative D incorporates local adjustments made in concert with cooperating agencies to NTT." A vague reference to "adapting" the NTT's recommendations and conclusions does not justify and support totally ignoring its most important recommendations and conclusions. Likewise, a vague reference to making adjustments "in concert with cooperating agencies" in the absence of any specific science based justification or rationale clearly does not suffice under NEPA and the decided cases. It is important to note that nowhere in the NTT Report is there any reference limiting their conclusions or recommendations to certain geographic areas or management zones. The EIS presents no science based justification for its failure to follow the two most important recommendations to maintain and/or increase sage-grouse abundance and distribution in "Northwest Colorado." The NTT conclusions broadly apply to all sage grouse populations and environments – e.g.,

- "There is strong evidence from the literature to support that surface – disturbing energy or mineral development within priority sage-grouse mineral development within priority sage-grouse habitats is not consistent with a goal to maintain or increase populations or distribution…findings suggest that impacts are UNIVERSALLY negative and typically severe." (NTT p. 19 Emphasis added).

In fact, many of the scientific studies relied on by the NTT were conducted in northwest Colorado. See NTT pp. 21, 39-49. The NTT Report states "negative responses of sage-grouse were consistent among studies."

The EIS states on p. xxviii – "No additional unique comment themes were identified outside of the issues identified in the range – wide analysis." Table ES.2 in the EIS under "energy and mineral development" identified no unique considerations in Northwest Colorado which would support and justify ignoring the most important conclusions of the NTT with respect to energy development. The EIS presents no science based explanation or justification for "local adjustments" to the two primary conclusions and recommendations of the NTT. In fact, the EIS states "the (Colorado) PPH does have special worth and does give the BLM cause for concern. The Colorado portion of PPH has special worth in that (it) is the Southeastern most edge of the range of GRSG. When land uses such as oil and gas development and rights of way are factored into the equation, the PPH becomes even more important for the protection of GRSG." (EIS p. H-2). In other words, the EIS states that local adjustments should favor the increased protection of the NTT for sage grouse conservation in Northwest Colorado.

The EIS presents contradictory explanations for Alternative D – it doesn't clearly state whether Alternative D is based on local adjustments or balancing resources and resource use among competing human interests. See EIS p. 39. BLM's avowed objective in the EIS is to maintain or increase GRSG abundance and distribution by conserving, enhancing or restoring the sagebrush ecosystem upon which populations depend" and avoid a listing of the sage grouse. (See EIS p. 33). Therefore, consistent with its own objectives for the EIS, BLM cannot rely on vague generalized references to balancing of resources and/or local adjustments as an excuse to totally ignore their own experts conclusions and recommendations in the NTT Report in the absence of any conflicting science. Such an attempted reliance would be arbitrary and capricious. In its failure to adopt the 2 major conclusions and recommendations of the NTT Report the BLM has clearly stated its overwhelming priority given to oil and gas development over sage grouse conservation. See Table 2.2 p.42 of EIS and Comments and Critique of BLM conclusions infra pp. 19-23 and 33-35. See also Zogg Letter attached as Exhibit B.

It appears that the approach of the BLM to Oil and Gas development under its preferred Alternative D was to impose the minimum limitations on horizontal and directional drilling into PPH areas from non-PPH areas and to further reduce the impact of any limitations in PPH through the granting of broad discretion to the regional offices. This approach, as opposed to the

NTT Report's science based approach, is unrealistic due to the collateral impacts on PPH from noise, traffic, mechanical movement, changes in water availability and quality, seismic vibrations and other impacts from drilling pads in proximity to PPH areas which will have a significant adverse impact on sage grouse. Blickley, Jessica L. & Gail L. Patricelli, "Impacts of Anthropogenic Noise on Wildlife: Research Priorities for the Development of Standards and Mitigation, Journal of International Wildlife Law and Policy (2013); Blickley, Blackwood & Patricelli, "Experimental Evidence for the Effects of Chronic Anthropogenic Noise on Abundance of Greater Sage-Grouse at Leks," Conservation Biology Vol 26 No. 3, 461-71; Tom Fowlers, "Study Shines Light on Fracking" Wall St Journal Aug. 27, 2013. BLM's approach encouraging and emphasizing horizontal and directional drilling requires that BLM review and analyze the cumulative impacts that could impact sage grouse habitat and populations from this form of drilling activity. BLM failed to do that in the EIS. In fact, the leading and most recent scientific studies conclude that visual impacts and noise from daily truck and other traffic on roads near a lek would significantly impact sage grouse habitat and populations. See EIS pp. 509-514. This is particularly true for fracking operations. In addition, the EIS fails to address the impact of horizontal drilling on PPH with respect to sage grouse connectivity. See USFWS Connectivity Study Zogg Letter (Exhibit B) and Holloran Letter (Exhibit A).

The fallacy in BLM's support for horizontal drilling into PPH areas from non-PPH areas is highlighted by the language on p. 516 of the EIS – "Development of well pads, roads and associated anthropogenic (human-caused) features would reduce sage brush communities creating a mosaic across the landscape and increasing edge habitat (Connally et al. 2004). Fragmented or altered landscapes (attributed to energy development) lead to a diminished habitat base and have been shown to influence lek activity, nesting and brood-rearing success, adult and chick survival, and winter habitat selection (Holloran et al. 2010)." In addition, the EIS on p. 778 states – "subsurface disturbances (from directional drilling) can alter natural aquifer properties…This can increase the potential for contamination of surface and groundwater resources along fractures or faults (BLM 2001)." Thus, directional drilling into PPH areas from pads on contiguous or near-by PGH areas will have the significant adverse impact on the sage grouse comparable to direct drilling on PPH areas.

The result of the BLM's preferred Alternative D will be a listing of the sage grouse or more severe court mandated provisions relevant to sage grouse which will adversely impact oil and gas development, ranching, recreation and other resource activity on both PPH and non-PPH areas. The EIS fails to discuss and consider these adverse impacts from a listing. See attached letter of Paul Zogg, Esq. in Appendix B ("Zogg Letter"). The issue is whether BLM will balance resources on all areas to facilitate oil and gas development and ranching operations on non-PPH areas and limit restrictions on previous leased areas as a balance and trade-off to following the NTT Report recommendations on PPH areas, subject to the limitation that the recommendations

of the NTT Report on PPH areas only apply to unleased Fluid Minerals – i.e. modify only NTT No. 46, GRSG PPH NSO-46d and Ecological Sites that Support Sagebrush in PPH CSU-46d.

WE ARE OF THE OPINION THAT BLM SHOULD FOLLOW THE RECOMMENDATIONS AND CONCLUSIONS OF THE NTT REPORT AND ADOPT ALTERNATIVE B AS THE PREFERRED ALTERNATIVE. HOWEVER, IF THE BLM DECIDES NOT TO ADOPT ALTERNATIVE B, WE SUGGEST MINOR MODIFICATIONS TO ALTERNATIVE D WHICH WILL SIGNIFICANTLY ENHANCE ITS FUTURE EFFECTIVENESS IN CONSERVING THE SAGE GROUSE AND PROTECTING OTHER RESOURCES ON BLM LANDS.

IN THE EVENT THE BLM DOES NOT ADOPT ALTERNATIVE B, OUR CONCLUSION IS THAT THE APPROPRIATE BALANCE OF THE COMPETING RESOURCES IN THE CONTEXT OF THE AVAILABLE SCIENCE WOULD ARGUE FOR LIMITED ADJUSTMENTS TO ALTERNATIVE D – THE PREFERRED ALTERNATIVE – WHICH WOULD ACCEPT THE 2 PRIMARY RECOMMENDATIONS OF THE NTT REPORT WITH APPLICATION LIMITED TO UNLEASED FLUID MINERALS ON PPH. THE RESULT OF THESE LIMITED ADJUSTMENTS WOULD BE A SUBSTANTIAL CONTRIBUTION TO ACHIEVING BLM'S STATED OBJECTIVE TO MANAGE FLUID MINERALS TO AVOID, MINIMIZE AND MITIGATE 1) DIRECT DISTURBANCE, DISPLACEMENT OR MORTALITY OF GRSG, 2) DIRECT LOSS OF HABITAT, OR LOSS OF EFFECTIVE HABITAT THROUGH FRAGMENTATION AND 3) CUMULATIVE LANDSCAPE – LEVEL IMPACTS.

THUS, OUR CONCLUSION IS THAT ALTERNATIVE B IS THE CORRECT ALTERNATIVE. HOWEVER, IF BLM IS NOT WILLING TO ACCEPT ALTERNATIVE B, WE STRONGLY RECOMMEND AND SUPPORT THE FOLLOWING THREE (3) LIMITED MODIFICATIONS TO ALTERNATIVE D:

1. **APPLICABLE ONLY TO UNLEASED FLUID MINERALS, CLOSE GRSG PPH AREAS TO FLUID MINERAL LEASING. "NO NEW LEASES WILL BE ISSUED WITHIN GRSG PPH AREAS." SEE MODIFICATION TO NTT NO. 46 PAGE 61 OF EIS AND GRSG PPH NSO – 46D AND P. 22 OF NTT REPORT.**
2. **APPLICABLE ONLY TO UNLEASED FLUID MINERALS, SURFACE DISTURBANCE WITHIN ECOLOGICAL SITES THAT SUPPORT SAGEBRUSH WOULD NOT EXCEED 3 PERCENT WITHIN THE COLORADO MZ. SEE MODIFICATION TO NTT NO. 46 OF EIS AND GRSG PPH COA – 55D AND P. 8 OF NTT REPORT. ("5 percent cap could**

allow 60 percent more surface disturbance than with a 3 percent cap in PPH." EIS p. 638).

3. **NO PROVISION FOR EXCEPTIONS, MODIFICATIONS OR WAIVERS WITH RESPECT TO UNLEASED FLUID MINERALS ON PPH AREAS EXCEPT WHERE A) A 60 DAY PUBLIC NOTICE AND COMMENT PERIOD IS REQUIRED, B) THE CPW AGREES WITH THE EXCEPTION, MODIFICATION OR WAIVER AND C) ALL OF THE REQUIREMENTS FOR AN EXCEPTION ALSO APPLY TO WAIVERS AND MODIFICATIONS. SEE MODIFICATION TO EIS PP. E-2 THRU E-11 AND DISCUSSION BELOW – COMMENTS ON APPENDIX E.**

It is our opinion that these three modifications to Alternative D for unleased fluid minerals on PPH areas would have only limited negative impacts on realistic oil and gas development potential and provide significant enhancement to the conservation of sage grouse. Since these modifications would significantly reduce the probability of a listing of the sage grouse and meet the requirements of NEPA, these modifications would also have a dramatic positive impact on ranching and recreation in the area. Furthermore, the reduced disturbances from lower levels of oil and gas leasing on PPH would be a positive impact on ranching and recreation. In addition, the exclusion from leasing for unleased fluid minerals on PPH would be consistent with the Oil Shale and Sands programmatic EIS (March 2013) which excludes from oil shale leasing all PPH.

The limited impact of our proposal on effective oil and gas development is apparent from the following data for fluid mineral leasing.

1. BLM Acres Open to Oil And Gas Leasing – PPH	858,700 Acs (EIS Table 3.35 p. 297)
2. BLM Acres of Oil and Gas Leasing within PPH	331,500 (EIS Table 3.36 p. 297)
3. Unleased Federal leasable Minerals with high potential For Oil and Gas on PPH	447,000 Acs (EIS Table 3.9 p. 299)

Thus, the impact on high potential oil and gas development in PPH areas from our proposal is very limited – areas closed to fluid mineral leasing would represent only 7.7 percent of the total fluid minerals in the 21 Colorado MZs. (EIS p. 644). "It is estimated that 99 percent of the drilling will take place in the area identified as high potential for the presence of oil and gas resources." (EIS p. 306) However, the impact on the listing decision will be substantial since our proposal adopts the most significant and compelling conclusions of the NTT Report.

To fully grasp and understand the impact of the listing decision on BLM resources there should be an Alternative E in the EIS describing the possible court mandated impact of a listing on each of the activities described in Table 4.2 of the EIS including ranching and recreation. (See Zogg Letter attached as Appendix B). A decision to list would have major adverse

consequences for oil and gas development, ranching and other BLM resources. See attached Zogg Letter.

See decision of Environment Canada on Sept. 17, 2013 which issued an emergency order to protect the greater sage grouse in response to litigation filed by various environmental groups.

We are of the opinion that the areas designated in the EIS as high potential for oil and gas (EIS Figure 3-7) in PPH is substantially greater than the current geology and operational experience would indicate. Figure 3-7 appears to be based on out-dated or incorrect information, with respect to the Middle Park area. For example, current geological and production assessments of the Niobrara play in this area are significantly lower than the initial enthusiasm of several years ago, since the realization of commercial production in many areas of the Niobrara has been disappointing.

It is important to note that "anthropogenic disturbance" as defined in Appendix F of the EIS does not apparently include reservoirs – e.g. Wolford Mtn Reservoir in Grand County was built by destroying significant acreage of sagebrush and thus should be counted toward the disturbance acreage. The estimate of approximately 8,800 acres of disturbance within the applicable MZ for the KFO is clearly in error in that it apparently does not include the sagebrush destruction necessary to build reservoirs. (See EIS p. 802).

Counties (such as GRAND County) with no oil and gas development sales (See EIS p. 436 Table 3.92) but large amounts of unleased fluid mineral PPH areas, should be enhanced and preserved by providing a protective haven to conserve the sage grouse. According to biologists with CPW, the Middle Park sage-grouse population is one of only two populations in Colorado not currently influenced by oil and gas development. BLM should take actions in the EIS to recognize, support and enhance the substantial private and governmental efforts to conserve the sage grouse in Grand County. This would make a substantial positive impact on reducing the likelihood of a listing of the sage grouse in Northwest Colorado. As stated on page H-2 of Exhibit H to the EIS – "the [Colorado] PPH does have special worth and does give the BLM cause for concern. The Colorado portion of PPH has special worth in that [it] is the southeastern most edge of the range of GRSG. When land uses such as oil and gas development and rights of way are factored into the equation, the PPH becomes even more important for the protection of GRSG." See Grand County Board of Commissioners Letter to BLM ("Grand County Letter") and excerpts from Grand County Zoning Regulations on oil and gas exploration and production attached as Appendix C.

Among other arguments opposing oil and gas development north of Kremmling and supporting conservation of sage grouse in Grand County the Grand County Commissioners state:

1. "The County feels that the impending exploration of Oil and Gas could have drastic negative consequences on our local environment and infrastructure."
2. "Two of the most serious issues in Grand County are water resources and water quality. Grand County is a unique and sensitive area due to being the headquarters for the

Colorado River. Grand County has a growing concern regarding availability of water to support the current population and tourism sector. Adding large industry, such as Oil and Gas, would put even further strain on this valuable resource."

3. "With respect to sage grouse, as well as other wildlife, such as mule deer, moose and elk, strong consideration should be given to the current condition of habitat and impacts of oil and gas drilling on the habitat. Other wildlife concerns include sage grouse winter habitat and potential habitat for threatened or endangered plant or animal species. Previous letters from Grand County have outlined concerns regarding…sage grouse nesting…."

See Grand County Letter attached as Appendix C.

Thus, Alternative B applied by BLM in a targeted approach to Counties with oil and gas development sales would preserve a refuge and sanctuary for sage grouse populations to stabilize and prosper. We believe that this would be a material contribution to avoiding listing by USFWS.

The avoidance of a listing of the sage grouse would greatly benefit the ranching and recreation activities within these counties with minimal adverse impacts on their resources. We believe our Alternative B and our modifications to Alternative D achieve this objective through the No New Leasing on PPH lands thereby providing a safe haven for existing sage grouse populations and encouraging their reproduction and population growth. Our recommendation would have no adverse impacts on ranching and recreation while it achieves substantial benefits for these resources through the avoidance of a listing of the sage-grouse and the elimination of additional disturbances from new oil and gas development.

With increased support from the BLM for sage grouse conservation through adoption of our recommendations, private parties will be encouraged to devote ever more resources and effort to the conservation of sage grouse. Obviously, as a private party it is often difficult to justify ever greater resources and efforts devoted to sage grouse conservation if the BLM remains receptive to and encouraging of oil and gas development which will adversely impact sage grouse conservation thereby reducing the effect of our private efforts.

Comments on Appendix E

In addition to the foregoing recommendations based on the NTT Report and existing science, the most troubling aspect of the EIS is the provisions in Appendix E in the description of Stipulations for No Surface Occupancy that provide for exceptions, waivers or modifications (EIS Appendix E pages E-1 thru E-3). The effect of the provisions on exceptions, modifications and waivers is to potentially gut the protective provisions relative to conservation of sage grouse in Alternative D. See Zogg Letter (Appendix B) and Matt Holloran Letter attached as Appendix A ("Holloran Letter"). The EIS on p. 638 makes the following statement with respect to Alternative D – "Because this alternative would apply more widely but with less

stringent restrictions and greater flexibility to approve projects, the number of acres potentially affected is not a meaningful number because the impacts could be minimal across much of the area." Thus, the BLM is stating that the effect of Alternative D could be MINIMAL due to the provisions on exceptions, modifications and waivers. Particularly, the requirements on pages E-2 and E-3 for Standard Modifications and Standard Waivers are totally inadequate:

a. A modification changes the language or provision of a stipulation due to "changed conditions or new information either temporarily or for the term of the lease"
    - There is absolutely no objective criteria or standard as to the substance of the "changed conditions or new information" which would allow for the change in the language or provisions of a stipulation for the term of a lease.
    - Furthermore, there is no provision that the 30 day notice and comment period must be required – the EIS only specifies that it may be required.
    - The modification or waiver is totally "at the discretion of the Authorized Officer" with no requirement of concurrence by CPW. See EIS Appendix E pg E-2.

b. A waiver permanently exempts the surface stipulation for a specific lease, planning area or resource based on "absence of need"
    - A waiver permanently exempts the surface stipulation for a specific lease, planning areas or resource based on "absence of need." There is absolutely no objective criteria or standard as to "absence of need" which would allow for a wholesale permanent elimination of surface stipulations. See EIS Appendix E pp. E-2 and E-2.

Given the broad definitions of modifications and waivers with respect to PPH areas, they should always be subject to the same requirements as an exemption in PPH areas in every situation, namely:

1) Generally accepted independent data – based documentation exists that requires a conclusion that a) GRSG populations in the applicable Colorado GRSG MZ are healthy and stable at objective levels or increasing, and b) an exception, modification, or waiver would not adversely affect GRSG populations due to habitat loss or disruptive activities;
2) The Authorized Officer may grant an exception, modification or waiver only with the concurrence from CPW; and
3) A 60 day public notice and comment period is required.
   See EIS Appendix E e.g. pages E-5 thru E-11, GRSG PPH NSO – 46d, GRSG ADH TL-46d, Ecological Sites that Support Sagebrush in PPH CSU – 46d, GRSG PPH COA – 55d, and GRSG PPH ROW Avoidance, Alternative D.

We would prefer no modifications, waivers or exceptions in order to remove uncertainty and the problems associated with bureaucratic discretion. However, at a minimum we would suggest the above amendment which could address the objections. Particularly disturbing is the

language on page F-6 of Appendix F which states "Alternative D uses the following guideline to assign an appropriate priority to GRSG issues: Consider GRSG habitat requirements in conjunction with all resource values managed by the BLM, and give preference to GRSG habitat unless site-specific circumstances warrant an exemption" (EIS Appendix F p. F6). This definition of Prioritization under Alternative D as a guideline combined with the rejections of the conclusions and recommendations of the NTT Report can only lead to one conclusion – listing of the GRSG by the U.S. Fish and Wildlife Service and on-going battles in the courts and public opinion with respect to the EIS. Also, this language on pg F-6 of Appendix F contradicts the statement on page 226 of Ch. 3 of the EIS "the…BLM have committed to ensuring that this species (GRSG) remains a high priority for management (BLM 2004b)." It is totally inconsistent to state that GRSG should receive high priority and also state that the administrative guideline is that GRSG only receive preference unless site specific circumstances warrant an exemption. Either GRSG is a high priority or it's a marginal conditional preference.

Likewise, in Appendix F pg. F-6 the following statements are made with respect to the Disturbance Cap –

> "The Authorized Office may consider the relative value to society in terms of employment, tax revenue and project need versus the potential for impacts on GRSG. Proposals that appear to make a disproportionate adverse impact on GRSG, compared to the relative value to society, may be deferred or rejected."

This standard for administrative decision making totally negates BLM's avowed objective of ensuring that conservation of sage grouse remains a "high priority." Requiring a showing of "disproportionate adverse impact on GRSG" compared to the "relative value" of "project need" is more consistent with establishing GRSG as BLM's lowest priority.

Additional Comments on NSO Stipulation, Split Estates and Connectivity

The EIS on p. 515 states that the use of traditional stipulations have been widely criticized as ineffective – "based on current understandings, impacts are not reduced to the degree necessary to stem progressive or prolonged development." In addition, the NTT Report states that "applying NSO or other buffers around leks at any distance is unlikely to be effective" NTT Report p. 20. "We do not include timing restrictions on construction and drilling during the breeding season because they do not prevent impacts of infrastructure (e.g. avoidance, mortality) at other times of the year, during the production phase, or in other seasonal habitats that are crucial for population persistence (e.g. winter, Walker et al 2007)." NTT Report p. 21. See also Zogg Letter and Holloran Letter. Notwithstanding the foregoing existing science on the ineffective TL stipulations, Alternative D provides for a NSO for fluid mineral leasing in (1) PPH and (2) ADH within a minimum distance of 4 miles from active leks during lekking, nesting and early brood rearing. GRSG ADH TL – 46d. Based on the recitals of scientific conclusions

in both the NTT Report, the EIS and USFWS Study there should be no new leasing in (1) PPH and (2) ADH within 4 miles of active leks with no seasonal limitations. See EIS p. 953 – "A recent summary of studies investigating GRSG response to natural gas development reported impacts on leks from energy development were most severe when infrastructure occurred near leks and that impacts remained discernible at distances up to 4 miles from the lek (Naugle et al 2011)." See also EIS p. 516 – "Recent studies have consistently demonstrated that oil and gas development and its infrastructure influence GRSG behavior and demographics at distances of up to 4 miles. This prompts declines in lek persistence and male attendance, yearling and adult hen survival, and nest initiation rates. It also elicits strong avoidance response in yearling age classes, nest/brooding hens, and wintering birds." See Holloran Letter.

