WYOMING OUTDOOR COUNCIL •
ENVIRONMENTAL DEFENSE FUND •
NATURAL RESOURCES DEFENSE COUNCIL •
THE SIERRA CLUB

March 4, 2013

Bureau of Land Management
Rawlins Field Office
Attn: Mr. Mark Ames
P.O. Box 2407
Rawlins, WY 82301

Re: Continental Divide-Creston Natural Gas Development Project Draft Environmental Impact Statement

Dear Mr. Ames:

Please accept these comments from the Wyoming Outdoor Council (WOC), Environmental Defense Fund (EDF), Natural Resources Defense Council (NRDC), and the Sierra Club regarding the above-referenced draft environmental impact statement (DEIS) that has been prepared by the Bureau of Land Management (BLM). Hereinafter we will refer to the Continental Divide-Creston project and project area as the CD-C.

WOC is Wyoming's oldest statewide environmental advocacy organization, and has worked to protect Wyoming's public lands and environment for over forty-five years. EDF's mission is to preserve the natural systems on which all life depends. Guided by science and economics, we find practical and lasting solutions to the most serious environmental problems. NRDC is a non-profit environmental membership organization with more than 565,000 members throughout the United States, including more than 900 who reside in Wyoming, and whose purpose is to safeguard the Earth: its people, its plants and animals and the natural systems on which all life depends. Since 1892, the Sierra Club has worked to help people enjoy, explore and protect the planet. Today, the Sierra Club has more than 2.1 million members and supporters throughout the United States, including almost 1000 members who live here in Wyoming.

The CD-C project would involve drilling up to an additional 8,950 natural gas wells generally in an existing natural gas development area that already contains 4,400 wells. The project area is generally in the "railroad checkerboard" land ownership pattern that extends roughly 20 miles north and south of Interstate 80. It includes 1.1 million acres, with the Federal government owning 58.6 percent of this acreage, the State of Wyoming 4.5 percent, and private parties owning 36.9 percent of the project area. The geographic center of the project area is found in the vicinity of Wamsutter, Wyoming. There are 60,176 acres of existing disturbance (5.6 percent of the project area), and under the

action proposed by the oil and gas companies active in this area (the "operators") another 47,200 acres of the project area (4.4 percent) would be disturbed.

I. INTRODUCTION.

In the following comments we will address the following concerns either directly in these comments or by reference to the expert comments regarding air quality we submit under separate cover.

- BLM's air quality analysis failed to:
    - Accurately consider baseline air quality conditions related to nitrogen oxide, and particulate matter pollution because it underestimates emissions from project sources as well as other air pollution sources affecting the project area, and fails to account for wintertime ozone impacts;
    - Consider indirect impacts on air quality including those resulting from deposition of air pollutants such as nitrogen and other impacts to ecosystems such as to critical trout fisheries in the area;
    - Consider cumulative impacts to air quality, including cumulative impacts to visibility in Class I areas and to ozone pollution levels in nearby nonattainment areas,
    - Provide sufficient mitigation measures to reduce air quality impacts so as to minimize adverse environmental impacts. In particular, it fails to control fugitive emissions from leaky equipment, vented emissions from well maintenance activities including liquids unloading activities, methane and volatile organic compound (VOC) emissions from sources that fall under state or federal VOC thresholds, and ensure compliance via adequate emissions monitoring and self-certification requirements,
    - Justify BLM's assumption of 100% compliance with best management practices (BMP), conditions of approval (COA), WY DEQ Presumptive best available control technology (BACT) and other regulatory requirements.
- BLM failed to take a "hard look" at the Operator's Proposed Action, and did not perform analyses to verify proposed project parameters.
- BLM's analysis of the direct and indirect effects of surface disturbance is not based on current and reliable scientific information and contradicts the agency's statements regarding the efficacy of mitigation.
- The DEIS did not address escalating effects of climate change on baseline ecosystem and air quality conditions.
- Resource values associated with continuous expanses of undeveloped habitat were not considered in connection with the agency's analysis of the direct and indirect project impacts.
- State-of-the-art technology was assumed in BLM's groundwater and surface water use and protection analysis, but these technologies are not required under existing and cited regulations, and implementation is not assured.