The analysis in the EIS of the Environmental Consequences as it relates to the Impacts from Mineral Split-Estate Management is inadequate. The only analysis is on p. 781 of the EIS which is limited to the impacts on Soil and Water Resources and presents no analysis of Alternative D other than "Alternative D would be more protective than Alternative A but less protective than Alternatives B and C." The EIS presents no analysis of the impact of Mineral Split-Estate Management on other resources.

Likewise the analysis in the EIS of linkage/connectivity habitat is totally inadequate. See Zogg Letter attached addressing the failure of the EIS to adequately analyze the impact of each of the alternatives on linkage/connectivity habitat. See also Holloran Letter. A recent study funded by the USFWS emphasizes the crucial importance of population connectivity to the sage-grouse:

1. "Land and wildlife agencies currently are developing conservation actions for sage-grouse based on core or priority areas containing highest densities of breeding birds (Doherty et al. 2011). Less clear are land-use plans for regions outside of core areas that might be important for dispersal and gene flow. Species that have multiple interconnected populations are more likely to persist because risk of extirpation caused by regional events is confined to local populations; connectivity among populations ensures that recolonization can occur following local extirpation assuming that sufficient habitat remains (Thomas 1994; Hanski 1998). Populations within the interior portion of the sage-grouse range were highly interconnected. However, peripheral populations often were connected by habitat corridors only to one adjacent population. Human development or habitat loss that eliminates habitat in these corridors would further isolate those populations."
2. "Our mapped corridors of habitat among populations provide an important step in designing conservation actions that facilitate dispersal and gene flow and reduce isolation and risk of extirpation."

Knick, Hanser and Preston, Modeling ecological minimum requirements for distribution of great sage-grouse leks: implications for population connectivity across their western range, USA (2013) (Funded by USFWS) (p. 1549) (Emphasis added). ("USFWS Connectivity Study").
See also Zogg Letter attached as Appendix B and Holloran Letter attached as Exhibit A.

Statements from EIS Supporting Our Recommendations

The following statements from Chapter 4 – Environmental Consequences – Terrestrial Wildlife support our recommendations to adopt Alternative B or, at a minimum, modify Alternative D:

1. "Both the construction and operation phases of ROW projects can lead to disruption impacts. Noise and an increase in human presence during construction may displace wildlife into lower quality habitat and may disrupt breeding, nesting, wintering and migration…In addition, noise and an increase in traffic during operation and maintenance would disturb and likely displace wildlife." (EIS p. 464)
2. "Withdrawing PPH from mineral entry and other authorized activities would be beneficial to wildlife habitats." (EIS p. 464)
3. "Inglefinger and Anderson (2004) found the nesting density of sagebrush-associated birds was reduced by 40 to 60 percent within 330 feet of roads assessing natural gas fields in Wyoming, with as few as 10 vehicle trips per day. Recent work from Wyoming gas fields (Gilbert and Chalfoun 2011) documents 10 to 20 percent declines in abundance of certain sagebrush obligates…in developed gas fields. (EIS p. 473)
4. "Alternative D…Exception criteria would allow leasing in Colorado MZ…where development would not adversely affect GRSG populations…Surface disturbance would be limited to 5 percent in any MZ, where practical." (EIS p. 475 Emphasis added).
5. "In general, GRSG are highly sensitive to habitat fragmentation, development or changes in habitat conditions. This is because GRSG inhabit and require large, intact sagebrush ecosystems, and are especially sensitive to disturbance and human presence." (EIS p. 507).
6. "In areas where ROWs are permitted, there would be more impacts on GRSG and their habitat than in areas where ROWs are excluded or avoided…
   ROWs, such as those for roads and industrial facilities, may lead to permanent loss of GRSG habitat…
   ROWs may also lead to habitat fragmentation and degradation…

The loss and degradation of sagebrush habitat can reduce the carrying capacity of local breeding populations of GRSG" (EIS p. 509).

7. "Both the construction and operation phases of ROW projects can lead to disruption impacts…In addition, noise and an increase in traffic during ROW operation and maintenance would disturb and likely displace GRSG (Lyons and Anderson 2003; Holloran 2005)." (EIS p. 509).

8. "Construction and operation of ROW facilities may also lead to direct mortality of GRSG." (EIS p. 510)

9. "ROW exclusion…would reduce or eliminate the above-described impacts on the GRSG by not allowing ROWs in PGH or PPH." (EIS p. 510)

10. "Withdrawing PPH from mineral entry and other authorized activities would be beneficial to wildlife habitats. Prohibiting surface – disturbing and disrupting activities would benefit GRSG by eliminating impacts from their activities." (EIS p. 510)

11. "Direct Habitat Loss/Fragmentation/Indirect Habitat Loss or Avoidance. Direct Habitat Loss – Direct habitat loss from fluid minerals development would be attributed to vegetation clearing (from well pad, access road, and ancillary facilities construction) and longer-term facility occupation. Loss or modification of big sagebrush communities would not regain any shrubland character or GRSG for 20 to 30 years, following interim or final reclamation, or longer depending on length of occupation. In some cases, shrubland may not regain functional utility (e.g., roads and permanent facilities) to support GRSG over the life of the plan amendment." (EIS pp. 515-516).

12. "Habitat Fragmentation/Alteration-Development of well pads, roads, and associated anthropogenic (human-caused) features would reduce intact sagebrush communities, creating a mosaic across the landscape and increasing edge habitat. GRSG populations generally require large expanses of intact sagebrush habitat (Connelly et al. 2004). Fragmented or altered landscapes (attributed to energy development) lead to diminished habitat base and have been shown to influence lek activity, nesting and brood-rearing success, adult and chick survival, and winter habitat selection (Holloran et al. 2010)." (EIS p. 516).

13. "INDIRECT HABITAT LOSS/AVOIDANCE. IN ADDITION TO DIRECT HABITAT LOSS AND ALTERATION, NOISE AND HUMAN ACTIVITY (INCLUDING IMPACTS FROM ROADS) FROM FLUID

MINERALS DEVELOPMENT HAS BEEN SHOWN TO INFLUENCE GRSG BEHAVIOR. RECENT STUDIES HAVE CONSISTENTLY DEMONSTRATED THAT OIL AND GAS DEVELOPMENT AND ITS INFRASTRUCTURE INFLUENCE GRSG BEHAVIOR AND DEMOGRAPHICS AT DISTANCES OF UP TO 4 MILES (NTT 2011). This prompts declines in lek persistence and male attendance, yearling and adult hen survival, and nest initiation rates. It also elicits strong avoidance response in yearling age classes, nesting/brooding hens, and wintering birds." (EIS p. 516).

"Most GRSG researchers have used various measures of lek use to infer population responses in GRSG subjected to development-related disturbances. Without exception, this work documents increased rates of lek inactivity and declining male attendance in response to increased frequency (vehicle use), intensity (well density), duration, and proximity of development and infrastructure (Doherty 2008; Lyon and Anderson 2003; Walker et al. 2007; Harju et al. 2010; Holloran 2005; see also discussion in Manier et al. 2013) Doherty (2008) found impacts on GRSG lek persistence and attendance increase with development intensity and proximity. At well densities (as a measure of development activity) of one to three per section, rates of lek inactivity were twice that of background levels, and bird abundance at remaining leks declined 30 to 55 percent. Rates of lek inactivity increased two to five times at well densities of four to eight per section. Influences became undetectable at distances of 2 miles or more. Doherty (2008) considered development activity at intensities of one well or fewer per section in GRSG habitat to be compatible with the conservation of GRSG populations. Holloran et al. (2010) demonstrated marked avoidance of all development infrastructure by yearling male GRSG. Although adult GRSG exhibit strong fidelity to nesting areas, there are strong indications that infrastructure and activity avoidance by and reduced survival of GRSG, particularly in yearlings, drives declines in GRSG populations that are subjected to development." (EIS p. 516).

"Noise from drilling, roads, and ancillary structures has been implicated as an important determinant in declining male lek attendance (Blickley et al. 2012; Holloran 2005; Manier et a. 2013). Holloran (2005) found that leks within 3 miles of drilling experienced significantly greater rates of decline than controls. Likewise, Blickley et al. (2012) found that chronic noise led to a decrease in male lek attendance and was more pronounced for road noise than drilling noise. Anthropogenic noise may displace birds in and around the area

1. "Avoid energy development in priority areas for conservation (Doherty et al. 2010)…
2. If avoidance is not possible within priority areas for conservation due to pre-existing valid rights, adjacent development or split estate issues, development should only occur in non-habitat areas, including all appurtenant structures, with an adequate buffer that is sufficient to preclude impacts on GRSG from noise and other human activities." (EIS p. 530).

Likewise, with respect to Impacts on GRSG from Infrastructure –

"The action alternatives are in agreement with the following conservation objectives/options identified in the Conservation Objectives Team Report specific to infrastructure:

1. Avoid development of infrastructure within priority areas for conservation (objective).
2. Avoid construction of these features in GRSG habitat, both within and outside of priority areas for conservation (option).
3. Restrictions limiting use of roads should be enforced (option)."

THUS, THE NTT REPORT AND BLM'S RECITAL OF THE RELEVANT SCIENCE ARE CONSISTENTLY SUPPORTIVE OF ALTERNATIVE B, OR AT A MINIMUM, A MODIFICATION OF ALTERNATIVE D AS PROPOSED BY US ON PAGES 13-15 HEREIN.

CRITIQUE OF BLM CONCLUSION

The EIS makes the following conclusionary statement on their support for Alternative D:

> "If allowing limited development within GRSG habitat on BLM administered and National Forest System lands would alleviate development pressures on other lands with less – stringent protections, management under Alternative D would have the greatest ability to reduce major threats to GRSG." (EIS p. 957 Emphasis added).

The "IF" condition for the conclusion is presented with no support or evidence that it does, would or is likely to actually occur. In fact, the EIS Report repeatedly states that the shifting outside of GRSG habitat as a result of specific regulatory limitations within priority habitat "may be negligible or it could vary" (See EIS p. 774). "Because these alterations cannot be quantified at present, it is not possible to estimate the degree to which Alternative D would result in a defacto limit on new leasing." (See EIS p. 634) "Exact assessment of the impact of these restrictions on access to new or future leases sufficient to preclude or significantly impede development is not possible." (EIS p. 630).

"For all these types of impacts it is impossible to state with certainty in this EIS the degree to which they would result in adverse impacts…These considerations, along with potential advances in technology, changes in economics…and geopolitical factors are likely to profoundly affect how each alternative analyzed in this EIS impacts oil and gas leasing and development for the foreseeable future." (EIS p. 621). Nowhere in the EIS is there any evidence or scientific support for BLM's conditional assumption on the impact of regulation to move development to less-regulated or non-regulated areas. It is merely a hypothetical assumption with no support or justification.

There are a multitude of factors that impact site specific oil and gas development. BLM has presented no data, studies or science to support their conclusion that "allowing limited development within GRSG – administered lands would alleviate development pressures on other lands with less – stringent protections." For example, the EIS states on pg. 799 "There is no way to know how, where and when RMP – projected development would occur within the KFO, and actual development would be highly dependent on the site-specific factors of accessibility, actual mineral potential, and other resource concerns for existing MZ leases and non-MZ mineral Lands." Likewise, on p. 895 the EIS states "The analysis of quantitative impacts of management alternatives affecting oil and gas development on federal lands assumes that operators who are unable to drill on federal lands would not access the same oil and gas from nearby private or state lands."

Taken to its logical conclusion, this conclusionary statement of the BLM in support of Alternative D would argue for allowing unlimited development within GRSG administered lands so long as BLM restrictions were marginally greater than unspecified lands with less – stringent protections. Obviously, this unsupported statement would justify lowest common denominator regulation and protection of sage grouse. Also, it ignores the substantial private efforts, as well as the efforts of other governmental agencies, to protect the sage grouse such that shifting of activities would not occur.

NEWEST DELINEATION OF PPH AND PGH

The BLM National Greater Sage-Grouse Land Use Planning Strategy provides that the BLM State offices will be responsible for coordinating with the NOC "to use the newest delineation of PPH and PGH" which have been identified in coordination with CPW. "The current delineations of GRSG habitat may be refined in collaboration with Colorado Parks and Wildlife…as additional information is gained and data is refined regarding GRSG habitats and habitat use." EIS pp. xxxi-xxxii.

The attached Exhibit A presents the latest published mapping of CPW and BLM staff applicable to our ranch. We believe the latest data and information based on the "on

the ground" observations substantiate that the areas marked PGH #1, PGH#2, PGH #3 and PGH #4 in the Holloran Letter should be designated PPH rather than PGH. See Holloran Letter Exhibit A; Tim Thomson memo and response of CPW and mapping prepared by CPW attached as Exhibit D.

Respectfully submitted,

APPENDIX A
HOLLORAN LETTER

WYOMING WILDLIFE
— CONSULTANTS, LLC —

NEPA Coordinator
Bureau of Land Management, Northwest Colorado District
2815 H Road
Grand Junction, CO 81506
November 26, 2013

To Whom It May Concern:

I am a Principal and the Senior Ecologist with Wyoming Wildlife Consultant, LLC. I have served as principal investigator, field supervisor, and/or research collaborator on research projects addressing various aspects of greater sage-grouse, sagebrush ecosystem, and sagebrush-obligate wildlife species ecology and management since 1996. My research emphasis has included: greater sage-grouse ecology, greater sage-grouse population response to energy development, livestock grazing and greater sage-grouse habitat suitability, habitat management planning to mitigate greater sage-grouse population declines, and sagebrush rangeland function, health and management. A copy of my Vitae is attached for reference.

I made numerous site visits to Pinto Valley Ranch located in Grand County, Colorado since 2011, and these visits gave me the opportunity to view the sage-grouse habitats on the ranch. I designed and oversaw the implementation of a field survey with the objective of determining sagebrush habitats occupied by sage-grouse on Pinto Valley Ranch. I discussed the sage-grouse habitats, sage-grouse habitat designations, and extant information and data concerning sage-grouse on Pinto Valley Ranch with employees of Colorado Parks and Wildlife. Given these efforts, it is my opinion that: Pinto Valley Ranch provides habitats across all seasons (nesting, early and late brood-rearing, summer and winter [including severe winter]) for a resident sage-grouse population; substantially all of the sagebrush-dominated areas of Pinto Valley Ranch are used by sage-grouse; high elevation habitats on Pinto Valley Ranch are used by sage-grouse for late brood-rearing and summer; and irrigated hay meadows are used by sage-grouse for late brood-rearing and summer and may be used as connectivity corridors among leks and other critical habitats (e.g., breeding and severe winter range).

In this letter I address 4 overriding concerns I have regarding the Northwest Colorado greater sage-grouse Draft Land Use Plan Amendment and Environmental Impact Statement (referred to as the EIS from here-on):

1. The designation of habitats that should be considered Preliminary Priority Habitats (PPH) instead of Preliminary General Habitats (PGH) in certain areas in and near Pinto Valley Ranch;
2. The minimal attention and consideration of the importance of population connectivity;
3. Adopting of a 5% surface disturbance threshold in the preferred alternative as it compares to the 3% threshold supported in the National Technical Team (NTT) report as well as in the Kremmling Field Office Draft Resource Management Plan (2011); and
4. The administrative flexibility and subjectivity to grant exceptions, waivers and modifications built into the preferred alternative which negates the regulatory mechanisms presented in the preferred alternative thereby making them inadequate.

1. The figure below is a copy of the BLM's map set out in Appendix B Figure 1-4 of the Sage-Grouse EIS of PPH (orangish/pinkish color) and PGH (green) in Middle Park, Colorado enlarged to the area north and west of the intersection of Highway 40 and Highway 134 and encompassing Pinto Valley

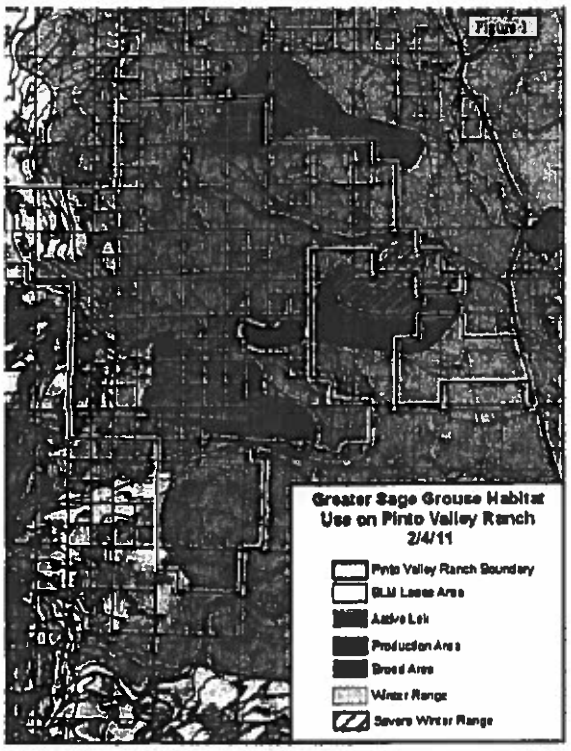
Ranch; the reservoir in the lower third of the image is Hinman Reservoir and the black square is a known active sage-grouse lek. I added the numbers to the PGH patches for ease of discussion.

I was able to discern from information presented by the Colorado Parks and Wildlife (CPW) on the website:
http://wildlife.state.co.us/SiteCollectionDocuments/DOW/Maps/WildlifeSpecies/Birds/GrSG_PPH_PGH_20120309_Final.pdf that the BLM used the following information to identify PPH and PGH:

1. Breeding, summer and winter habitat models developed at state-wide spatial scales from occurrence data; models are presented in Rice, M. B., A. D. Apa, M. L. Phillips, J. H. Gammonley, B. B. Petch, and K. Eichhoff. 2013. Analysis of regional species distribution models based on radio-telemetry datasets from multiple small-scale studies. Journal of Wildlife Management 77:821-831; and
2. Production Area and Occupied Range maps maintained by the CPW.

I fully support the BLM's approach of using data-derived models as the basis for identifying suitable sage-grouse habitats. I also fully agree with the BLM's use of extant production area and seasonal range maps as site-specific knowledge important for verifying and "tweaking" modeled estimates of habitat suitability. The use of localized information to ensure that statewide projections accurately reflect conditions at smaller spatial scales is an extremely important step and I applaud the BLM for recognizing this.

However, the verification step of identifying PPH does not appear to have been fully vetted on certain portions of Pinto Valley Ranch and the habitat immediately adjacent to the ranch. Below is again a figure centered on Pinto Valley Ranch in Middle Park, CO; the active lek shown in red in the following figure is the same lek identified by the black box in the first figure I present. The sage-grouse seasonal ranges depicted in the figure were identified and mapped by CPW.



A comparison of the areas identified as PGH in the first figure I present with this figure highlights several inconsistencies. Portions of PGH #2 and #3 are identified by CPW as severe winter range, winter range, and a brood-rearing area. Portions of PGH #1 are identified by CPW as winter range and a brood-rearing area. All of the PGH highlighted (PGH #1-4) in the figure is identified by CPW as a production area. In support, the field surveys conducted on Pinto Valley Ranch established sage-grouse use of PGH #1 (the other PGH habitats identified in the figure were not surveyed).

As I have previously stated in documents submitted to the BLM, surveys undertaken on Pinto Valley Ranch corroborate CPW's contention that the sagebrush-dominated areas on the ranch are important for sage-grouse. Pinto Valley Ranch provides a critical mix of intact sage-grouse nesting, early and late brood-rearing, summer and winter (including severe winter) ranges. Oil and gas exploration and development on or near Pinto Valley Ranch is likely to either directly (e.g., surface disturbance) or indirectly (e.g., sage-grouse avoidance of infrastructure) adversely modify and destroy critical sage-grouse habitat resulting in reduced lek attendance and persistence, nesting and winter habitat use, chick productivity and adult survival. Therefore, based on the methodology used by the BLM as supported by information maintained by CPW and my analysis of the habitats on Pinto Valley Ranch, the areas shaded in green as PGH on the BLM's map are more accurately PPH, and should be designated as such.