In light of these concerns, BLM should adopt Alternative D as its preferred alternative for the CD-C project, with modifications, as will be discussed in detail below.

II. AIR QUALITY ISSUES.

We incorporate the expert comments on BLM's air quality analysis, submitted by Ms. Megan Williams under separate cover, and which are also attached to this document as Appendix 1. Highlights of the expert comments and findings include:

- The BLM's air quality modeling analysis predicts significant ozone, nitrogen dioxide ($NO_{2)\ and}$ particulate matter (PM) impacts.
- The BLM's air quality modeling analysis predicts unacceptable health risks associated with hazardous air pollutant impacts.
- The BLM's air quality modeling analysis predicts significant cumulative visibility impacts.
- The BLM's air quality modeling analysis predicts significant direct and cumulative ecosystem impacts.
- The BLM's air quality modeling analysis does not assure the prevention of significant deterioration of air quality.
- The BLM's air quality modeling analysis is deficient and likely underestimates impacts of the project.
- The DEIS does not sufficiently address greenhouse gas emissions and climate change impacts from the proposed development.
- The DEIS does not include mitigation measures that will ensure adverse environmental impacts from the proposed development will be minimized.

We ask the BLM to fully consider these expert comments. In addition, we note the following two issues of concern in the air quality analysis in the DEIS.

A. Fugitive and Vented Emissions are not Adequately Addressed.

The air emissions inventory analyzed in the DEIS fails to conform to BLM's own data standards. BLM's NEPA Handbook requires that the agency must "[u]se the best available science to support NEPA analysis, and give greater consideration to peer-reviewed science and methodology over that which is not peer-reviewed." BLM National Environmental Policy Handbook H-1790-1 at 55. However, in this DEIS, BLM relied on "data from the CD-C Operators as the primary source of information" from which the agency compiled its air emission inventories for the CD-C project area. DEIS at 4-41.

In relying on information from CD-C Operators, BLM ignored a significant and growing number of peer-reviewed publications that have reported troubling leakage (fugitive and vented emissions) rates. *See, e.g.,* U.S. Environmental Protection Agency *(2011) Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2009 (*EPA Publication 430-R-11-005*);* Jeff Tollefson, *Air sampling reveals high emissions from gas field,* Nature, Feb. 7, 2012 (http://www.nature.com/news/air-sampling-reveals-high-emissions-from-gas-field-1.9982); Jeff Tollefson, *Methane leaks erode green credentials of natural gas,* Nature, Jan. 2, 2013 (http://www.nature.com/news/methane-leaks-erode-green-credentials-of-natural-gas-1.12123); Ramon A. Alvarez, et al., *Greater focus needed on methane leakage from natural gas infrastructure,* 109 PNAS 17, 6435-6440 (2012);

http://www.pnas.org/content/109/17/6435.full]; Terri Shires & Miriam Lev-On, API/ANGA, *Characterizing Pivotal Sources of Methane Emissions from Unconventional Natural Gas Production* ("API/ANGA Report") (Sept. 21, 2012) (reporting high emissions from liquids unloading activities across the country and in the Rockies).

The agency does not explain or justify its decision to rely on data provided by CD-C operators, despite ample reason to believe those data are inaccurate and incomplete. *See, e.g.,* Government Accountability Office, *Federal Oil and Gas Leases: Opportunities Exist to Capture Vented and Flared Natural Gas, Which Would Increase Royalty Payments and Reduce Greenhouse Gases,* (Oct. 2010), GAO-11-343 at 10 (operators significantly underreport to the Department of the Interior the amounts of natural gas produced that is vented and/or flared). Operators reported to the GAO that "they generally did not report operational sources [of gas emissions], and in some cases did not report intermittent sources as long as they were under BLM's permissible limits for venting and flaring." *Id. at* 11.