In the preferred alternative D, a No Surface Occupancy (NSO) designation is put in place for all PPH for which the minerals have not been leased. This establishes (as is pointed out in the EIS) that minerals underlying PPH will need to be accessed directionally from infrastructure placed in PGH or in unoccupied habitat. As mitigation, this infrastructure will be subjected to timing limitations. The research is unequivocal that energy development of non-renewable reserves (e.g., gas and oil) is detrimental to sage-grouse, with most research suggesting an impact to at least 4 miles. The research is also unequivocal that implementing timing limitations including those referenced in the EIS are not an effective means of minimizing impacts of energy development to sage-grouse (see Manier, D. J., Wood, D. J. A., Bowen, Z. H., Donovan, R. M., Holloran, M. J., Juliusson, L. M., Mayne, K. S., Oyler-McCance,

S. J., Quamen, F. R., Saher, D. J., and Titolo, A. J. 2013. Summary of science, activities, programs, and policies that influence the rangewide conservation of Greater Sage-Grouse (*Centrocercus urophasianus*): U.S. Geological Survey Open-File Report 2013–1098, 170 p., http://pubs.usgs.gov/of/2013/1098/ for review of literature). Additionally, the NTT report specifically states: "We do not include timing restrictions on construction and drilling during the breeding season because they do not prevent impacts of infrastructure (e.g., avoidance, mortality) at other times of the year, during the production phase, or in other seasonal habitats that are crucial for population persistence" (page 21 of 74). The PGH designated in the figures presented above is all within 4 miles of the active lek identified in the figures, and the mitigation measures outlined in the preferred alternative are ineffective. Therefore, energy development occurring on that PGH to access minerals under PPH will negatively influence the sage-grouse population breeding on the lek. There are only 19 active leks in Middle Park, with 12 of those leks being on private lands. According to biologists with CPW, the Middle Park sage-grouse population is one of only two populations in Colorado not currently influenced by oil and gas development. Therefore, impacts to the sage-grouse population using the lek identified above would have major adverse consequences on the conservation of the Middle Park and Northwest Colorado sage-grouse population.

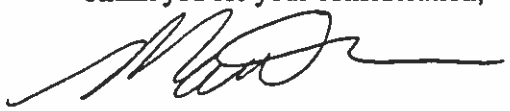
2. A recent publication investigating connectivity between sage-grouse leks in western portions of the species range concluded that: (1) connectivity among leks (populations) is important for species persistence; and (2) peripheral populations are often connected by limited numbers of corridors, and habitat loss or human development that eliminates habitat in these corridors could result in extirpation of these populations from regional, stochastic events (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. Ecology and Evolution. doi: 10.1002/ece3.557). Anthropogenic development in the PGH habitats on and near Pinto Valley Ranch may eliminate movement corridors used by sage-grouse to move to and from habitats on the Ranch. Elimination of these corridors could effectively isolate the population which would increase the probability of extirpation of this population which in turn would have major adverse consequences on the conservation of the Middle Park and Northwest Colorado sage-grouse populations as a whole.

Based on the foregoing analyses it is important to prohibit energy development on Pinto Valley Ranch and nearby areas to the east and west of the ranch to maintain the unique and irreplaceable intact sage-grouse habitats the ranch provides, maintain travel corridors to and from the habitats on the ranch, and thereby maintain the population of sage-grouse established by the CPW as critically important for sustaining populations in Colorado. In order for the regulatory mechanisms to be adequate and pass the scrutiny of the USFWS, the area of PPH should be expanded as proposed above to afford the entire area the no surface occupancy protections as set forth in Alternative D. If habitat designations cannot be changed, the protections set forth in Alternative D should be modified to extend no leasing provisions to PPH as set forth in Alternative B and the NTT report; and the protections set forth in Alternative D should be significantly strengthened by insuring that regulatory mechanisms are not negated by the administrative subjectivity as discussed below.

3. The expert opinion of the NTT report concluded that a 3% surface disturbance threshold was necessary to maintain sage-grouse populations. Additionally, the Kremmling Field Office Draft Resource Management Plan (KFO DRMP) established that a "3 percent surface disturbance threshold will be maintained within sage-grouse core areas" (page 4-283). Given the MOU as presented in Appendix A of the EIS as well as the KFO DRMP, the onus is on the authors of the EIS to justify and support any deviation from recommendations made by the NTT. The authors of the EIS present no scientific justification for deviating from the 3% threshold, and no scientific literature exists that I am aware of justifying this deviation. Therefore the surface disturbance threshold should be maintained at 3% within the preferred alternative.

4. The authors of the EIS repeatedly emphasize throughout the document that the preferred alternative includes broad administrative subjectivity to grant exceptions and make decisions based on site-specific or local conditions; this subjectivity is not a major part of any of the other pertinent alternatives. The following statements in the EIS are examples of the excessive flexibility and subjectivity built into Alternative D: "it is not possible to quantify the reductions [in development] because the flexibility built into this alternative [preferred alternative] would be highly variable..." (page 646) and "because this alternative [D] would apply more widely but with less stringent restrictions and greater flexibility to approve projects, the number of acres potentially affected is not a meaningful number..." (page 638). In Appendix F of the EIS and specific to how "prioritization" was used on page F-6, the NTT report (and as such Alternative B) states: "management priorities will need to be shifted and balanced to maximize benefits to sage-grouse habitats and populations in priority habitats" whereas the preferred alternative presents the following for prioritization: "Consider GRSG [greater sage-grouse] habitat requirements in conjunction with all resource values managed by the BLM, and give preference to GRSG habitat unless site-specific circumstances warrant an exemption." The repeated use of the *flexibility* language establishes a broad subjective administrative discretion, modification and limitation to the preferred alternative. Subjectivity undermines the scientific-credibility and potential efficacy of actions suggested under the preferred alternative. Although it is more scientifically valid to eliminate the administrative subjectivity in PPH, if flexibility is allowed under the preferred alternative, specific and inflexible sidebars based on documented scientific analysis of when exemptions can be considered need to be established in the EIS. In my opinion, the administrative subjectivity to grant exceptions, waivers and modifications included in the preferred alternative negates the protections and regulatory mechanisms included in this alternative thereby making them, and the alternative, inadequate.

Thank you for your consideration,



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Matthew J. Holloran
Vitae
January 2013

PERSONAL

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EDUCATION

2005	Ph.D., Zoology and Physiology with Wildlife Management concentration, University of Wyoming, Laramie, WY, USA. Dissertation: *Greater sage-grouse* (Centrocercus urophasianus) *population response to natural gas field development in western Wyoming*. Dr. Stanley H. Anderson, advisor.
1999	M.S., Zoology and Physiology, University of Wyoming, Laramie, WY, USA. Thesis: *Sage grouse* (Centrocercus urophasianus) *seasonal habitat use near Casper, Wyoming*. Dr. Stanley H. Anderson, advisor.
1991	B.S., Biology, Colorado College, Colorado Springs, CO, USA.

RECENT POSITIONS HELD

2013 – present	Chief Scientist, Wildlife Management Research Support (a fiscally-sponsored nonprofit)
2005 – present	Principal and Senior Ecologist, Wyoming Wildlife Consultants, LLC.
2003 – 2005	Doctoral Researcher, Wyoming Cooperative Fish and Wildlife Research Unit; with Dr. Stanley H. Anderson, University of Wyoming.
1999 – 2003	Research Scientist, Wyoming Cooperative Fish and Wildlife Research Unit; University of Wyoming.

PROFESSIONAL EXPERIENCE

2005 – present: **Principal and Senior Ecologist; Wyoming Wildlife Consultants, LLC.**
Partner: John Dahlke; Principal Wyoming Wildlife Consultants LLC; 207 West Pine Street, Pinedale, WY 82941; (307) 367-2765.

Project Specific Information:

- Principal investigator: *Holistic greater sage-grouse management on a ranch destined for wind development.* Project designed to investigate the following objectives: (1) develop quantified predictions of population-level response of sage-grouse to wind energy developments; and (2) develop quantified and detailed wildlife habitat suitability focused state-and-transition models for the ecological sites occurring on the Pathfinder Ranch. ($847,900)
- Co-Principal investigator: *Greater sage-grouse telemetry study for the Simpson Ridge Wind Resource Area; Carbon County, Wyoming.* Project designed to compile pre-treatment sage-grouse information necessary to effectively document sage-grouse population response to wind development. ($621,260)
- Co-Principal investigator: *Documenting structural and spatial characteristics of sage-grouse nesting and early brood-rearing habitat suitability at selected ecological sites in the Wyoming Basin.* Project designed to correlate ecological site information with habitat requirements of sage-grouse. ($317, 590)
- Principal investigator: *Greater sage-grouse winter habitat selection in the Upper Green River Basin, Wyoming.* Project to determine whether natural gas development influenced habitat selection of wintering greater sage-grouse in southwestern Wyoming. Probability-of-occurrence differences between distinct patches of habitat relative to the proximity of those patches to natural gas field infrastructure being investigated. (≈$800,000)
- Initiator: *Identifying habitats for greater sage-grouse population persistence on Atlantic Rim, Rawlins, Wyoming: A process of protecting specific areas within a developing natural gas field critical for population*

sustainability in an adaptive management framework. Study designed to identify source breeding season habitats through seasonal risk-assessment modeling and to generate areas-of-critical-conservation-concern maps based on limiting seasonal habitats, risk assessment, multi-seasonal occurrence, and seasonal juxtaposition. (*Study being conducted by University of Wyoming*) ($75,000)

- Principal investigator: *Habitat mitigation planning for greater sage-grouse in the Upper Green River Basin, Wyoming.* Project designed to compile the wildlife and vegetative information, and establish the landowner contacts required to effectively prepare allotment scale habitat management plans focused on enhancing areas for greater sage-grouse. ($478,000)
- Principal investigator: *Recruitment by greater sage-grouse in association with natural gas development in western Wyoming.* Study designed to establish the reaction of yearling greater sage-grouse males and females to natural gas field development. (*Study a continuation of a master's project (University of Wyoming) completed in 2006, and completed August 2007*)
- Principal investigator: *Pygmy rabbit block survey of EnCana Oil & Gas (USA) Inc. proposed 2007 drilling locations in the Jonah Infill Drilling Project Area.* Project identified habitats utilized by pygmy rabbits within the Jonah natural gas field in southwestern Wyoming. (*Project completed April 2007*)
- Principal investigator: *EnCana offsite habitat manipulation project at Arambel Reservoir.* (*Project completed February 2007*)

2002 – 2005: **Ph.D. Candidate; University of Wyoming.**
Advisor: Dr. Stanley H. Anderson (deceased); Leader, Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, Laramie, WY 82071; Dr. Matt Kaufman (*current contact*), (307) 766-5415.

Doctoral researcher for the study: *Greater sage-grouse* (Centrocercus urophasianus) *population response to natural gas field development in western Wyoming.* Determine if and how the development of natural gas resources was influencing greater sage-grouse populations in the upper Green River Basin of southwestern Wyoming.

1999 – 2003: **Research Scientist; Wyoming Cooperative Fish and Wildlife Research Unit.**
Supervisor: Dr. Stanley H. Anderson (deceased); Leader, Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, Laramie, WY 82071; Dr. Matt Kaufman (*current contact*), (307) 766-5415.

Project Specific Information:

- Initiated the study: *Grazing system and linear corridor influences on greater sage-grouse* (Centrocercus urophasianus) *habitat selection and productivity.* Study determined the effects of differing cattle grazing practices on sagebrush dominated landscapes as they relate to greater sage-grouse seasonal habitat selection and productivity. (*A master's student (University of Wyoming) assumed the study in 2002; the study was completed August 2004*)
- Initiated the study: *Sage-grouse* (Centrocercus urophasianus) *use of different-aged burns and the effects of coyote control in southwestern Wyoming.* Study determined temporal effects to greater sage-grouse survival and productivity of prescribed fire by quantifying use of different aged sagebrush burns. (*A master's student (University of Wyoming) assumed the study in 2001; the study was completed December 2003*)
- Principal investigator for the study: *Greater sage-grouse seasonal habitat selection and survival in Jackson Hole, Wyoming.* Study documented greater sage-grouse seasonal habitat selection and survival, identified limiting seasonal range(s), and quantified habitat conditions associated with sustainable and increasing productivity. (*Study completed August 2004*)

RECENT PEER-REVIEWED PUBLICATIONS

Holloran, M. J., B. C. Fedy, and J. Dahlke. *In Review.* Winter habitat selection of greater sage-grouse relative to activity levels at natural gas well pads. Journal of Wildlife Management.

LeBeau, C. W., J. L. Beck, G. D. Johnson, and M. J. **Holloran**. *In Review.* Short-term impacts of wind energy development on greater sage-grouse fitness parameters. Journal of Wildlife Management.

Kirol, C. P., J. L. Beck, S. V. Huzurbazar, M. J. **Holloran**, and S. N. Miller. *In Review.* Identifying greater sage-grouse source and sink habitats for conservation planning in an energy development landscape. Ecological Applications.

Johnson, D. H., M. J. **Holloran**, J. W. Connelly, S. E. Hanser, C. L. Amundson, and S. T. Knick. 2011. Influences of environmental and anthropogenic features on greater sage-grouse populations, 1997-2007. pp.

407-450 in S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkeley, CA, USA.

Naugle, D. E., K. E. Doherty, B. L. Walker, H. E. Copeland, M. J. **Holloran**, and J. D. Tack. 2011. Sage-grouse and cumulative impacts of energy development. pp. 55-70 in D. E. Naugle (editor). Energy development and wildlife conservation in western North America. Island Press, Washington, DC, USA.

Naugle, D. E., K. E. Doherty, B. L. Walker, M. J. **Holloran**, and H. E. Copeland. 2011. Energy development and greater sage-grouse. pp. 489-503 in S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkeley, CA, USA.

Holloran, M. J., R. C. Kaiser, and W. A. Hubert. 2010. Yearling Greater Sage-grouse Response to Energy Development in Wyoming. Journal Wildlife Management 74:65-72.

Kiesecker, J. M., H. Copeland, A. Pocewicz, N. Nibbelink, B. McKenney, J. Dahlke, M. **Holloran**, and D. Stroud. 2009. A framework for implementing biodiversity offsets: selecting sites and determining scale. BioScience 59:77-84.

Thompson, K. M., M. J. **Holloran**, S. J. Slater, J. L. Kuipers, and S. H. Anderson. 2006. Early brood-rearing habitat use and productivity of greater sage-grouse in Wyoming. Western North American Naturalist 66:332-342.

Holloran, M. J., and S. H. Anderson. 2005. Spatial distribution of greater sage-grouse nests in relatively contiguous sagebrush habitats. Condor 107:742-752.

Holloran, M. J., and S. H. Anderson. 2005. Greater sage-grouse population response to natural gas development in western Wyoming: are regional populations affected by relatively localized disturbances? Transactions North American Wildlife and Natural Resources Conference 70:160-170.

Holloran, M. J., B. J. Heath, A. G. Lyon, S. J. Slater, J. L. Kuipers, and S. H. Anderson. 2005. Greater sage-grouse nesting habitat selection and success in Wyoming. Journal Wildlife Management 69:638-649.

Holloran, M. J., and S. H. Anderson. 2003. Direct identification of northern sage-grouse, Centrocercus urophasianus, nest predators using remote sensing cameras. Canadian Field-Naturalist 117:308-310.

GROUP INVOLVEMENT

- Wyoming statewide greater sage-grouse working group (*Wyoming greater sage-grouse conservation plan*).
- Wyoming Game and Fish Department greater sage-grouse management and livestock grazing technical team.
- Wyoming Game and Fish Department greater sage-grouse working group.
- Wyoming State Governor's greater sage-grouse conservation task force.
- Wyoming Chapter of The Wildlife Society (President)

References Available upon Request

APPENDIX B
ZOGG LETTER

LAW OFFICE OF PAUL ZOGG

VIA OVERNIGHT FEDERAL EXPRESS DELIVERY AND VIA EMAIL TO BLM_CO_NW_SAGE_GROUSE@BLM.GOV

Nov. 26, 2013

Bureau of Land Management
Northwest Colorado District
Re: NEPA/Greater Sage Grouse EIS
2815 H Road
Grand Junction, CO 81506

RE: LEGAL COMMENTS ON BEHALF OF OWNERS OF PINTO VALLEY RANCH, GRAND COUNTY ON DRAFT NORTHWEST COLORADO GREATER SAGE GROUSE LUPA/EIS

Dear BLM:

I am writing on behalf of the owners of Pinto Valley Ranch, ("the Ranch"), in Grand County to provide official legal comments on the Draft Northwest Colorado Greater Sage Grouse Land Use Plan Amendment/Environmental Impact Statement ("LUPA/EIS").

Thank you for this opportunity to comment.

I. THE RANCH

By way of background, the Ranch is owned by Wingspread West LLC and related entities. BLM owns some of the mineral rights beneath the Ranch.

The Ranch was acquired because of its unspoiled scenic beauty, tranquility, tremendous wildlife, creeks, springs and other water resources. Over the past seven years, the owners have expended considerable time and resources, with the assistance of the National Resource Conservation Service, the U.S. Fish and Wildlife Service and Colorado Parks and Wildlife to revitalize the ranch.

The Ranch contains prime wetlands, groundwater springs, steep slopes, prime sage grouse habitat, key

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habitat for elk, mule deer, pronghorn antelope and numerous other wildlife, and preserves an important migration route used by elk to get to lower ground each year. In addition, the Ranch contains significant paleontological resources and endangered plant species.

The Ranch has been very active in working with federal and state agencies on programs for the protection of sage grouse. These include projects with the Natural Resources Conservation Service, the U.S. Fish and Wildlife Service and Colorado Parks and Wildlife for sage grouse habitat improvement. In addition, they have conducted substantial private efforts to conserve sage grouse.

The Ranch is very concerned that these personal efforts not be nullified or undermined by inappropriate BLM management actions with respect to its mineral rights or on adjacent lands that fail to protect the sage grouse in light of the best available scientific understandings and data.

These private conservation efforts are especially significant in that sage grouse populations in Grand County, as elsewhere, have been declining.

The DEIS points out that BLM manages approximately 50 percent of sage grouse habitat, and even less than that in Grand County. DEIS at xxi, also Table 1, ES-1, p.246 (29 percent of Middle Park population). Thus, the cooperation of many private landowners in the survival and conservation of the species will likely be essential.

Accordingly, where private landowners such as those here are making efforts to preserve the species, BLM, if it is truly serious about sage grouse protection, must foster and encourage those efforts.

Sadly, however, by adopting Alternative D as the preferred alternative, BLM is proposing to actually introduce oil and gas leasing into the Pinto Valley Ranch and contiguous BLM parcels where drilling has not been historically present and undermine the efforts of the Ranch owners, along with those of three Federal and State governmental agencies, to preserve and enhance the sage grouse habitat on their property.

II. LEGAL DEFICIENCIES IN EIS AND PREFERRED ALTERNATIVE

Thank you for your considerable efforts in preparing the Draft LUPA/EIS. However, the owners of the Ranch are extremely disappointed with BLM's selection of Alternative D as the Preferred Alternative.

In particular, they strongly object to BLM's failure to follow the recommendations of the Report on National Greater Sage-Grouse Conservation Measures produced by the Sage Grouse National Technical Team on Dec. 21, 2011 ("Tech Team") pertaining to oil and gas development which, as the DEIS concedes, is considered the greatest threat to Greater Sage Grouse in this area. The result is reasonably likely to lead to the actual listing of Greater Sage Grouse as an endangered or threatened species by the U.S. Fish and Wildlife Service.

On more considered review, it appears that BLM, should it adopt Alternative D based on the EIS as it now stands, would be in violation of both the National Environmental Policy Act ("NEPA") and the Federal Land Policy and Management Act ("FLPMA"), its implementing regulations, including the agency's "sensitive species" regulations, and BLM sage grouse directives and policies.

Generally speaking, the Draft EIS and Preferred Alternative fail to disclose the reasonably foreseeable likelihood and actual impacts of listing of the Greater Sage Grouse as either endangered or threatened under the Endangered Species Act; fail to use and rely upon the best available science that BLM has; and fail to consider key alternatives that would protect the sage grouse while avoiding unjustified impacts on other resources.

We respectfully request that these deficiencies be corrected prior to final action based on the LUPA/EIS, and that Alternative B be adopted. In the alternative, we request that at a minimum, the Tech Team's major recommendations for oil and gas be adopted and followed, i.e., (1) no oil and gas leasing on Preliminary Priority Habitat and (2) a 3 percent surface disturbance limitation.

The owners in their individual comments also propose that in the event Alternative B based on the Tech Team Report is not adopted, a modification of the ill-advised Preferred Alternative should be adopted.

III. VIOLATIONS OF NEPA

The National Environmental Policy Act, 42 U.S.C. §4321 *et seq.*, "prescribes the necessary process by which federal agencies must 'take a hard look' at the environmental consequences of the proposed courses of action." *Pennaco Energy, Inc., v. U.S. Dep't. of the Interior,* 377 F.3d 1147, 1150 (10th Cir. 2004).

Under NEPA, an EIS "shall provide full and fair discussion of significant environmental impacts" to inform both agency decision-makers and the public. 40 C.F.R. §1502.2. In carrying out this mandate, the EIS shall disclose both direct effects of a proposed action and indirect effects that are still reasonably foreseeable. 40 C.F.R. 1502.16 1508.8. BLM's own regulations focus on the importance of disclosure of reasonably foreseeable future actions. 43 C.F.R. §46.30.

"It must be remembered that the basic thrust of an agency's responsibilities under NEPA is to predict the environmental effects of proposed action before the action is taken and those effects fully known. Reasonable forecasting and speculation is thus implicit in NEPA, and we must reject any attempt by agencies to shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as 'crystal ball inquiry.'" *Scientists' Institute for Public Information, Inc. v. Atomic Energy Commission,* 481 F.2d 1079, 1092 (D.C.Cir. 1973).

A. Failure to Disclose Listing of Sage Grouse and the Practical Consequences

Here, the Draft EIS fails significantly in failing to disclose the likelihood that Alternatives A (current management) and D (preferred alternative) will lead to the U.S. Fish and Wildlife Service listing the Greater Sage Grouse as an endangered, or at least threatened, species under the Endangered Species Act, and the practical consequences of such a listing.

The impacts are of course reasonably foreseeable. BLM's Tech Team report, itself, points out the measures that are "needed" to protect and foster the Greater Sage Grouse, but Alternative D declines to adopt them. It points

out that measures Alternative D adopts - like leasing priority habitat lands for oil and gas development and controlling impacts through stipulations -- even no surface occupancy stipulations - are likely to be ineffective. The Tech Team Report is hereby incorporated by reference into these comments.

The report states very clearly that:

> "Past BLM conservation measures have focused on 0.25 mile No Surface Occupancy (NSO) buffers around leks, and timing stipulations applied to 0.6 mile buffers around leks to protect both breeding and nesting activities. Given impacts of large scale disturbances described above that occur across seasons and impact all demographic rates, applying NSO or other buffers around leks at any distance is **unlikely to be effective.**" (p.20) (emphasis supplied)

The Tech Team was clear in its recommendations:

> "...we recommend excluding mineral development and other large scale disturbances from priority habits where possible... the conservation strategy most likely to meet the objective of maintaining or increasing sage-grouse distribution and abundance is to exclude energy development and other large scale disturbances from priority habitats, and where valid existing rights exist, minimize those impacts by keeping disturbances to 1 per section with direct surface disturbance impacts held to 3% of the area or less." (p.21)

In its 12-Month Findings on Listing of the Greater Sage Grouse, the Fish and Wildlife Service made the same point:

> "Stipulations commonly applied by BLM to oil and gas leases and permits do not adequately address the scope of negative influences of development on sage-grouse (Holloran 2005, pp. 57-60, Walker 2007, pp. 2651; see discussion under Factor A), with the exception of the new 2010 IM issued by the BLM in Wyoming (see discussion

> below). In addition, BLM's ability to waive, modify, and allow exceptions to those stipulations without regard to sage-grouse persistence further limits the adequacy of those regulatory mechanisms in alleviating the negative impacts to the species associated with energy development." 55 Fed.Reg. 13910, 13979 (March 23, 2010).

Sadly, the Draft EIS, which concedes that oil and gas development is the greatest threat to Greater Sage Grouse in this region, instead proposes to adopt the old tried and failed policies like leasing of oil and gas minerals with stipulations that the Tech Team specifically found would be "ineffective."

Alternative D also fails to adopt the 1 per section/3 percent disturbance limitation. The 5 percent caps discussed in the DEIS could allow 60 percent more surface impact than the Tech Team's proposed 3 percent limitation, as the DEIS is forced to admit. (p.638).

Matt Holloran, principal and senior ecologist at Wyoming Wildlife Consultants LLC who has studied and worked with the greater sage grouse on Pinto Valley Ranch and has authored studies on the Greater Sage Grouse, has reviewed the DEIS and notes that:

> "The authors of the EIS present no scientific justification for deviating from the 3% threshold, and no scientific literature exists that I am aware of justifying this deviation." (See Attachment A.)

This is especially significant in light of a recent study concluding that 99 percent of active sage grouse leks are located within a three mile radius of land with only three percent of land categorized as developed. Kruck, S.T., Hansen, S.E. and Preston, K.L., *Modeling Minimum Requirements for Distribution of Greater Sage Grouse Leks: Implications for Population Connectivity Across Their Western Range,* 3 *Ecology and Evolution,* Issue 6, pp. 1539-51 (2013).

Table 2.6 at page 188 of the DEIS makes this point very clear. The areas closed to fluid mineral leasing

remain the same from existing management Alternative A to the Preferred Alternative D. This treatment for what the Fish and Wildlife Service considers the Highest Importance Allieviated Threat (namely, oil and gas) shows the likelihood that the preferred Alternative D would only lead to listing of the species.

The net effect of adopting ineffective mitigation over the entire northwest sector of Colorado affecting 8.6 million acres of land would be significant and would likely tip this perilously threatened species to actual listing by the Fish & Wildlife Service.

BLM offers no explanation for rejecting the Tech Team's recommendation, but merely describes Alternative D as "adapting" the team's recommendations to Northwest Colorado. (DEIS at xv.) It is a triumph of misstatement to turn *rejection* of the Tech Team's recommendations into a mere "adaptation" of them. NEPA requires more honest and complete disclosure.

The consequences of such a listing would be significant, including, for example, additional restrictions on oil and gas development, recreation and ranching on both public and private land due to prohibitions on "taking" and the establishment of "critical habitat." These new limitations would be federally based and not result from the ordinary regulatory agencies such as the BLM, Colorado Oil and Gas Conservation Commission or local governments.

Even habitat alterations --- such as farming and related activities - could result in landowners facing civil or criminal charges under the Endangered Species Act since these alterations may harass or annoy and actually kill Greater Sage Grouse.

By failing to disclose these likely impacts, the BLM paints an unduly rosy picture of Alternative D as the preferred alternative. This kind of practice is a plain violation of NEPA.

B. Failure to Disclose Exceptions Create Unlimited Ability to Undermine Stipulations

The EIS emphasizes No Surface Occupancy stipulations as the primary justification for allowing oil and gas

leasing in important sage grouse habitat areas under the preferred Alternative D.

However, it is only in Appendix E, at pages E-2 and E-3, that BLM discloses that No Surface Occupancy stipulations are subject to exception, waivers and modification in the discretion of local officers with only limited vague standards for the protection of sage grouse.

For example, while Appendix E does establish vague and ineffective criteria for an "exception" to the No Surface Occupancy stipulation under Alternative D, no criteria are specified for waivers or modifications. (E-5). Thus, even the limited criteria for exceptions are effectively illusory since they may be avoided by a waiver or modification.

Indeed, none of the four alternatives considered in the DEIS establishes comprehensive criteria limiting waiver, exceptions and modification for the protection of sage grouse - and thus no alternative closes this critical loophole.

Indeed, such exceptions and modifications are likely to be sought in situations where sage grouse and its habitat are likely to be sacrificed or marginalized.

Without meaningful, detailed and comprehensive standards or criteria for the protection of sage grouse or its habitat, reliance on these NSO stipulations to project improved conditions for sage grouse is entirely arbitrary and capricious. For all the authors of this EIS know, in light of these open-ended vague and discretionary provisions, protection of sage grouse overall is highly likely to be undermined further. The grant of broad administrative discretion in the Appendix effectively eliminates whatever protections for the sage grouse can be found in the body of the EIS.

Wildlife consultant Holloran is concerned that the DEIS repeatedly emphasizes "broad administrative subjectivity to grant exceptions" to stipulations for the protection of sage grouse, which "undermines the scientific credibility and potential efficacy" of the stipulations." See Attachment A. He states:

> "In my opinion, the administrative subjectivity to grant exceptions, waivers and modifications included in the preferred alternative negates the protections and regulatory mechanisms included in this alternative thereby making them, and the alternative, inadequate."

The disclosure here is not adequate or fair as required under NEPA and CEQ guidelines. Burying an all important limitation on the mitigation prescribed in Appendix E outside the text of the EIS is intolerable and unreasonable. These significant qualifications and limitations on the most important mitigation planned for sage grouse with respect to oil and gas should be loudly emphasized and underlined in the Executive Summary, not buried in small print in an appendix.

The EIS is inadequate on this score.

C. Failure to Consider Reasonable Alternatives

Under NEPA, an agency must "rigorously explore and objectively evaluate all reasonable alternatives" to the proposed action. 40 C.F.R. §1502.14.

"The obligation to consider alternatives to the proposed action is at the heart of the NEPA process, and is 'operative even if the agency finds no significant environmental impact.' … In formulating an EA, an agency must 'study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.' 42 U.S.C. §4332(2)(E); 40 C.F.R. §1508.9(b)." *Dine Citizens Against Ruining Our Environment v. Klein,* 2010 WL 4284602 *13 (D.Colo. 2010). An agency may not "define the project so narrowly that it foreclose[s] a reasonable consideration of alternatives." *Id.*

Under BLM's NEPA regulations, the agency must consider a range of alternatives that cover "the full spectrum of reasonable alternatives, each of which must be rigorously explored and objectively evaluated." 43 C.F.R. §420(2)(c).

Here, the Draft LUPA/EIS does not contain sufficient variation and alternatives to permit reasoned understanding and evaluation of potential future courses of action.

1. Failure to Consider an Alternative with Specific Protections for Sage Grouse Linkage Corridors

The Draft EIS classifies Sage Grouse habitat in three categories, as explained at page xxiii and at §1.1.1. pp.1-2. These include Preliminary Priority Habitat ("PPH"), Preliminary General Habitat ("PGH"), Linkage/Connectivity Habitat and All Designated Habitat ("ADH"), which consists of all of the three previous categories.

Alternative A, the existing management, does not address these designations. But B, C, and D do. DEIS at xxxii-xxxiv. However, throughout the latter alternatives Linkage/Connectivity Habitat is treated only generally in a vague manner and as a minimal alternative.

Indeed, Alternatives B and D appear not to consider any conservation measures for linkage habitat at all. DEIS at xxxiii-xxxiv.

There is no scientific basis for excluding Linkage/Connectivity Habitat from protection or according it separate treatment. The Greater Sage Grouse's habitat must be considered as an ecological and scientific unit. See Knick, Hanser & Preston, "Modeling ecological minimum requirements for distribution of greater sage-grouse leks; implications for population connectivity across there Western range, U.S.A." (funded by U.S. Fish and Wildlife Service 2013, hereafter "USFWS Survey")(See Attachment B).

Given that linkage habitat is comparatively small at 295,800 acres compared to 2.4 million acres of PPH, this omission is not justified. DEIS at xxiii.

After reviewing the DEIS, wildlife consultant Holloran states that a problem is "[t]he minimal attention and consideration of the importance of population connectivity." See Attachment A.

The USFWS Survey emphasized the critical role of sage grouse population connectivity and concluded that "models developed from a general set of broad-scale, rangewide

variables often fail to capture critical environmental factors specific to local areas (Scott, et al 2002)." (Attachment B).

The Survey clearly and unequivocally emphasized the importance of sage grouse population connectivity -

> "Land and wildlife agencies currently are developing conservation actions for sage-grouse based on core or priority areas containing highest densities of breeding birds (Doherty et al. 2011). Less clear are land-use plans for regions outside of core areas that might be important for dispersal and gene flow. Species that have multiple interconnected populations are more likely to persist because risk of extirpation caused by regional events is confined to local populations; connectivity among populations ensures that recolonization can occur following local extirpation assuming that sufficient habitat remains (Thomas 1994; Hanski 1998). Populations within the interior portion of the sage-grouse range were highly interconnected. However, peripheral populations often were connected by habitat corridors only to one adjacent population. Human development or habitat loss that eliminates habitat in these corridors would further isolate those populations." Id at 1549
>
> "Our mapped corridors of habitat among populations provide an important step in designing conservation actions that facilitate dispersal and gene flow and reduce isolation and risk of extirpation." Id. (Attachment B).

BLM's own Tech Team Report also emphasized the importance of linkage/connectivity habitat, stating that:

> "It will be necessary to achieve the following sub-objectives for general habitat:
>
> "□ Quantify and delineate general habitat for capability to provide connectivity among priority areas (Knick and Hanser 2011).

> "□ Conserve, enhance or restore sage-grouse habitat and connectivity (Knick and Hanser 2011) to promote movement and genetic diversity, with emphasis on those habitats occupied by sage grouse…" (p.9)

BLM's Instruction Memorandum 2010-071 specifies that sage grouse "priority habitat" includes habitat "necessary to maintain range-wide connectivity." At page 1-2. See Attachment C.

Legally, the EIS fails to present an effective alternative that addresses Linkage/Connectivity Habitat with the kind of specific, protective measures necessary to ensure that the BLM Tech Team's recommendations for preservation of the species are implemented and achieved.

2. Failure to Consider an Alternative with Additional Protections in Areas of Low Oil and Gas Production, Such as Grand County, CO

The Draft EIS is also legally inadequate in that it treats all potential oil and gas lands as equivalent over 8.6 million acres of land in 10 counties, 5 BLM resource areas and one national forest and fails to distinguish between high production areas and low production areas like Grand County, CO.

To be more specific, Alternatives B and C apply "no leasing" designations to certain sage grouse habitat lands, whereas Alternative D would lease almost all sage grouse habitat lands and rely on stipulations for the protection of the grouse.

This kind of "all or nothing" approach, without regard to the likely oil and gas productivity of the lands involved, is not sanctioned by NEPA or BLM's regulations requiring a look at a "full spectrum" of alternatives.

The omission is significant. For example, in low oil and gas productivity areas, like Grand County for instance, the tradeoffs with oil and gas are less significant and may appropriately be dealt with by a "no leasing" designation at less cost to potential mineral development.

The DEIS recognizes that there are three major oil and gas basins in the region, none of them in Grand County. DEIS at 296.

If the only alternative considered for Grand County is to lump the county in with high productivity areas like Garfield County, for instance, BLM is not considering a "full spectrum" of alternatives, and is ignoring reasonable steps to mitigate the impacts of potential oil and gas development in a cost-efficient and sensible way.

This omission should be addressed in the Final EIS.

3. Failure to Consider an Alternative That Comprehensively Restricts and Limits Exceptions, Modifications or Waivers of Oil and Gas Stipulations

As the Tech Team pointed out, BLM's reliance on stipulations to protect the Greater Sage Grouse from oil and gas development is likely to be ineffective. Also, even the most restrictive stipulation is subject under BLM policy to "exceptions," "modifications" or "waivers" that undermine the imposition of a protective uniform policy.

As explained in Appendix E at E-2 and E-3, exceptions and modifications to stipulations may be authorized in the discretion of BLM's local officer with only limited specific standards for the protection of sage grouse or sage grouse habitat.

The Fish and Wildlife Service, in its 12-Month Findings, also pointed out specifically that: "…BLM's ability to waive, modify, and allow exceptions to those stipulations without regard to sage-grouse persistence further limits the adequacy of those regulatory mechanisms in alleviating the negative impacts to the species associated with energy development." 55 Fed.Reg. 13910, 13979 (March 23, 2010).

However, in the DEIS, the exceptions, modifications or waivers (Appx. E at E-2) vary somewhat between the alternatives and establish some criteria for waivers, exceptions and modifications. But none of the four alternatives comprehensively limits the use of waivers,

exceptions and modifications in specific ways that ensure that the greater sage grouse is protected.

For example, while Appendix E does establish vague criteria for an "exception" to the No Surface Occupancy stipulation under Alternative D, no such criteria are specified for waivers or modifications. (E-5). Thus, the criteria for exceptions are effectively illusory since they may be avoided by a waiver or modification.

Indeed, wildlife consultant Holloran describes the "administrative subjectivity" built into the preferred alternative as effectively "negating" the protections for sage grouse included in that alternative. Attachment A.

Moreover, none of the four alternatives considered in the DEIS establishes comprehensive criteria limiting waiver, exceptions and modification for the protection of sage grouse - and thus no alternative closes this critical loophole.

BLM's failure to consider variation and a "full spectrum" of alternatives with respect to exceptions, modifications and waivers violates NEPA and BLM's NEPA regulations.

This omission is especially significant in that the Preferred Alternative D relies on the old, failed policy of leasing almost every square inch of land, with mitigation left to be controlled by stipulations on the leases.

Ominously, the DEIS speaks of "flexibility" with Alternative D that would lead to a "minimal" impact on oil and gas development. (DEIS p.638). As consultant Holloran notes, "This repeated use of the flexibility language establishes a broad subjective administrative discretion, modification and limitation to the preferred alternative." Attachment A.

It also suggests, by turns, widespread undermining on a local basis of standards and stipulations adopted after this comprehensive EIS - namely a widespread local use of modifications, waivers and exceptions.

By contrast, the Tech Team stated that because oil and gas development disturbance is so large: "…applying NSO or other buffers around leks at any distance is unlikely to be

effective" and "timing" restrictions are simply not comprehensive enough to prevent impacts to sage grouse. (Report pp.20-21).

At the very least, one alternative, if not more, should have featured stipulations that cannot be waived, excluded or modified with respect to sage grouse priority habitat.

Accordingly, the range of alternatives - without a single alternative that comprehensively restricts waiver, exclusion and modification of protective stipulations - is wholly inadequate in the DEIS.

D. THE EIS IS INADEQUATE AS TO OIL AND GAS, TIERED TO AN OUTDATED RMP THAT DID NOT CONSIDER NEW OIL AND GAS TECHNOLOGIES SUCH AS FRACKING, HORIZONTAL DRILLING AND THE RECENT 'NIOBRARA PLAY'

The Draft EIS is also, in itself, inadequate to support oil and gas development in Grand County, inasmuch as it does not consider new oil and gas technologies and developments that did not exist at the time the old Kremmling Resource Area Resource Management Plan ("RMP") was adopted in 1984 or amended in 1999, or when Colorado BLM did a purported "statewide" oil and gas environmental impact statement in 1991.

While "tiering" to an older, broader EIS may be appropriate in some circumstance, 43 C.F.R. §46.140, 40 C.F.R. §1508.28, this is only true in situations where there are no "new circumstances," "new information," or "changes in the action" that "may result in significantly different environmental effects." 43 C.F.R. §46.120; 40 C.F.R. 1502.9(c).

This is certainly not the case here. Nor does the Council on Environmental Quality's "rule of thumb" that an EIS "more than 5 years old" should be "carefully reexamined" for supplementation support reliance on the 14-year old RMP/EIS. Item 32, 46 Fed.Reg. 18026, March 23, 1981.

In a report dated March 10, 2011, Weston Wilson expounded about the inadequacies of the existing and still in effect Kremmling RMP/EIS on an occasion in which BLM was

considering auctioning Grand County oil and gas leases. Please see the Wilson report at Attachment D.

For example, Mr. Wilson stated:

> "[Neither the] RMP/EIS nor the Statewide Oil and Gas EIS of 1991 evaluated modern shale oil or shale gas technology. Not till this decade did the industry master the techniques needed to release oil from shale. This is an unstudied and untested new technology not previously analyzed by BLM in its prior NEPA documents." (p.2)(Attachment D).

As a part of this new technology, as Mr. Wilson discusses, industry is using improved horizontal drilling and large-scale hydraulic fracturing and seeking oil rather than gas, from the Niobrara shale. (p.7)

To demonstrate how outdated BLM's documents are, the 1991 EIS projected with a 95 percent probability level that only negligible oil and gas deposits existed in the Middle Park Basin. (p.7) And yet, as recently as two years ago, industry had nominated parcels there, including some on the Pinto Valley Ranch, for development.

The content of Mr. Wilson's criticisms remain valid today in that the new, final Kremmling RMP has not been issued and developed, and the extent to which it might address these issues is unknown.

The Draft Sage Grouse EIS does not address these new oil and gas technologies and developments, and so cannot serve to support future oil and gas development in accordance with NEPA and BLM regulations.

E. FAILURE TO DISCLOSE IRREVERSIBLE OR IRRETRIEVABLE LOSS OF GREATER SAGE GROUSE

Under BLM's regulations, an EIS "shall disclose … (a)ny irreversible or irretrievable commitments of resources which would be involved in the proposed action should it be implemented." 43 C.F.R. §46.415(a)(8). An administrative agency such as BLM is "bound by its own regulations." *Mead Data Central, Inc., v. U.S. Departmment of the Air Force,* 566 F.2d 242, 258 (D.C.Cir. 1977).

Here, the EIS contains a section 4.25 addressing such impacts at pp. 916-17, but it fails to address loss of the Greater Sage Grouse population in Northwest Colorado.

Such a loss is reasonably foreseeable in light of the fact that Alternative D adopts a mitigation strategy for oil and gas that its own Tech Team has found to be ineffective in protecting sage grouse and the USFWS considers the greatest threat. (DEIS at 951)(energy development considered "greatest threat" to Greater Sage Grouse in these management zones).

Past efforts at trying to restore Greater Sage Grouse to habitats that the grouse no longer use have not been particularly successful. *E.g., Fish and Wildlife Service 12 Month Findings,* 75 Fed.Reg. 13910, 14006 ("recovery and repopulation of extirpated areas will be slow and infrequent…. Translocation of this species is difficult and to date has not been successful…."); *Tech Team Report p.35* lek not used for 10 years deemed abandoned; *DEIS* at 515 (loss of shrubland would not be expected to regain its shrubland character for 20 to 30 years).

Thus, in adopting Alternative D, BLM is heading on a course that its own best experts have predicted will be ineffective in protecting the grouse, whose populations are already in decline and are likely heading for species listing with the Fish and Wildlife Service.

The Draft EIS fails to adequately disclose this potential irretrievable impact.

F. DRAFT EIS INADEQUATE IN SUPPORTING SITE SPECIFIC OIL AND GAS DECISIONS

The DEIS also fails to support oil and gas development decisions in that it does not fulfill the mandates that BLM set forth in Instruction Memorandum 2010-117, dated May 17, 2010, and incorporated herein by reference, namely that site-specific NEPA compliance must be completed in all cases prior to leasing for oil and gas and site visits should be conducted to specific sites in the "majority" of cases.

For the record, BLM has not prepared any NEPA document that analyzed the site-specific impacts on the Pinto Valley Ranch, and that includes this EIS.

Thus, the DEIS fails to clear the agency's own legal standards for oil and gas leasing with respect to the Pinto Valley Ranch, and most likely, many other parcels of land.

IV. VIOLATIONS OF FLPMA

A. Failure to Use Best Available Data Violates BLM Consistency Regulations, BLM's sage grouse plan and NEPA and is arbitrary and capricious.

BLM's selection of Alternative D as the Preferred Alternative is a violation of agency "consistency" regulations developed under FLPMA because it rejects the recommendations of the Tech Team, its chosen top team of sage grouse experts. It also shows that in selecting the alternative, BLM would be acting in an arbitrary and capricious fashion under the Administrative Procedure Act.