Fugitive and vented emissions are already a significant source of local air pollution and any increase will negatively impact local and regional air quality, including the nearby Upper Green River Basin ozone nonattainment area. According to inventories compiled by Environ for the Western Regional Air Partnership (WRAP), the second largest source of local VOC emissions in this area is "unpermitted fugitives," which contribute an estimated 25% of VOC emissions in southwestern Wyoming. Environ (2013), *Final Emissions Technical Memorandum 4c Figure 10* Meanwhile, Environ's 2015 emissions modeling projects net overall increases in southwest Wyoming VOC emissions. Environ (2012) *WRAP Phase III Inventories of Upstream Oil and Gas Activities in Wyoming*. According to these projections, Wyoming will have statewide VOC emissions of 135.8 thousand tons per year in 2015 (a 22.6 thousand tpy increase over the current inventory). The lion's share of these emissions (105.5 thousand tpy) is projected to emanate from the southwest Wyoming basin. These projections make the need to better quantify and control fugitive and vented emissions from this project all the more stark.

Furthermore, the DEIS makes it clear that the CD-C project area would contribute to conditions that bring the area close to exceeding the ozone standard under some development alternatives. *See, e.g.,* DEIS at 4-56 (Table 4.5-10) (indicating ozone levels under the proposed action will reach 97 percent of the current ozone standard).[1] It is possible that inclusion of realistic estimates for fugitive emissions will push areas close to exceedances over the standard.

Transmission of natural gas produced in the CD-C project area through infield gathering lines, and local and regional distribution networks is a reasonably foreseeable result of every alternative and action evaluated in the DEIS. EPA estimates that gathering lines and distribution networks that transport natural gas produced and emitted 570 billion

1 The EPA will initiate revision of the ozone National Ambient Air Quality Standard this year and will likely finalize the new rule by next year. There is a strong likelihood the standard will be reduced to within the range of 60-70 parts per billion. The BLM should consider this upcoming modification in its analysis and consider the implications of a stricter standard.

cubic feet of methane in 2009, which corresponds to 2.4% of gross U.S. natural gas production (1.9–3.1% at a 95% confidence level). U.S. Environmental Protection Agency *(2011) Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2009* (EPA Publication 430-R-11-005). However, BLM failed to consider as indirect and cumulative effects on air quality and on climate change increased natural gas emissions associated with leaks and venting in the natural gas transmission network between production wells in the project area and local distribution facilities. This omission is a serious flaw in the agency's analysis and must be corrected before any action is taken.

B. BLM has an Obligation to Minimize Adverse Environmental Impacts to Air Quality but it has not met this Obligation.

Under numerous regulatory and near-regulatory provisions the BLM is required to minimize the adverse environmental impacts of authorized oil and gas development. These requirements are found in BLM's oil and gas leasing regulations, standard lease form, leasing, permitting and easement regulations, Onshore Order No. 1, and other authorities. *See* 43 C.F.R. § 3101.1-2 (providing for reasonable measures to minimize adverse impacts); Standard Lease Form 3100-11 (providing that lessees shall/must conduct operations so as to minimize adverse impacts), 43 C.F.R. § 2920.7(b)(2) (providing that every land use authorization will minimize damage to resources), Onshore Order No. 1 §§ III.F.a.3 and IV (providing that operations must minimize adverse impacts and APDs must contain mitigation to minimize impacts).[2] In addition BLMs Gold Book makes various provisions for the minimization of adverse environmental impacts and several statutes make similar provisions. *See, e.g.,* 30 U.S.C. § 226(g) (providing that BLM shall "regulate" surface disturbing oil and gas activities "in the interest of conservation of surface resources"), 43 U.S.C. § 1732(b) (prohibiting unnecessary or undue degradation of the public lands).

As our expert air quality comments show, the CD-C DEIS does not meet the obligation to minimize adverse environmental impacts relative to air quality. In the concluding section to these comments a number of measures to reduce air pollution and impacts to air quality are identified. Although these measures are available to BLM, the DEIS did not consider, did not require, or otherwise overlooked them. Thus, BLM has not met its mandatory regulatory responsibility to minimize impacts to air quality that result from the CD-C oil and gas project.