The Tech Team's report speaks for itself, stating that: "Conservation measures described in this report are derived from interpretation of the best available scientific studies using our best professional judgment." (p.58).

Similarly, BLM has disregarded its best available data in the form of the U.S. Fish and Wildlife Survey indicating the importance of linkage habitat for peripheral populations of sage grouse.

Under the Endangered Species Act, 16 U.S.C. §1533(b)(1)(A), the U.S. Fish and Wildlife Service is required to "make determinations" on the endangered status of the sage grouse "on the basis of the best scientific and commercial data available…"

Under BLM's consistency regulations, 43 C.F.R. §1610.3-2, agency regulations require that BLM planning decisions "shall be consistent with officially approved or adopted resource related plans, and the policies and programs contained therein, of other Federal agencies." BLM is bound to comply with its own regulations. *Mead Data Central, Inc., v. U.S. Departmment of the Air Force,* 566 F.2d 242, 258 (D.C.Cir. 1977).

Here, there is no consistency with the Fish and Wildlife Service's programs, policies and research.

This omission is particularly unfortunate, and unlawful, for BLM because in its 2004 National Sage Grouse Habitat Conservation Strategy Plan, see Attachment E, BLM specifically stated:

> "The BLM will use the best available science and other relevant information to develop conservation efforts for sage grouse and sage-brush habitats." At V, p.7

In adopting its plan, BLM declared that "cooperation" with other federal agencies, among others, is "essential" for successful conservation of the sage grouse. At V, p.8.

The selection of Alternative D violates BLM's own national sage grouse plan in these respects.

Council on Environmental Quality Regulations under NEPA also require environmental impact statements to be coordinated "to the fullest extent possible" with the requirements of statutes including the Endangered Species Act. 40 C.F.R. §1502.25. These regulations are binding on BLM in preparing this EIS. 40 C.F.R. §1507.1.

The selection of Alternative D, ignoring and rejecting the best available data and science as stated in the Tech Team Report, violates these regulations.

As courts have noted, although a court must defer to an agency's expertise, "it must do so only to the extent the agency utilizes, rather than ignores, the analysis of its own experts." *Defenders of Wildlife v. Babbitt,* 958 F.Supp. 670, 685 (D.D.C. 1997).

Here, by acting in violation of its own regulations and policies, failing to coordinate with the Fish and Wildlife Service's research and statutory mandate and failing to follow the conclusions and recommendations of its own experts on the Tech Team, the BLM in selecting Alternative D has acted in a very arbitrary, capricious and unlawful manner. It is the most compelling example of arbitrary and capricious conduct to refuse to follow the findings, conclusions and recommendations of its own chosen experts on the Tech Team. The EIS presents no data, theories or arguments which disagree with the Tech Team and the USFWS study.

B. Failure to use Best Available Data and to Coordinate with Fish and Wildlife Service also Violates BLM's sensitive species regulations.

Under BLM policy and regulations developed under FLPMA, the Greater Sage Grouse is an official "sensitive species."

In selecting Alternative D as the Preferred Alternative, BLM has violated these regulations requiring cooperation with other agencies and use of the best available data. BLM also violates these regulations in failing to include site-specific information in the EIS.

These regulations specify that: "BLM should work cooperatively with other agencies … '[t]o help ensure that the best information is available in the BLM decision-making process.'" Sensitive Species, 6840.2A1D. This was not done here.

The regulations require that "[a]ctions authorized by BLM shall further the conservation and/or recovery of … Bureau sensitive species" and "BLM shall cooperate with other governmental …. agencies" to achieve these results. Sensitive Species, 6840.06, .2E. In rejecting the Tech Team's and USFWS Study's findings, and adopting an alternative that will likely be "ineffective," BLM simply has not complied with these provisions.

Sensitive species regulations also provide that: "When appropriate, land use plans shall be sufficiently detailed to identify and resolve significant land use conflicts with Bureau sensitive species without deferring conflict resolution to implementation-level planning." SS 6840.2A1B.

By covering a large swath of Northwest Colorado and attempting uniform decisions, BLM has not complied with this regulation.

Similarly, the provisions of E-1 and E-2 that allow for exceptions and modifications to sage grouse protective stipulations violate these regulations by providing an opportunity and incentive for "deferring conflict resolution to implementation-level planning."

As with the other regulations cited above, these regulations are binding on BLM." *Mead Data Central, Inc., v. U.S. Departmment of the Air Force,* 566 F.2d 242, 258 (D.C.Cir. 1977).

C. Alternative D is Also Not Consistent with Grand County Land Use Policies.

Under FLPMA, the BLM is required "coordinate" its land use planning and management "with the land use planning and management programs … of the State and local governments within which the lands are located" "to the extent consistent with the laws governing administration of the public lands." 43 U.S.C. §1712(c)(9).

Here, BLM's Preferred Alternative D fails on this score as it pertains to Grand County, Colorado, as shown by the attached letter of Grand County dated Feb. 1, 2011, pertaining to then proposed oil and gas leasing in the county and the attached Grand County Zoning Regulations applicable to oil and gas exploration and production. See Attachments F and G.

The County there makes plain that "the local ecosystem is very fragile" and oil and gas leasing "could have drastic negative consequences on our local environment."

As the County points out:

> "With respect to sage grouse, as well as other wildlife, such as mule deer, moose and elk, strong consideration should be given to the current condition of habitat and the impacts of oil and gas drilling on the habitat….

"...The NEPA analysis in the current RMPs cannot support leasing parcels under conservation easements or parcels with wilderness characteristics or habitat for sage grouse, mule deer, moose, elk."

The Ranch owners concur. Alternative D is not consistent with the county's land use policies, and therefore violates FLPMA.

Please give these comments your serious attention and concern. We look forward to significant changes that will remove the illegalities in BLM's process prior to a final decision.

Very truly yours,

Paul Zogg

cc: Wingspread West

ATTACHMENTS

A - Letter of Wildlife Consultant Matt Holloran Dated Nov. 26, 2013.

B-Knick, Hanser & Preston, Modeling ecological minimum requirements for distribution of greater sage-grouse leks: implications for population connectivity across their western range, U.S.A., *Ecology and Evoluation* pp.1539-1551, 2013.

C - BLM Instruction Memorandum 2010-071, March 5, 2010.

D-Review of the Draft Environmental Assessment August 2011 Competitive Oil and Gas Lease Sale, Weston W. Wilson, March 10, 2011.

E-Bureau of Land Management National Sage-Grouse Habitat Conservation Strategy, November 2004.

F-Grand County Board of Commissioners Letter dated February 1, 2011.

G - Grand County Oil and Gas Regulations.

WYOMING WILDLIFE
CONSULTANTS, LLC

(A)

NEPA Coordinator
Bureau of Land Management, Northwest Colorado District
2815 H Road
Grand Junction, CO 81506
November 26, 2013

To Whom It May Concern:

I am a Principal and the Senior Ecologist with Wyoming Wildlife Consultant, LLC. I have served as principal investigator, field supervisor, and/or research collaborator on research projects addressing various aspects of greater sage-grouse, sagebrush ecosystem, and sagebrush-obligate wildlife species ecology and management since 1996. My research emphasis has included: greater sage-grouse ecology, greater sage-grouse population response to energy development, livestock grazing and greater sage-grouse habitat suitability, habitat management planning to mitigate greater sage-grouse population declines, and sagebrush rangeland function, health and management. A copy of my Vitae is attached for reference.

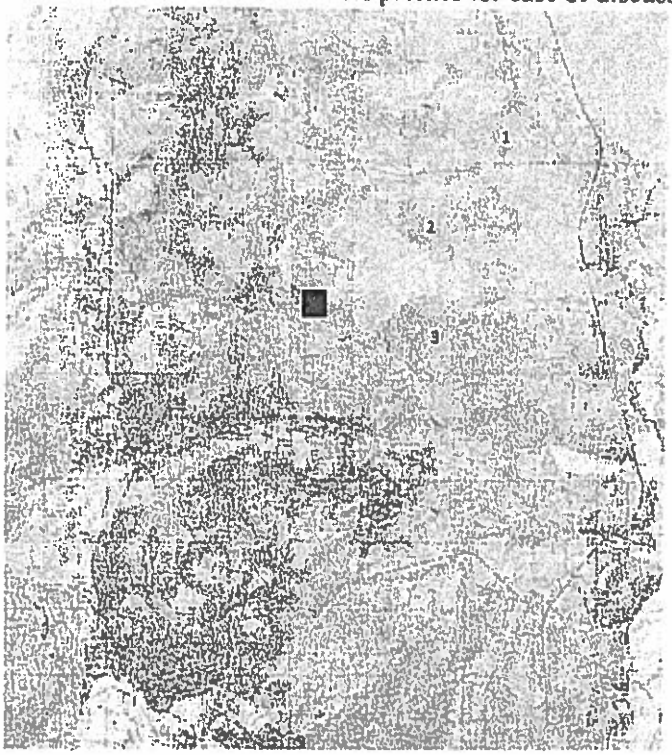
I made numerous site visits to Pinto Valley Ranch located in Grand County, Colorado since 2011, and these visits gave me the opportunity to view the sage-grouse habitats on the ranch. I designed and oversaw the implementation of a field survey with the objective of determining sagebrush habitats occupied by sage-grouse on Pinto Valley Ranch. I discussed the sage-grouse habitats, sage-grouse habitat designations, and extant information and data concerning sage-grouse on Pinto Valley Ranch with employees of Colorado Parks and Wildlife. Given these efforts, it is my opinion that: Pinto Valley Ranch provides habitats across all seasons (nesting, early and late brood-rearing, summer and winter [including severe winter]) for a resident sage-grouse population; substantially all of the sagebrush-dominated areas of Pinto Valley Ranch are used by sage-grouse; high elevation habitats on Pinto Valley Ranch are used by sage-grouse for late brood-rearing and summer; and irrigated hay meadows are used by sage-grouse for late brood-rearing and summer and may be used as connectivity corridors among leks and other critical habitats (e.g., breeding and severe winter range).

In this letter I address 4 overriding concerns I have regarding the Northwest Colorado greater sage-grouse Draft Land Use Plan Amendment and Environmental Impact Statement (referred to as the EIS from here-on):

1. The designation of habitats that should be considered Preliminary Priority Habitats (PPH) instead of Preliminary General Habitats (PGH) in certain areas in and near Pinto Valley Ranch;
2. The minimal attention and consideration of the importance of population connectivity;
3. Adopting of a 5% surface disturbance threshold in the preferred alternative as it compares to the 3% threshold supported in the National Technical Team (NTT) report as well as in the Kremmling Field Office Draft Resource Management Plan (2011); and
4. The administrative flexibility and subjectivity to grant exceptions, waivers and modifications built into the preferred alternative which negates the regulatory mechanisms presented in the preferred alternative thereby making them inadequate.

1. The figure below is a copy of the BLM's map set out in Appendix B Figure 1-4 of the Sage-Grouse EIS of PPH (orangish/pinkish color) and PGH (green) in Middle Park, Colorado enlarged to the area north and west of the intersection of Highway 40 and Highway 134 and encompassing Pinto Valley

Ranch; the reservoir in the lower third of the image is Hinman Reservoir and the black square is a known active sage-grouse lek. I added the numbers to the PGH patches for ease of discussion.

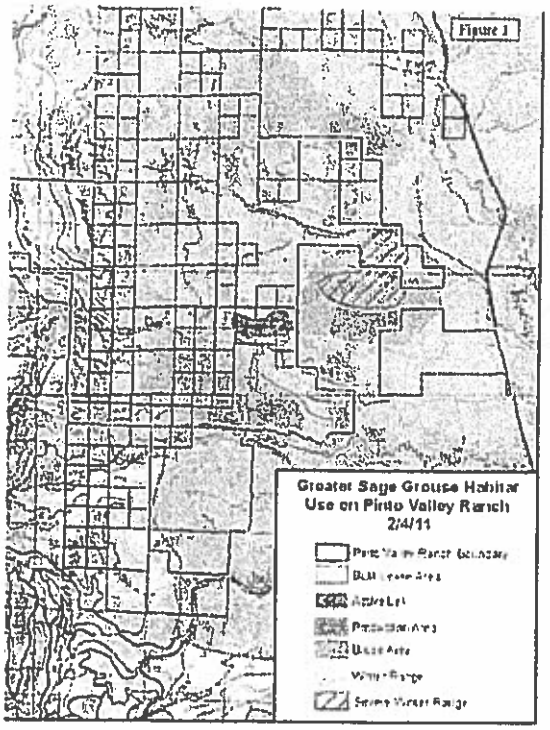


I was able to discern from information presented by the Colorado Parks and Wildlife (CPW) on the website:
http://wildlife.state.co.us/SiteCollectionDocuments/DOW/Maps/WildlifeSpecies/Birds/GrSG_PPH_PGH_20120309_Final.pdf that the BLM used the following information to identify PPH and PGH:

1. Breeding, summer and winter habitat models developed at state-wide spatial scales from occurrence data; models are presented in Rice, M. B., A. D. Apa, M. L. Phillips, J. H. Gammonley, B. B. Petch, and K. Eichhoff. 2013. Analysis of regional species distribution models based on radio-telemetry datasets from multiple small-scale studies. Journal of Wildlife Management 77:821-831; and
2. Production Area and Occupied Range maps maintained by the CPW.

I fully support the BLM's approach of using data-derived models as the basis for identifying suitable sage-grouse habitats. I also fully agree with the BLM's use of extant production area and seasonal range maps as site-specific knowledge important for verifying and "tweaking" modeled estimates of habitat suitability. The use of localized information to ensure that statewide projections accurately reflect conditions at smaller spatial scales is an extremely important step and I applaud the BLM for recognizing this.

However, the verification step of identifying PPH does not appear to have been fully vetted on certain portions of Pinto Valley Ranch and the habitat immediately adjacent to the ranch. Below is again a figure centered on Pinto Valley Ranch in Middle Park, CO; the active lek shown in red in the following figure is the same lek identified by the black box in the first figure I present. The sage-grouse seasonal ranges depicted in the figure were identified and mapped by CPW.



A comparison of the areas identified as PGH in the first figure I present with this figure highlights several inconsistencies. Portions of PGH #2 and #3 are identified by CPW as severe winter range, winter range, and a brood-rearing area. Portions of PGH #1 are identified by CPW as winter range and a brood-rearing area. All of the PGH highlighted (PGH #1-4) in the figure is identified by CPW as a production area. In support, the field surveys conducted on Pinto Valley Ranch established sage-grouse use of PGH #1 (the other PGH habitats identified in the figure were not surveyed).

As I have previously stated in documents submitted to the BLM, surveys undertaken on Pinto Valley Ranch corroborate CPW's contention that the sagebrush-dominated areas on the ranch are important for sage-grouse. Pinto Valley Ranch provides a critical mix of intact sage-grouse nesting, early and late brood-rearing, summer and winter (including severe winter) ranges. Oil and gas exploration and development on or near Pinto Valley Ranch is likely to either directly (e.g., surface disturbance) or indirectly (e.g., sage-grouse avoidance of infrastructure) adversely modify and destroy critical sage-grouse habitat resulting in reduced lek attendance and persistence, nesting and winter habitat use, chick productivity and adult survival. Therefore, based on the methodology used by the BLM as supported by information maintained by CPW and my analysis of the habitats on Pinto Valley Ranch, the areas shaded in green as PGH on the BLM's map are more accurately PPH, and should be designated as such.

In the preferred alternative D, a No Surface Occupancy (NSO) designation is put in place for all PPH for which the minerals have not been leased. This establishes (as is pointed out in the EIS) that minerals underlying PPH will need to be accessed directionally from infrastructure placed in PGH or in unoccupied habitat. As mitigation, this infrastructure will be subjected to timing limitations. The research is unequivocal that energy development of non-renewable reserves (e.g., gas and oil) is detrimental to sage-grouse, with most research suggesting an impact to at least 4 miles. The research is also unequivocal that implementing timing limitations including those referenced in the EIS are not an effective means of minimizing impacts of energy development to sage-grouse (see Manier, D. J., Wood, D. J. A., Bowen, Z. H., Donovan, R. M., Holloran, M. J., Juliusson, L. M., Mayne, K. S., Oyler-McCance,

S. J., Quamen, F. R., Saher, D. J., and Titolo, A. J. 2013. Summary of science, activities, programs, and policies that influence the rangewide conservation of Greater Sage-Grouse (*Centrocercus urophasianus*): U.S. Geological Survey Open-File Report 2013–1098, 170 p., http://pubs.usgs.gov/of/2013/1098/ for review of literature). Additionally, the NTT report specifically states: "We do not include timing restrictions on construction and drilling during the breeding season because they do not prevent impacts of infrastructure (e.g., avoidance, mortality) at other times of the year, during the production phase, or in other seasonal habitats that are crucial for population persistence" (page 21 of 74). The PGH designated in the figures presented above is all within 4 miles of the active lek identified in the figures, and the mitigation measures outlined in the preferred alternative are ineffective. Therefore, energy development occurring on that PGH to access minerals under PPH will negatively influence the sage-grouse population breeding on the lek. There are only 19 active leks in Middle Park, with 12 of those leks being on private lands. According to biologists with CPW, the Middle Park sage-grouse population is one of only two populations in Colorado not currently influenced by oil and gas development. Therefore, impacts to the sage-grouse population using the lek identified above would have major adverse consequences on the conservation of the Middle Park and Northwest Colorado sage-grouse population.

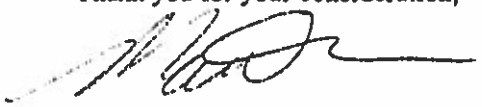
2. A recent publication investigating connectivity between sage-grouse leks in western portions of the species range concluded that: (1) connectivity among leks (populations) is important for species persistence; and (2) peripheral populations are often connected by limited numbers of corridors, and habitat loss or human development that eliminates habitat in these corridors could result in extirpation of these populations from regional, stochastic events (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. Ecology and Evolution. doi: 10.1002/ece3.557). Anthropogenic development in the PGH habitats on and near Pinto Valley Ranch may eliminate movement corridors used by sage-grouse to move to and from habitats on the Ranch. Elimination of these corridors could effectively isolate the population which would increase the probability of extirpation of this population which in turn would have major adverse consequences on the conservation of the Middle Park and Northwest Colorado sage-grouse populations as a whole.

Based on the foregoing analyses it is important to prohibit energy development on Pinto Valley Ranch and nearby areas to the east and west of the ranch to maintain the unique and irreplaceable intact sage-grouse habitats the ranch provides, maintain travel corridors to and from the habitats on the ranch, and thereby maintain the population of sage-grouse established by the CPW as critically important for sustaining populations in Colorado. In order for the regulatory mechanisms to be adequate and pass the scrutiny of the USFWS, the area of PPH should be expanded as proposed above to afford the entire area the no surface occupancy protections as set forth in Alternative D. If habitat designations cannot be changed, the protections set forth in Alternative D should be modified to extend no leasing provisions to PPH as set forth in Alternative B and the NTT report; and the protections set forth in Alternative D should be significantly strengthened by insuring that regulatory mechanisms are not negated by the administrative subjectivity as discussed below.

3. The expert opinion of the NTT report concluded that a 3% surface disturbance threshold was necessary to maintain sage-grouse populations. Additionally, the Kremmling Field Office Draft Resource Management Plan (KFO DRMP) established that a "3 percent surface disturbance threshold will be maintained within sage-grouse core areas" (page 4-283). Given the MOU as presented in Appendix A of the EIS as well as the KFO DRMP, the onus is on the authors of the EIS to justify and support any deviation from recommendations made by the NTT. The authors of the EIS present no scientific justification for deviating from the 3% threshold, and no scientific literature exists that I am aware of justifying this deviation. Therefore the surface disturbance threshold should be maintained at 3% within the preferred alternative.

4. The authors of the EIS repeatedly emphasize throughout the document that the preferred alternative includes broad administrative subjectivity to grant exceptions and make decisions based on site-specific or local conditions; this subjectivity is not a major part of any of the other pertinent alternatives. The following statements in the EIS are examples of the excessive flexibility and subjectivity built into Alternative D: "it is not possible to quantify the reductions [in development] because the flexibility built into this alternative [preferred alternative] would be highly variable..." (page 646) and "because this alternative [D] would apply more widely but with less stringent restrictions and greater flexibility to approve projects, the number of acres potentially affected is not a meaningful number..." (page 638). In Appendix F of the EIS and specific to how "prioritization" was used on page F-6, the NTT report (and as such Alternative B) states: "management priorities will need to be shifted and balanced to maximize benefits to sage-grouse habitats and populations in priority habitats" whereas the preferred alternative presents the following for prioritization: "Consider GRSG [greater sage-grouse] habitat requirements in conjunction with all resource values managed by the BLM, and give preference to GRSG habitat unless site-specific circumstances warrant an exemption." The repeated use of the *flexibility* language establishes a broad subjective administrative discretion, modification and limitation to the preferred alternative. Subjectivity undermines the scientific-credibility and potential efficacy of actions suggested under the preferred alternative. Although it is more scientifically valid to eliminate the administrative subjectivity in PPH, if flexibility is allowed under the preferred alternative, specific and inflexible sidebars based on documented scientific analysis of when exemptions can be considered need to be established in the EIS. In my opinion, the administrative subjectivity to grant exceptions, waivers and modifications included in the preferred alternative negates the protections and regulatory mechanisms included in this alternative thereby making them, and the alternative, inadequate.

Thank you for your consideration,



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Matthew J. Holloran
Vitae
January 2013

PERSONAL

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EDUCATION

2005	Ph.D., Zoology and Physiology with Wildlife Management concentration, University of Wyoming, Laramie, WY, USA. Dissertation: *Greater sage-grouse* (Centrocercus urophasianus) *population response to natural gas field development in western Wyoming*. Dr. Stanley H. Anderson, advisor.
1999	M.S., Zoology and Physiology, University of Wyoming, Laramie, WY, USA. Thesis: *Sage grouse* (Centrocercus urophasianus) *seasonal habitat use near Casper, Wyoming*. Dr. Stanley H. Anderson, advisor.
1991	B.S., Biology, Colorado College, Colorado Springs, CO, USA.

RECENT POSITIONS HELD

2013 – present	Chief Scientist, Wildlife Management Research Support (a fiscally-sponsored nonprofit)
2005 – present	Principal and Senior Ecologist, Wyoming Wildlife Consultants, LLC.
2003 – 2005	Doctoral Researcher, Wyoming Cooperative Fish and Wildlife Research Unit; with Dr. Stanley H. Anderson, University of Wyoming.
1999 – 2003	Research Scientist, Wyoming Cooperative Fish and Wildlife Research Unit; University of Wyoming.

PROFESSIONAL EXPERIENCE

2005 – present: **Principal and Senior Ecologist; Wyoming Wildlife Consultants, LLC.**
Partner: John Dahlke; Principal Wyoming Wildlife Consultants LLC; 207 West Pine Street, Pinedale, WY 82941; (307) 367-2765.

Project Specific Information:

- Principal investigator: *Holistic greater sage-grouse management on a ranch destined for wind development.* Project designed to investigate the following objectives: (1) develop quantified predictions of population-level response of sage-grouse to wind energy developments; and (2) develop quantified and detailed wildlife habitat suitability focused state-and-transition models for the ecological sites occurring on the Pathfinder Ranch. ($847,900)
- Co-Principal investigator: *Greater sage-grouse telemetry study for the Simpson Ridge Wind Resource Area; Carbon County, Wyoming.* Project designed to compile pre-treatment sage-grouse information necessary to effectively document sage-grouse population response to wind development. ($621,260)
- Co-Principal investigator: *Documenting structural and spatial characteristics of sage-grouse nesting and early brood-rearing habitat suitability at selected ecological sites in the Wyoming Basin.* Project designed to correlate ecological site information with habitat requirements of sage-grouse. ($317, 590)
- Principal investigator: *Greater sage-grouse winter habitat selection in the Upper Green River Basin, Wyoming.* Project to determine whether natural gas development influenced habitat selection of wintering greater sage-grouse in southwestern Wyoming. Probability-of-occurrence differences between distinct patches of habitat relative to the proximity of those patches to natural gas field infrastructure being investigated. (≈$800,000)
- Initiator: *Identifying habitats for greater sage-grouse population persistence on Atlantic Rim, Rawlins, Wyoming: A process of protecting specific areas within a developing natural gas field critical for population*

sustainability in an adaptive management framework. Study designed to identify source breeding season habitats through seasonal risk-assessment modeling and to generate areas-of-critical-conservation-concern maps based on limiting seasonal habitats, risk assessment, multi-seasonal occurrence, and seasonal juxtaposition. (*Study being conducted by University of Wyoming*) ($75,000)

- Principal investigator: *Habitat mitigation planning for greater sage-grouse in the Upper Green River Basin, Wyoming.* Project designed to compile the wildlife and vegetative information, and establish the landowner contacts required to effectively prepare allotment scale habitat management plans focused on enhancing areas for greater sage-grouse. ($478,000)
- Principal investigator: *Recruitment by greater sage-grouse in association with natural gas development in western Wyoming.* Study designed to establish the reaction of yearling greater sage-grouse males and females to natural gas field development. (*Study a continuation of a master's project (University of Wyoming) completed in 2006, and completed August 2007*)
- Principal investigator: *Pygmy rabbit block survey of EnCana Oil & Gas (USA) Inc. proposed 2007 drilling locations in the Jonah Infill Drilling Project Area.* Project identified habitats utilized by pygmy rabbits within the Jonah natural gas field in southwestern Wyoming. (*Project completed April 2007*)
- Principal investigator: *EnCana offsite habitat manipulation project at Arambel Reservoir.* (*Project completed February 2007*)

2002 – 2005: **Ph.D. Candidate; University of Wyoming.**
Advisor: Dr. Stanley H. Anderson (deceased); Leader, Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, Laramie, WY 82071; Dr. Matt Kaufman (*current contact*), (307) 766-5415.

Doctoral researcher for the study: *Greater sage-grouse* (Centrocercus urophasianus) *population response to natural gas field development in western Wyoming.* Determine if and how the development of natural gas resources was influencing greater sage-grouse populations in the upper Green River Basin of southwestern Wyoming.

1999 – 2003: **Research Scientist; Wyoming Cooperative Fish and Wildlife Research Unit.**
Supervisor: Dr. Stanley H. Anderson (deceased); Leader, Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, Laramie, WY 82071; Dr. Matt Kaufman (*current contact*), (307) 766-5415.

Project Specific Information:

- Initiated the study: *Grazing system and linear corridor influences on greater sage-grouse* (Centrocercus urophasianus) *habitat selection and productivity.* Study determined the effects of differing cattle grazing practices on sagebrush dominated landscapes as they relate to greater sage-grouse seasonal habitat selection and productivity. (*A master's student (University of Wyoming) assumed the study in 2002; the study was completed August 2004*)
- Initiated the study: *Sage-grouse* (Centrocercus urophasianus) *use of different-aged burns and the effects of coyote control in southwestern Wyoming.* Study determined temporal effects to greater sage-grouse survival and productivity of prescribed fire by quantifying use of different aged sagebrush burns. (*A master's student (University of Wyoming) assumed the study in 2001; the study was completed December 2003*)
- Principal investigator for the study: *Greater sage-grouse seasonal habitat selection and survival in Jackson Hole, Wyoming.* Study documented greater sage-grouse seasonal habitat selection and survival, identified limiting seasonal range(s), and quantified habitat conditions associated with sustainable and increasing productivity. (*Study completed August 2004*)

RECENT PEER-REVIEWED PUBLICATIONS

Holloran, M. J., B. C. Fedy, and J. Dahlke. *In Review.* Winter habitat selection of greater sage-grouse relative to activity levels at natural gas well pads. Journal of Wildlife Management.

LeBeau, C. W., J. L. Beck, G. D. Johnson, and M. J. Holloran. *In Review.* Short-term impacts of wind energy development on greater sage-grouse fitness parameters. Journal of Wildlife Management.

Kirol, C. P., J. L. Beck, S. V. Huzurbazar, M. J. Holloran, and S. N. Miller. *In Review.* Identifying greater sage-grouse source and sink habitats for conservation planning in an energy development landscape. Ecological Applications.

Johnson, D. H., M. J. Holloran, J. W. Connelly, S. E. Hanser, C. L. Amundson, and S. T. Knick. 2011. Influences of environmental and anthropogenic features on greater sage-grouse populations, 1997-2007. pp.

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Holloran, M. J., and S. H. Anderson. 2003. Direct identification of northern sage-grouse, Centrocercus urophasianus, nest predators using remote sensing cameras. Canadian Field-Naturalist 117:308-310.

GROUP INVOLVEMENT

- Wyoming statewide greater sage-grouse working group (*Wyoming greater sage-grouse conservation plan*).
- Wyoming Game and Fish Department greater sage-grouse management and livestock grazing technical team.
- Wyoming Game and Fish Department greater sage-grouse working group.
- Wyoming State Governor's greater sage-grouse conservation task force.
- Wyoming Chapter of The Wildlife Society (President)

References Available upon Request

Ecology and Evolution

Open Access

Modeling ecological minimum requirements for distribution of greater sage-grouse leks: implications for population connectivity across their western range, U.S.A.

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Abstract

Greater sage-grouse *Centrocercus urophasianus* (Bonaparte) currently occupy approximately half of their historical distribution across western North America. Sage-grouse are a candidate for endangered species listing due to habitat and population fragmentation coupled with inadequate regulation to control development in critical areas. Conservation planning would benefit from accurate maps delineating required habitats and movement corridors. However, developing a species distribution model that incorporates the diversity of habitats used by sage-grouse across their widespread distribution has statistical and logistical challenges. We first identified the ecological minimums limiting sage-grouse, mapped similarity to the multivariate set of minimums, and delineated connectivity across a 920,000 km^2 region. We partitioned a Mahalanobis D^2 model of habitat use into k separate additive components each representing independent combinations of species–habitat relationships to identify the ecological minimums required by sage-grouse. We constructed the model from abiotic, land cover, and anthropogenic variables measured at leks (breeding) and surrounding areas within 5 km. We evaluated model partitions using a random subset of leks and historic locations and selected D^2 (k = 10) for mapping a habitat similarity index (HSI). Finally, we delineated connectivity by converting the mapped HSI to a resistance surface. Sage-grouse required sagebrush-dominated landscapes containing minimal levels of human land use. Sage-grouse used relatively arid regions characterized by shallow slopes, even terrain, and low amounts of forest, grassland, and agriculture in the surrounding landscape. Most populations were interconnected although several outlying populations were isolated because of distance or lack of habitat corridors for exchange. Land management agencies currently are revising land-use plans and designating critical habitat to conserve sage-grouse and avoid endangered species listing. Our results identifying attributes important for delineating habitats or modeling connectivity will facilitate conservation and management of landscapes important for supporting current and future sage-grouse populations.

Introduction

The greater sage-grouse *Centrocercus urophasianus* (Bonaparte) is an obligate resident of semiarid sagebrush *Artemisia* (L.) shrublands in western North America (Fig. 1). Although sage-grouse are still widely distributed across 11 states and 2 provinces, their current range is only 56% of their historical distribution prior to Euro-American settlement (Schroeder et al. 2004). Greater sage-grouse was recently designated as a candidate species for listing under the U.S. Endangered Species Act (U.S. Fish and Wildlife Service 2010). Although biological data coupled with lack of regulatory mechanisms warranted listing, endangered status was precluded because other species were considered to be higher priorities.

Sage-grouse are managed as an umbrella species for over 350 species of plants and animals that depend on sagebrush (Suring et al. 2005). The long-term future for

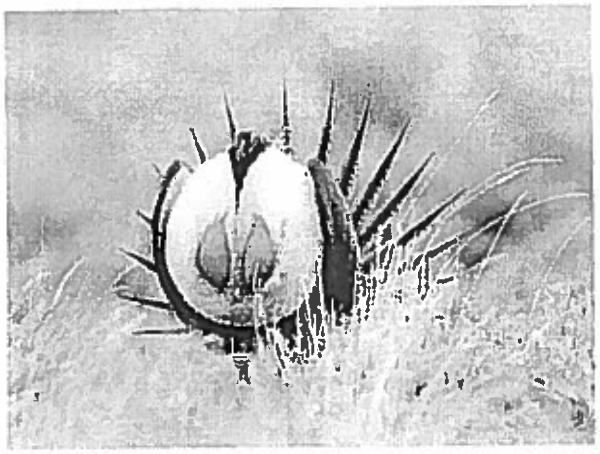

Figure 1. A male greater sage-grouse displays on a lek (traditional breeding ground). Photo credit: Matt T. Lee.

this ecosystem is uncertain (Davies et al. 2011). Extensive regions of sagebrush have been burned by wildfire or lost to agriculture, energy and infrastructure development, and other resource demands by increasing human populations within the sage-grouse range (Knick et al. 2011). Remaining sagebrush landscapes are threatened further by exotic plant invasions leading to altered fire regimes and conversions to unsuitable expanses of exotic annual grasslands (Chambers et al. 2007; Miller et al. 2011; Balch et al. 2013). Long-term effects of changing climate could result in further loss of sagebrush by the end of this century: as much as 80% of the current sagebrush distribution could disappear under extreme projections (Neilson et al. 2005). Thus, current trajectories and future loss of sagebrush are likely to further imperil sage-grouse and other dependent species (U.S. Fish and Wildlife Service 2005, 2010).

Sage-grouse differ from many threatened species whose populations often are at risk because of localized ranges, restrictive habitat requirements, or are jeopardized by a dominant stressor. In contrast, sage-grouse are broadly distributed, occupy a diversity of environments containing sagebrush, and face multiple but cumulative threats throughout their range (Knick and Connelly 2011). Because conservation resources and time are limiting, delineating important areas and connecting corridors among populations could help focus actions in critical regions. Spatially explicit models delineating habitat for a species are important tools for directing land use or planning long-term conservation (Guisan and Zimmerman 2000; Elith et al. 2006). Numerous species distribution models have been developed for sage-grouse and have been important for understanding site-specific habitat relationships (Aldridge and Boyce 2007; Doherty et al. 2008; Shepherd et al. 2011). However, translating these habitat relationships into broad-scale maps has been hindered due to limited availability of accurate and consistent data spanning regional or range-wide distributions. Standard statistical approaches also present challenges because models based on ecological means, optimums, or correlational relationships often fail when applied to novel environments outside the inference space of the original data and do not accurately track either spatial or temporal change (Knick and Rotenberry 1998). Therefore, we used a partitioned Mahalanobis D^2 model of resource selection to identify environmental characteristics that varied least at locations where a species occurs (Dunn and Duncan 2000; Browning et al. 2005). These consistent environmental characteristics, which correspond to an ecological niche, represent the most essential set of requirements limiting a species distribution (Rotenberry et al. 2002, 2006).

Identifying minimum requirements underlying sage-grouse distributions is particularly relevant because agencies responsible for managing sagebrush-dominated lands are considering sage-grouse needs while currently revising land-use plans and delineating priority regions (U.S. Bureau of Land Management 2011). Our second objective was to map a habitat similarity index (HSI) relative to the multivariate model of ecological minimums for the western portion of the sage-grouse range. We then converted the HSI to a resistance surface to model connectivity among delineated populations. These results are necessary to identify populations vulnerable to extirpation because of habitat loss or isolation, delineate potential corridors for movement among populations, and to provide a foundation from which to assess the implications of current or future habitat change.

Study Area

Our study area encompassed approximately 920,000 km^2 of the western portion of the historic range occupied by sage-grouse, including areas outside of mapped population boundaries (Fig. 2) (Schroeder et al. 2004). A small part of our study area also included populations in the eastern range, which is generally delineated by the Rocky Mountains. The area is dominated by big sagebrush *A. tridentata* (Nutt.), little sagebrush *A. arbuscula* (Nutt.), and black sagebrush *A. nova* (A. Nelson) communities and is topographically and climatically diverse (Miller et al. 2011). Sage-grouse breed each spring (March–June) at traditional locations (leks) throughout this region. Thirty-six population units were delineated (Connelly et al. 2004), including six that may be extirpated based on absence of male sage-grouse at leks from 1998 to 2007.

Materials and Methods

Sage-grouse locations and environmental variables

We modeled species presence from locations of 3184 sage-grouse leks known to be active between 1998 and 2007. State wildlife biologists count displaying males each year to estimate population status; active leks were defined on an annual basis as those with ≥ 1 male sage-grouse attending (Garton et al. 2011).

We characterized the environment from land cover, anthropogenic, edaphic, topographic, and climatic variables represented in a 1-km grid within a Geographical Information System. We used an existing database of environmental variables that had been developed previously for broad-scale studies of sage-grouse population trend and habitat selection (Johnson et al. 2011; Wisdom et al. 2011). When possible, we matched time-specific predictor variables with the temporal period for lek data.

Most variables were measured for the 1-km grid cell within which the lek was located and also at larger scales represented by 5- and 18-km radii surrounding the lek location. We used these distances because a large proportion of females in nonmigratory and migratory populations nest within 5 and 18 km of the lek location (Connelly et al. 2000). Variables measured at 18-km radii did not perform as well in initial models as those at 5 km and were dropped in subsequent analyses.

The percentage of land cover class was measured from a 90-m resolution vegetation map (Landfire 2007). Land cover included agriculture, big sagebrush shrubland, big sagebrush steppe, conifer forest, developed, grassland, low sagebrush, mountain sagebrush, pinyon *Pinus* (L.) – juniper *Juniperus* (L.), riparian and all sagebrush types combined. Our environmental variables did not include understory components because these were not mapped explicitly (Landfire 2007). However, land cover communities described in the classification included associations for subdominant components.

We used fire perimeter data to characterize fire history by measuring total area burned between 1980 and 2007 (U.S. Geological Survey 2011a). Densities of anthropogenic features were developed from road, power line, pipeline, and communication tower distributions (U.S. Geological Survey 2011b). Soil variables were measured only at the lek location and included soil depth, available water capacity, salinity, and percent silt, clay, and sand (U.S. Department of Agriculture 2011). Topographic variables (slope and topographic heterogeneity) were calculated from a 90-m resolution raster-based digital elevation model (U.S. Geological Survey 2011c). We quantified local topographic heterogeneity using a vector ruggedness model (Sappington et al. 2007). Climate variables included mean annual, winter (November–February) and summer (May–August) precipitation, and mean annual minimum and maximum temperatures (Daly et al. 2004). Temperature and precipitation were averaged for 1998 through 2007 using 800-m resolution monthly climate data obtained from the PRISM Climate Group (Oregon State University 2011).

Partitioned Mahalanobis D^2

Mahalanobis D^2 measures the standardized difference between the multivariate mean for p environmental variables calculated at n species occurrence locations and the values of those environmental variables at different points in the landscape being modeled (Clark et al. 1993). Smaller D^2 values represent more similar conditions relative to the vector of multivariate means describing a species environment. An HSI can be created by rescaling D^2 to range continuously from 0 to 1; an HSI of 1 indicates environmental conditions identical to the mean habitat vector whereas a value near 0 indicates very dissimilar conditions. Although these models identify areas most similar to characteristics of occupied habitat, other factors may determine actual occupancy (Pulliam 2000).

Mahalanobis D^2 can be partitioned into k separate components, each reflecting independent relationships between a species occurrence and the set of selected environmental variables (Dunn and Duncan 2000; Rotenberry et al. 2002). Total number of partitions equals the number of variables in the model. Partitions are orthogonal and additive; summing all partitions equals the full rank model and provides the original D^2 value. Independent partitions are derived in a principal components analysis (PCA) of the $n \times p$ matrix. An eigenvalue provides the variance accounted for by each partition and an eigenvector describes the linear contribution of each variable. Because partitions that have eigenvalues ≤ 1.0 explain little variance, they represent invariant environmental relationships in a species distribution. As such, these partitions define a multivariate model of limiting factors or environmental minimums (Dunn and Duncan 2000; Browning et al. 2005). Model precision can be increased by adding partitions, but at the cost of decreasing predictive capability.

Model construction and evaluation

We randomly selected 70% of the leks ($n = 2070$) to calibrate models (Fig. 3A) and withheld the remaining 30% ($n = 1114$) to evaluate performance (Fig. 3B). We estimated distributions of variables from 1000 iterative

samples created by bootstrapping the calibration data. To better incorporate conditions in both large and small populations, we restricted the contribution from each population in a sample to a random selection of a maximum of 25 leks. We then performed a PCA on each of the 1000 iterative samples. The final model was created by subsequently averaging the PCA output after correcting for sign ambiguity (Bro et al. 2008) across all iterations.

We evaluated the ability of each $D^2(k)$ partition to predict habitat by calculating median HSI scores for calibration and evaluation data (Rotenberry et al. 2006). We also used 99 locations where sage-grouse historically occurred but are no longer extant to evaluate how well models distinguished current from unoccupied habitat (Wisdom et al. 2011). To further evaluate model performance, we calculated the area under the curve (AUC) for a receiver operating characteristic (ROC) to assess sensitivity (fraction of occurrences correctly classified) and specificity (fraction of unoccupied points predicted as occupied) (Fielding and Bell 1997). To calculate the AUC, we used the HSI values for 3184 randomly selected locations in the study area and for the 3184 lek to construct the ROC and calculate AUC (Phillips et al. 2006).

We used multiple criteria to select the final partition (Dunn and Duncan 2000). First, we examined each k partition having an eigenvalue ≤ 1.0 for relative differences in the spacing of eigenvalues among adjacent partitions. We also considered performance against evaluation data and our subjective knowledge of use areas predicted by each partition. Finally, we assessed the interpretability of eigenvector coefficients from the broader context of known sage-grouse biology (Connelly et al. 2011).

Ecological minimums

We assumed first that all variables directly measured and included in the model contributed to the p-dimensional $D^2(k)$ space describing sage-grouse environmental requirements. We also assumed that variables not measured directly nonetheless were captured within that statistical characterization. We then identified variables that were highly correlated with partitions maintaining a consistent value where sage-grouse occurred (small eigenvalues <1).

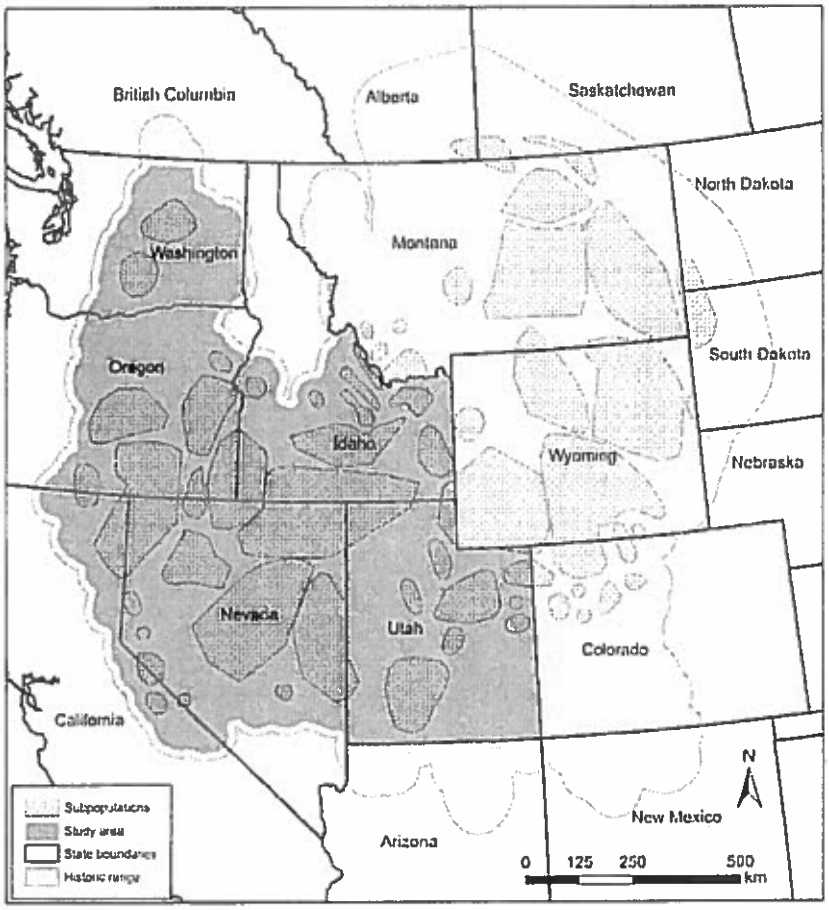

Figure 2. Study area and greater sage-grouse population boundaries within the historic sage-grouse range in western North America.

These variables were most likely to be associated with limiting factors compared to those correlated with partitions explaining large amounts of variation (larger eigenvalues) (Rotenberry et al. 2006). Finally, we considered a variable as an important contributor to the ecological minimum vector if it was correlated with the selected partition (eigenvectors > |0. 3| and to HSI scores (Halama et al. 2008).

We used dose-response curves (Hanser et al. 2011) to examine relationships between predicted HSI values and estimates for environmental variables measured at locations of sage-grouse leks active between 1998 and 2007 and for the study area grid. Relationships potentially identified include values for predictor variables relative to HSI scores at a threshold level estimated for 90% of the lek occurrences, strong linear relationships, or optimum of HSI scores. We also evaluated whether proportion of lek locations with high HSI scores differed from the proportion of points in the study area falling within that range of values. We calculated means and 95% confidence intervals for each variable to compare environmental characteristics among active leks, historic locations, and the study area.

Population connectivity

We used mapped HSI scores to model pathways of potential sage-grouse movement among leks and populations (Circuitscape 3.5; McRae 2006). Models based on circuit theory treat landscapes as conductive surfaces to predict movement and connectivity patterns. Current flowing across the landscape can then be used to identify areas important for connectivity. Number, width, and permeability of available pathways determine the robustness of connections between two locations of interest (McRae et al. 2008). Important model attributes include strength of the current source, landscape resistance, and juxtaposition of current source to grounds. We set the strength of each current source equal to the mean annual count of individuals (1998–2007) at leks within 1-km cells to incorporate size variation. We assumed that individuals would move more easily through areas meeting their habitat requirements and estimated resistance for each 1-km cell in the study area by scaling the inverse of the HSI from 1 (low resistance/high HSI) to 100,000 (high resistance/low HSI). Areas outside the historic range of sage-grouse were given a value of 100,000 to reduce influence from map boundaries (Koen et al. 2010). Each lek cell was iteratively activated as a source with all others as ground that simulated an increased likelihood of individuals to move to adjacent leks. We combined all current (movement potential) map outputs to produce a cumulative map of connectivity.

Table 1. Model partition (k) and eigenvalues for a Mahalanobis D^2 model of 27 environmental variables describing sage-grouse environments.

Model partition (k)	Eigenvalue
1	3.85
2	2.98
3	2.36
4	1.85
5	1.70
6	1.48
7	1.29
8	1.18
9	1.11
10	1.01
11	0.94
12	0.86
13	0.81
14	0.75
15	0.67
16	0.56
17	0.53
18	0.49
19	0.46
20	0.43
21	0.40
22	0.32
23	0.29
24	0.23
25	0.21
26	0.13
27	0.11

Partition eigenvalues were averaged from 1000 models using iterative subsamples randomly drawn from 2070 active sage-grouse lek locations.

Results

Eighteen of 27 $D^2(k)$ partitions met our criteria of having an eigenvalue ≤ 1 (Table 1). We selected $D^2(k = 10)$ because of its relative difference among adjacent partitions ($\Delta\text{eigenvalue}_{D^2(k = 9\text{–}10)} = 0.10$), performance against evaluation data (median HSI: evaluation leks = 0.85; historic locations = 0.0, AUC = 0.85), our subjective assessment of accuracy in map delineations (Fig. 4), and our ability to interpret $D^2(k = 10)$ based on relative importance of variables (Table 2).

Ecological minimums

Land cover of sagebrush and anthropogenic features were the primary variables defining the multivariate vector of ecological minimums (Table 2). Sagebrush in the surrounding landscape was highly important, particularly the big sagebrush shrub steppe type (Table 2). When all four sagebrush types were summed, 79% of the area within

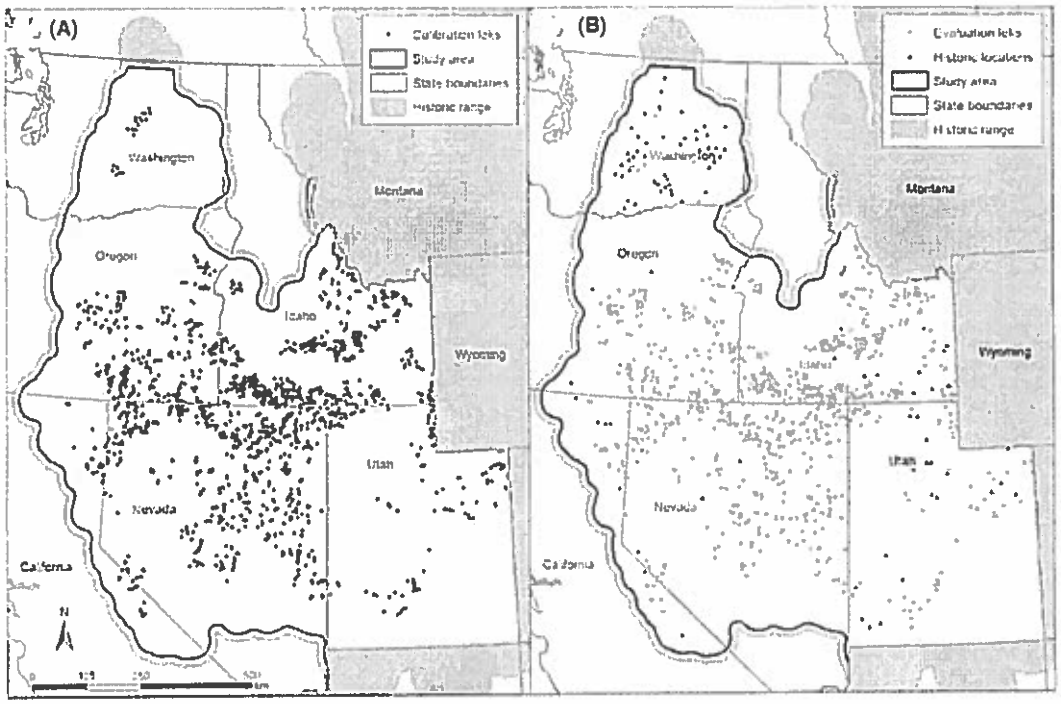

Figure 3. Distribution of greater sage-grouse lek locations active between 1998 and 2007 in the western range used to calibrate and evaluate models. Leks were randomly selected into calibration (A, black circles) and evaluation subsets (B, gray squares). Historic, but currently unoccupied sage-grouse locations (B, black triangles) were also used to test model performance.

5 km of the lek was in sagebrush land cover compared to 28% at 99 historic but no longer occupied locations and 35% for the study area. Lek locations had approximately twice the average large-scale sagebrush cover for the study area and nearly three times that of historic locations. Using the distribution of HSI scores for 90% of the leks as a threshold, active leks were surrounded by >40% landscape cover of sagebrush on average (Fig. 5A). Of the other dominant land cover types in our analysis, leks were absent from regions with $\geq$40% conifer and averaged <1% conifer forest within 5 km compared to an average of 13% for the study area and 3.4% for historic grouse locations (Table 2). Historic locations also had nearly five times more grassland and the study area nearly twice that of active leks (Table 2).

The HSI declined with increasing levels of human land use. Percent agriculture varied widely across individual lek locations, but <2% of the leks were in areas surrounded by >25% agriculture within a 5-km radius, and 93% by <10% agriculture (Fig. 5B). Ninety-nine percent of active leks were in landscapes with <3% developed; all lands surrounding leks were <14% developed (Fig. 5C). Historic locations where sage-grouse no longer occur were associated with landscapes dominated by >10 times the agriculture and >25 times the developed land as currently active leks (Table 2). Because large fires seldom occur in agriculture or developed landscapes, active leks had larger burned areas on average than historic locations and for the study area (Table 2).

Active leks also had lower densities of individual anthropogenic features than the study area or historic sage-grouse locations (Table 2). High lek HSI scores ($\geq$0.60) were associated with large-scale densities of <1.0 km/km^2 of secondary roads, 0.05 km/km^2 of highways, and 0.01 km/km^2 of interstate highways. Ninety-three percent of active leks fell below this threshold for interstate highways (Fig. 5D). Habitat suitability was highest at power line densities <0.06 km/km^2 and pipeline and communication tower densities <0.01 km/km^2. Leks were absent from areas where power line densities exceeded 0.20 km/km^2, pipeline densities exceeded 0.47 km/km^2, or communication towers exceeded 0.08 km/km^2.

Active leks were situated on shallow slopes with less rugged terrain compared to the study area or historic locations (Table 2). No leks were characterized by slopes $\geq$27° or terrain ruggedness $\geq$0.05, although the study area included slopes to 70° and terrain ruggedness to 0.35. Mean annual precipitation for active leks and historic locations was on average 88% of that for the study area (Table 2) and varied from 169 to 835 mm. Minimum annual temperatures were lower at active leks and the study area compared with historic sage-grouse locations, whereas maximum annual temperatures were similar across datasets (Table 2). Maximum temperature varied between 11 and

Table 2. Mean (SE), range, and absolute values of D^2 (k = 10) eigenvectors for environmental variables measured at 3184 sage-grouse leks, 99 historic but currently extant locations, and for the study area.

Environmental variables	Active leks		Historic		Study area		Eigenvector D^2 (k = 10)
	Mean (SE)	Range	Mean (SE)	Range	Mean (SE)	Range	
Land cover (%)							
Big sagebrush shrubland	29.8 (0.4)	0–97.6	11.8 (1.3)	0–66.1	15.3 (0.02)	0–99.5	0.09
Big sagebrush shrub steppe	19.5 (0.4)	0–94.5	8.0 (1.1)	0–51.3	6.9 (0.01)	0–100	0.33
Low sagebrush	20.1 (0.4)	0–95.4	4.1 (0.9)	0–59.1	8.0 (0.01)	0–97.1	0.12
Mountain sagebrush	9.4 (0.3)	0–89.1	3.7 (1.1)	0–77.8	4.7 (0.01)	0–98.8	0.10
All sagebrush	78.84 (0.33)	1.93–99.98	34.87 (0.03)	0–100	27.7 (2.01)	0.43–80.22	
Agriculture	2.1 (0.1)	0–83.1	26.6 (2.4)	0–93.5	8.1 (0.02)	0–97.8	0.36
Conifer forest	0.8 (0.1)	0–44.4	3.4 (0.7)	0–40.6	12.5 (0.03)	0–99.1	0.21
Developed land	0.3 (0.01)	0–14.1	8.7 (1.5)	0–83.9	1.4 (0.004)	0–99.5	0.04
Grassland	2.2 (0.1)	0–71.0	9.8 (1.3)	0–61.2	3.8 (0.01)	0–84.1	0.09
Riparian	1.9 (0.1)	0–33.5	2.2 (0.5)	0–50.7	2.1 (0.003)	0–87.1	0.10
Burn							
Burned area 1980–2007 (ha)	1421 (40)	0–7974	587 (121)	0–6145	770 (2)	0–7974	0.18
Anthropogenic							
Secondary roads (km/km^2)[1]	66.6 (0.6)	0–288.8	164.7 (16.5)	26.3–1242.6	75.7 (0.1)	0–1332.4	0.11
Highways (km/km^2)[1]	2.0 (0.1)	0–32.3	11.0 (1.3)	0–58.7	3.4 (0.01)	0–77.1	0.12
Interstate highways (km/km^2)[1]	0.1 (0.02)	0–19.8	3.8 (0.8)	0–46.6	0.6 (0.003)	0–52.0	0.33
Power lines (km/km^2)[1]	2.5 (0.1)	0–34.6	14.4 (1.4)	0–52.1	4.3 (0.01)	0–79.5	0.11
Pipelines (km/km^2)[1]	1.4 (0.1)	0–78.1	8.6 (1.5)	0–64.3	2.7 (0.01)	0–208.2	0.08
Communication towers (towers/km^2)[1]	0.1 (0.01)	0–8.9	18.3 (5.5)	0–286.5	0.6 (0.01)	0–2005.3	0.22
Soil							
Soil depth (cm)	102.6 (0.7)	0–152.0	110.4 (4.1)	0–152.0	104.0 (0.1)	0–152.0	0.06
Sand (% soil volume)	28.8 (0.2)	0–85.5	32.0 (1.7)	0–90.2	30.5 (0.02)	0–92.0	0.14
Silt (% soil volume)	28.3 (0.2)	0–70.0	37.9 (1.7)	0–70.0	30.0 (0.02)	0–81.5	0.08
Clay (% soil volume)	21.5 (0.2)	0–50.1	14.8 (0.7)	0–34.5	15.8 (0.01)	0–57.4	0.34
Salinity (mmhos/cm)	1.1 (0.02)	0–10.7	0.9 (0.1)	0–11.0	1.6 (0.003)	0–21.1	0.16
Available water capacity (cm/cm)	4.2 (0.03)	0–12.3	5.6 (0.3)	0–12.3	4.7 (0.003)	0–25.0	0.04
Topography							
Slope (degrees)	3.1 (0.1)	0–26.0	5.7 (0.7)	0–36.0	7.3 (0.01)	0–69.3	0.15
Terrain ruggedness index	1.0 (0.1)	0–46.4	2.6 (0.7)	0–55.1	4.1 (0.01)	0–354.6	0.13
Climate							
Precipitation (mm)	333.3 (1.6)	169.0–835.8	329.3 (11.7)	140.4–782.0	376.3 (0.2)	76.4–3810.4	0.06
Minimum temperature (°C)	−9.5 (0.04)	−17.0 to −3.9	−6.6 (0.3)	−15.3 to −1.3	−8.3 (0.003)	−19.6 to 3.9	0.09
Maximum temperature (°C)	30.5 (0.03)	23.5–35.7	31.8 (0.2)	21.7–37.6	30.9 (0.004)	11.0–46.1	0.07

Land cover, burn area, and anthropogenic variables were measured within a 5-km radius of the lek. Soil, topography, and climate were measured at the lek location. Source data are available at http://sagemap.wr.usgs.gov.
[1]Multiplied by 10^2.

46°C across the study area but was 27 to 32°C at leks having the highest HSI values.

Population connectivity

The majority of populations were connected through landscapes characterized by moderate-to-high potential for animal movement ($\geq$0.16, Fig. 6). Notable exceptions included both the Columbia Basin (Washington) and Bi-State (California–Nevada) Distinct Population Segments. Movement potential was higher among leks within individual populations than between populations. Large core populations in Nevada, Oregon, and Idaho were especially well connected. Small populations (mean annual count of males summed across all leks <250) were smaller in spatial area and had lower connectedness compared to large populations. Five populations with no active leks observed between 1998 and 2007 had limited connectivity to only one or two neighboring populations; four of these also were among the smallest designated populations by area (Fig. 6).

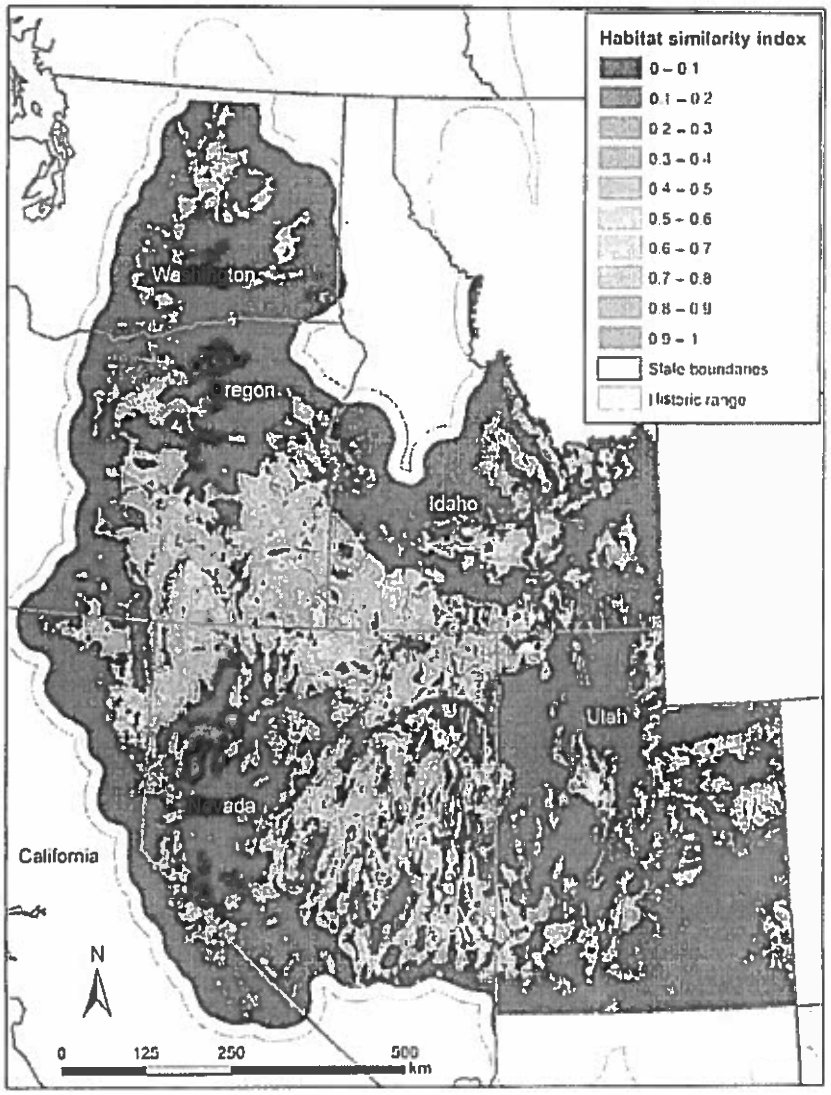

Figure 4. Habitat similarity index (HSI) values for greater sage-grouse across their western range. HSI values represent the relationship of environmental values at map locations to the multivariate model of minimum requirements for sage-grouse defined by land cover, anthropogenic variables, soil, topography, and climate.

Discussion

Sage-grouse are broadly distributed across western North America and occupy landscape matrices that vary widely in cover and configuration of sagebrush and other environmental characteristics (Johnson et al. 2011). Given this variability, it is difficult to accurately model habitat at fine spatial and thematic resolutions across the species range. Trade-offs are inherent because statistical relationships developed from small study extents can have high accuracy and use specific environmental variables, but have little predictive power elsewhere. Conversely, models developed from a general set of broad-scale, range-wide variables often fail to capture critical environmental factors specific to local areas (Scott et al. 2002). Therefore, developing a habitat model for sage-grouse required an approach that not only captured the spatial variability in their local environments but also maximized accuracy when applied across broad spatial extents. We developed and mapped an HSI representing a multivariate vector of ecological minimums that accurately discriminated the majority of lek locations including those in small, outlying populations from the study area and also from historic, but unoccupied locations.

Ecological minimums

Species distribution models provide insights into how a species is linked to its environment. Alternative forms of statistical functions and models each address different questions relative to species-habitat relationships (Scott et al. 2002; Elith et al. 2006). Among these statistical options, partitioned D^2 models that identify ecological minimums may not only be useful for modeling species

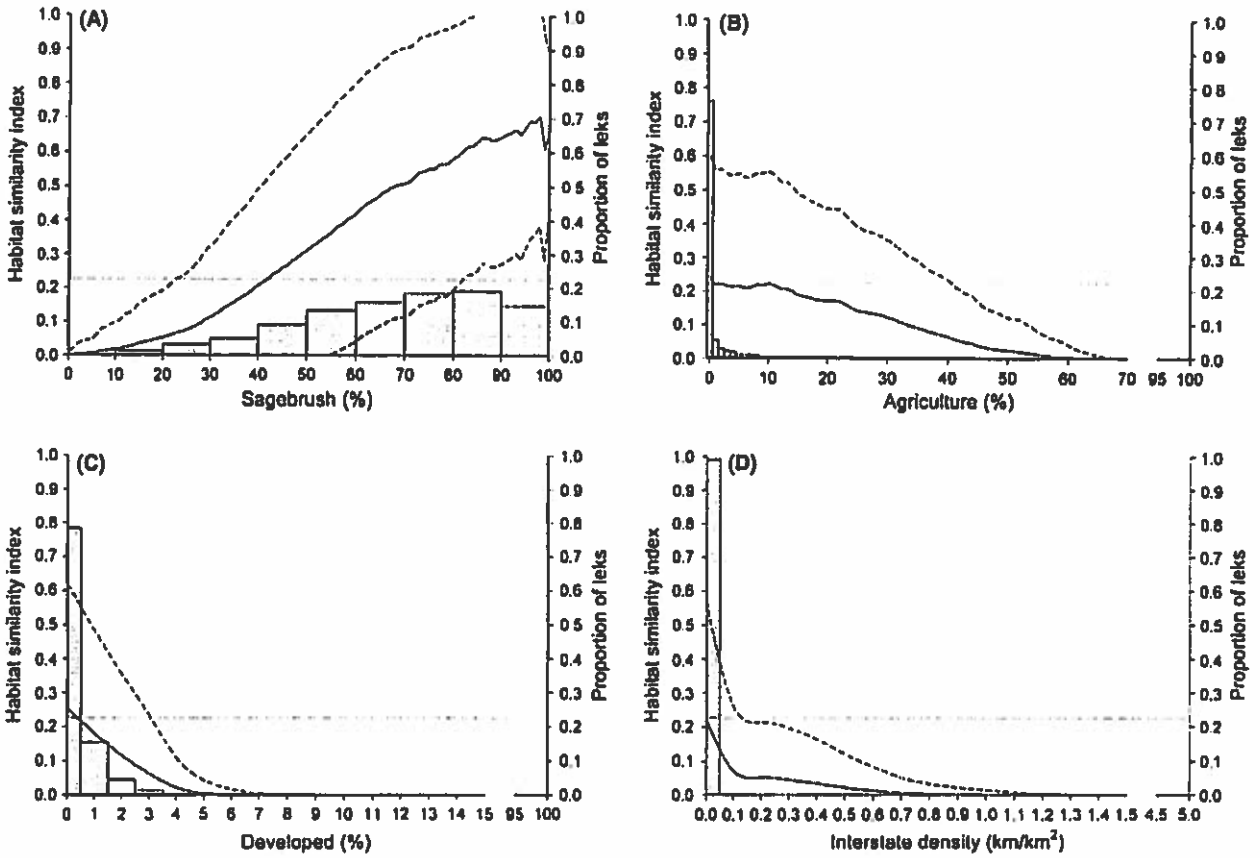

Figure 5. Changes in the habitat similarity index (HSI) relative to (A) sagebrush, (B) agriculture, (C) developed lands, and (D) density of interstate highways in the landscape within 5 km. Mean HSI values for study area (black line, ±1 SD [stippled lines]) and proportion of total leks (gray bars) were calculated for each increment of the environmental variables. Range of environmental variable values relates to the values within the study area. The dashed horizontal line indicates the HSI value (0.22) above which characterizes 90% of active leks.

distributions across large or changing environments but also provide important insights into that basic combination of factors necessary to support a species (Rotenberry et al. 2002; Browning et al. 2005). We used variables for land cover and human activities variables that affected sage-grouse directly but also included soil and abiotic characteristics because of their influence on distribution of sagebrush. We could not model fine-grained features, such as grass and forb understory composition, despite their seasonal importance to sage-grouse (Connelly et al. 2011) but suggest that these unmeasured components were captured within the environmental space of the ecological minimum.

Each partition of a D^2 model delineates a relationship between a species and a multivariate configuration of the selected variables. We selected the partition that defined ecological minimums based on multiple but somewhat subjective criteria (Dunn and Duncan 2000). Of the partitions having eigenvalues <1.0, $D^2(k = 10)$ provided the best combination of ability to identify lek locations in independent evaluation data, accurately map current sage-grouse regions based on known distributions, and was readily interpreted relative to sage-grouse habitat requirements.

The multivariate vector defined by $D^2(k = 10)$ not only clearly reflected dependence on sagebrush by sage-grouse but also revealed other factors associated with core environmental conditions in landscapes used by sage-grouse. Minimum thresholds for sagebrush land cover required by sage-grouse in the landscape are emerging from this and other range-wide studies. In this study, 90% of the active leks had at least 40% of the large-scale landscape dominated by sagebrush, which compares to 25% to 30% sagebrush within 18- and 30-km scales previously identified as necessary to support sage-grouse persistence (Aldridge et al. 2008; Wisdom et al. 2011). Our estimate that 98% of the active leks were in regions containing <25% agriculture in the landscape also concurs with other range-wide analyses on effects of cultivated croplands (Aldridge et al. 2008; Wisdom et al. 2011). Leks were absent from areas with relatively low levels of anthropogenic development and infrastructure. Historic sage-grouse locations that cur-

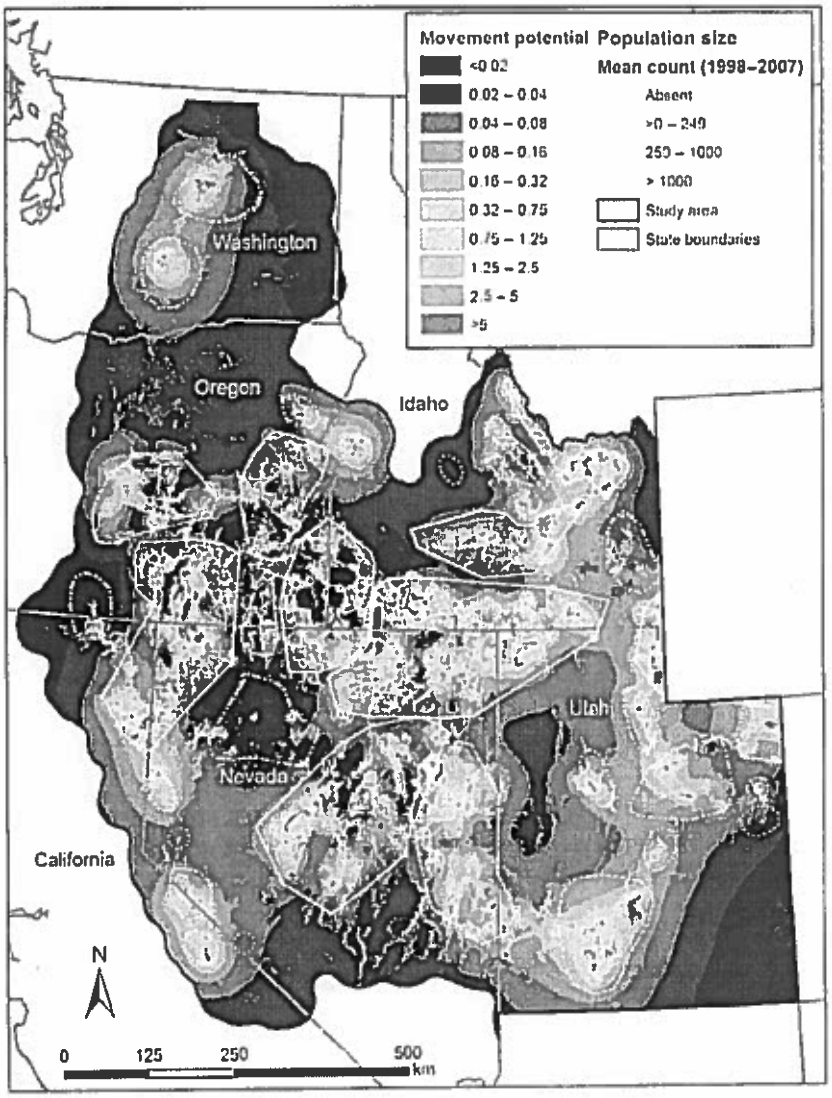

Figure 6. Estimated potential for sage-grouse movement among sage-grouse leks (Circuitscape; McRae 2006). Rescaled HSI values were used as a measure of landscape resistance.

rently are unoccupied were located in areas that now have high levels of development, indicating that human activity in addition to habitat loss may have contributed to extirpation from these areas (Aldridge et al. 2008; Wisdom et al. 2011). The ability of some leks to persist in landscapes containing lower amounts of sagebrush or greater levels of development likely was due to ameliorating presence of other ecological requirements.

Large-scale expansion and increasing dominance of invasive grasses in sagebrush shrublands at lower elevations is adversely affecting sage-grouse habitats (Knick et al. 2003). Synergistic feedbacks between invasive grasses and increased fire frequency and size has reduced sagebrush shrub cover and plant diversity and resulted in type conversions from sagebrush shrublands to non-native grassland landscapes (Davies 2011; Davies et al. 2011). The risk of further invasion by exotic grasses and ecosystem disruption over 100,000s of kilometers is moderate-to-high (Miller et al. 2011). At higher elevations, conifer and juniper woodlands are encroaching into sagebrush shrublands (Tausch et al. 1981; Miller et al. 2011), again resulting in lower habitat suitability for sage-grouse. Almost all leks were in areas containing little conifer or grassland cover in the surrounding landscape. Thus, two widespread trajectories of vegetation change are likely to further reduce habitat suitability across large areas of the sage-grouse range.

Active leks occurred only within a subset of the precipitation and temperature ranges even though climate varied widely across the study area. Sage-grouse currently occur in drier regions dominated by sagebrush. Thus, sage-grouse may have the ability to redistribute to areas that presently are cooler and wetter assuming that environmental conditions in new regions will be suitable and

available for sagebrush expansion. The southwestern United States is projected to become more arid and is likely to experience more extensive and intensive droughts (Intergovernmental Panel on Climate Change 2007; Seager et al. 2007). Sage-grouse population extirpations have been linked to severe droughts (Aldridge et al. 2008), suggesting that populations in southern and more arid portions of the range may be most vulnerable.

Population connectivity

Accurate maps of a species distribution are a primary goal of ecological niche-modeling (Elith et al. 2006). These maps can have an important role in conservation planning by delineating metapopulations and connecting corridors. Land and wildlife agencies currently are developing conservation actions for sage-grouse based on core or priority areas containing highest densities of breeding birds (Doherty et al. 2011). Less clear are land-use plans for regions outside of core areas that might be important for dispersal and gene flow. Species that have multiple interconnected populations are more likely to persist because risk of extirpation caused by regional events is confined to local populations; connectivity among populations ensures that recolonization can occur following local extirpation assuming that sufficient habitat remains (Thomas 1994; Hanski 1998). Populations within the interior portion of the sage-grouse range were highly interconnected. However, peripheral populations often were connected by habitat corridors only to one adjacent population. Human development or habitat loss that eliminates habitat in these corridors would further isolate those populations.

Synthesis and Applications

Sagebrush shrublands are likely to be lost and fragmented in the future from a broad array of stressors (Miller et al. 2011). Extensive wildfires, expansion of agriculture, and development of utility and transportation infrastructures within the western range of the sage-grouse may continue to reduce habitat for sage-grouse across their western range. In addition, sagebrush distribution is predicted to decrease under future climate and land cover changes in the southern portion of the range may be most affected (Neilson et al. 2005; Bradley 2010). Leks persisting in landscapes already below the basic minimum ecological requirements might be most at risk and could be targeted for conservation actions. Minimum thresholds defining lek presence provide a basis from which to determine effects of projected or proposed levels of land use and anthropogenic development in areas that currently support active leks or to identify areas suitable for restoration of future sage-grouse habitat. We also caution that our results were based solely on lek locations. Although leks are important focal points for breeding and subsequent nesting in the surrounding region, other seasonal use areas and habitat requirements may be equally limiting to sage-grouse populations.

Population size and isolation can have serious negative impacts on genetic variability and population persistence (Frankham 2006; Höglund et al. 2007). Our mapped corridors of habitat among populations provide an important step in designing conservation actions that facilitate dispersal and gene flow and reduce isolation and risk of extirpation.

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Conflict of Interest

None declared.

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WASHINGTON, D.C. 20240
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March 5, 2010

In Reply Refer To:
1110 (230/300) P

EMS TRANSMISSION 03/05/2010
Instruction Memorandum No. 2010-071
Expires: 09/30/2011

To: All Field Officials

From: Director

Subject: Gunnison and Greater Sage-grouse Management Considerations for Energy Development (Supplement to *National Sage-Grouse Habitat Conservation Strategy*)

Program Areas: Oil and Gas, Oil Shale, Geothermal, Wind, Solar, and Associated Rights-of-Way, Wildlife, Land Use Planning, National Environmental Policy Act.

Purpose: This Instruction Memorandum (IM) supplements the Bureau of Land Management's (BLM) 2004 *National Sage-Grouse Habitat Conservation Strategy* (BLM National Strategy). The BLM is issuing this IM in light of—

- recent peer-reviewed scientific studies addressing the impacts of oil and gas development on sage-grouse;
- the currently limited information available concerning the impacts of wind energy development on sage-grouse; and
- the increasing land use pressures on the public lands, including the BLM's authorization of renewable energy projects.

This IM identifies management actions necessary at some sites to ensure environmentally responsible exploration, authorization, leasing, and development of renewable and non-renewable energy resources within the ranges of the Gunnison sage-grouse and greater sage-grouse.

On March 5, 2010, the U.S. Fish and Wildlife Service announced that listing of the greater sage-grouse as an endangered species under the Endangered Species Act (ESA) is warranted, but listing is precluded by the need to complete other listing actions of higher priority. In view of this finding, it is of even greater importance that the BLM continue to work to improve the BLM National Strategy. This IM, focusing on energy development, is another step in that direction. When a range-wide "priority" or "core" sage-grouse habitat map is developed and as additional research on threats to sage-grouse other than energy development becomes available, the BLM will issue a more comprehensive Bureau-wide policy directive. The BLM will continue to work with its partners—the Western Association of Fish and Wildlife Agencies (WAFWA), U.S. Fish and Wildlife Service, U.S. Geological Survey, Natural Resources Conservation Service, U.S. Forest Service, and the Farm Service Agency—within the framework of the partners' Sagebrush Memorandum of Understanding (2008) (Sagebrush MOU) and the *Greater Sage-Grouse Comprehensive Conservation Strategy* (2006) (Multiagency Strategy).

Policy/Action: The Gunnison sage-grouse and greater sage-grouse are BLM sensitive species that are to be managed to promote their conservation and to minimize the need for listing under the ESA, in accordance with the BLM's special status species policy (BLM Manual 6840). Therefore, when necessary to maintain sustainable sage-grouse populations across the broader landscape within the state, field managers will implement an appropriate combination of the following actions in "priority habitat."

Generally speaking, "priority habitat" is the habitat of highest conservation value relative to maintaining

sustainable sage-grouse populations range-wide. Priority habitat will be areas of high quality habitat supporting important sage-grouse populations, including those populations that are vulnerable to localized extirpation but necessary to maintain range-wide connectivity and genetic diversity.

I. Actions Available for Protection of Sage-grouse Populations

Oil and Gas/Geothermal:

- Withhold from sale or defer the sale of parcels, in whole or in part, that industry has proposed for oil and gas or geothermal leasing in priority habitat as supported by analysis under the National Environmental Policy Act (NEPA) of the impacts of leasing on sage-grouse.
- If parcels are offered for sale in sage-grouse priority habitat, attach a lease notice to new leases alerting the lessee that additional conditions will be applied to approvals to develop to the lease, including Applications for Permit to Drill (APDs), sundry notices and associated rights-of-way, if future sage-grouse conservation efforts are appropriate.
- In priority habitat and where supported by NEPA analysis, attach conditions to the approval of APDs that are more protective than the stipulations or restrictions identified in the applicable Resource Management Plan (RMP), as appropriate.

Oil Shale:

- Screen new oil shale lease applications to identify whether the proposed leasing area includes priority habitat. If so, alert the applicant as early as possible that, pending NEPA analysis, the application may be delayed or denied or that lease stipulations and project conditions of approval may be imposed that designate avoidance areas or include No Surface Occupancy restrictions, for example.

Wind and Solar Energy Development and Associated Site Testing:

- Screen new right-of-way applications to identify whether the wind or solar energy development or site testing and project area includes priority habitat. If so, alert the applicant as early as possible that the application may be denied or that terms and conditions may be imposed on the right-of-way grant to protect priority habitat as supported by NEPA analysis.

Transmission:

- Re-route proposed transmission projects to avoid priority habitat.

RMP Revisions/Amendments:

- In RMP revisions and amendments, analyze one or more alternatives that would exclude priority habitat from energy development and transmission projects.

The BLM will consider how projects can avoid, minimize, and mitigate impacts onsite. However, the BLM may condition approval of a project proposal upon additional onsite modification or additional mitigation, including offsite mitigation.

Both the BLM and the state fish and wildlife agencies recognize that priority habitat has not been identified range-wide utilizing a consistent methodology. Until the BLM has fully engaged its state fish and wildlife agency counterparts in the mapping of priority habitat, the BLM will identify priority habitat using RMPs, state-led and Local Working Group sage-grouse plans, peer-reviewed literature, conservation plans or agreements, and professional judgment.

II. Future Actions for the Protection of Sage-grouse Populations

Further action that will help to develop a comprehensive Bureau-wide policy for the protection of sage-grouse populations and the conservation of habitat on a landscape scale will be pursued in the near future. These efforts will be undertaken within the collaborative framework established by the Sagebrush MOU and the Multiagency Strategy. Specifically, the following steps will be taken after issuance of this IM:

- The BLM will continue to work with the state fish and wildlife agencies, using a consistent protocol, to delineate and map areas of high priority habitat across the ranges of Gunnison sage-grouse and greater sage-grouse. This map will serve as a platform for a more directed Bureau-wide sage-grouse policy, similar to the approach already taken in Wyoming.

- Upon completion of a range-wide priority habitat map described above, each BLM State Office, working in coordination with the respective state fish and wildlife agency, will identify state-specific management actions (not limited to energy development) on a landscape level that will be undertaken both inside and outside of identified priority habitat in order to maintain sustainable sage-grouse populations.

Protection of sage-grouse populations and habitat is of critical importance, and several BLM State Offices have extensive sage-grouse conservation plans that were developed cooperatively with state fish and wildlife directors and stakeholder groups. In taking the steps listed above, the BLM will work diligently to ensure that it addresses local efforts or situations.

Timeframe: This IM is effective immediately.

Budget Impact: This IM will result in additional costs for mapping, coordination, NEPA review, and monitoring.

Background: It is imperative that fragmentation and degradation of Gunnison sage-grouse and greater sage-grouse habitat not continue to the point that sustainable sage-grouse populations can no longer be supported. In November 2004, the BLM published the BLM National Strategy. The BLM National Strategy set goals and objectives and assembled guidance and resource materials. It also provided comprehensive management direction for the BLM's contributions to the ongoing multi-state sage-grouse conservation effort, in cooperation with WAFWA. This IM reflects continued implementation of the goals set forth in the BLM National Strategy.

Although the focus of this IM is energy development, energy development is not the only or necessarily the most significant threat to Gunnison or greater sage-grouse. The purpose of this IM is to highlight management actions affecting sage-grouse habitat that will be necessary to sustain sage-grouse populations in light of new information and the Department of the Interior's energy-related priorities.

Since completion of the BLM National Strategy, additional peer-reviewed research analyzing the impacts of oil and gas development on greater sage-grouse has become available. Some aspects of oil and gas development affecting sage-grouse use of an area (e.g., construction of facilities, road networks, and resulting habitat fragmentation) also occur in other types of energy development. In addition, while not specific to Gunnison sage-grouse or greater sage-grouse, other research has been completed on the impacts of wind energy development on prairie chickens that is applicable to closely related species such as Gunnison and greater sage-grouse. The BLM will consider this body of research in the context of all energy development activities on the public lands.

The Mineral Leasing Act (Act or MLA) provides that all lands subject to the Act "which are known or believed to contain oil or gas deposits may be leased by the Secretary [of the Interior]." 30 U.S.C. 226(a) (2009). The Supreme Court held that the Act gives the Secretary broad discretion not to offer an oil and gas tract for leasing. *Udall v. Tallman*, 380 U.S. 1, 4 (1965). The U.S. Court of Appeals for the Ninth Circuit held that refusing to issue leases is a legitimate exercise of the Secretary's discretion under the MLA (*see Burglin v. Morton*, 527 F.2d 486, 488 (9th Cir. 1975) (citing *Tallman*, 380 U.S. at 4)). The Interior Board of Land Appeals has expressly held that lands identified for oil and gas leasing in an RMP are open for permissible uses, and the BLM has no duty to offer them for lease, even when the BLM has received a pre-sale non-competitive offer to lease (*Richard D. Sawyer*, 160 IBLA 158, 163 (2003)) or a nomination for competitive lease (*Marathon Oil Co.*, 139 IBLA 347 (1997)). The BLM may also decline to lease even after the BLM has received bids and bonus monies at a competitive lease sale (*Continental Land Resources*, 162 IBLA 1, 14-15 (2004)). The IBLA has also upheld the BLM's authority to impose more stringent protection measures on approval of development plans or permits than provided for in lease stipulations when supported by current science and analyzed through the NEPA process (*see William P. Maycock*, 177 IBLA 1 (2009); *Yates Petroleum Corp.*, 176 IBLA 144 (2008)).

Title V of the Federal Land Policy and Management Act, 43 U.S.C. 1761-1771, authorizes the Secretary to grant rights-of-way over, upon, under, or through the public lands for a variety of purposes, such as roads, water pipelines, systems for generation of electric energy, and communication systems. The IBLA has held that a decision to issue a right-of-way is discretionary. (*Mark Patrick Heath*, 161 IBLA 381, 388 (2004)). The discretionary nature of a right-of-way grant is underscored by BLM regulations at 43 CFR 2804.26, which provide that an application for a right-of-way may be denied if the proposed use would not be in the public interest.

Coordination: This IM was coordinated with the Assistant Director, Renewable Resources and Planning (WO-200), the Assistant Director, Minerals and Realty Management (WO-300), and BLM Deputy State Directors.

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