As the comments point out on pages 41 to 46, a number of mitigation measures have not been fully evaluated, let alone required, as Best Management Practices (BMPs) or Conditions of Approval (COAs) for the CD-C project. Additional measures are needed to address exceedances of the 1-hour NO_2 standard. These could include field electrification, requirements for Tier 4 drill rigs, and centralization of well pad production facilities to reduce emissions from heaters. Exceedances of the 24-hour $PM_{2.5}$ standard support requirements for field electrification and steps to minimize traffic. Leak detection and repair protocols could help address issues related to elevated

[2] *See also* 43 C.F.R. §§ 3161.2, 3162.1(a), 3162.5-1(b), and 3164.3(b) (making various mandatory provisions requiring that oil and development only be authorized if environmental protection is assured).

ozone levels and climate change due to methane emissions. High formaldehyde levels could be addressed through the use of auto-igniters and surveillance systems. There is a need for stated and required setbacks of well pad facilities from things such as homes or other occupied sites. The expert comments identify a number of mitigation measures that have been applied by BLM in other oil and gas development project areas, as well as mitigation measures that are available through programs such as EPA's Natural Gas STAR program. None of these provisions are considered in the CD-C DEIS. Instead, all the agency does is presume that Wyoming's presumptive BACT permitting requirements will be used and operator commitments to use Tier 2 engines will be required, with additional and unknown mitigation measures possibly being required as a result of further analysis in the final EIS. These limited actions are insufficient in their breadth of measures considered, fall short of requiring necessary mitigation measures, and thus do not meet BLMs' obligation to minimize adverse environmental impacts.

We think that the measures we have suggested in the expert comments presented in Appendix 1 for reducing air pollution in the CD-C project area are necessary to minimize adverse environmental impacts. A number of significant impacts to air quality resources will result from development under BLM's current plans, including elevated ozone, NO_2, and $PM_{2.5}$ levels. To avoid these extreme and irreversible adverse impacts, BLM should consider, and adopt as BMPs and COAs where appropriate, measures like electrifying the field, requiring Tier 4 drill rig emissions controls, requiring operators to implement a rigorous leak detection and repair program,[3] and control venting from well maintenance activities such as workovers and liquids unloading.

III. INCOMPLETE ANALYSIS OF THE PROPOSED ACTION AND ALTERNATIVES.

A. No Hard Look at Operator's Proposed Action.

The Proposed Action analyzed in the CD-C DEIS is premised on a series of proposals for additional drilling submitted by BP America Production Company (BP) and "more than 20 other natural gas development companies" (collectively referred to in the DEIS and this comment document as "Operators"). DEIS at 1-1. Under the Proposed Action, "up to 8,950 additional natural gas wells would be drilled from an estimated 6,126 well pads" and "an estimated 42% of the future wells would be located on multiple-well pads and drilled to formation directly." DEIS at ES-4. The DEIS failed to analyze these projections, and made no attempt to determine whether the proposed number of 8,950 wells is reasonable or necessary to fully develop the target resource.

If the Proposed Action is adopted, nothing in the DEIS suggests that actual development will conform to the 8,950 wells, or 42% multiple-well pad figure. The agency and Operators acknowledge that the total number of wells depends on a variety of factors not considered in the agency's analysis of the Proposed Action or constrained by relevant agency regulation. *See,* DEIS at 1-3 (stating "total number of wells drilled

[3] See QEP's Energy Company's Leak Detection and Repair Program and SWEPI LP Leak Detection and Repair Program which are contained in Jonah Pinedale Anticline Development Area WY DEQ permits.

would depend largely on variables outside of the Operators' control, such as production success, appropriate engineering technology, economic factors, commodity prices, availability of commodity markets, and lease stipulations and restrictions.").

The agency also erred when it adopted without analysis the Operators' assumption that drilling will occur "at well densities of up to one well per 40 acres." DEIS at 1-3. In fact, information presented in Map 4.0-2 of the DEIS contradicts this assumption. DEIS at 4-9. Based on current well spacing orders in effect in the CD-C project area, it appears as though roughly 35 percent of the project area is subject to a 160-acre down-hole spacing order, 40 percent to an 80-acre spacing order, 10 percent to a 70-acre spacing order, and 15 percent to a 40-acre spacing order. *See id*. These are equivalent to 4 wells per section, 8 wells per section, 9 wells per section, and 16 wells per section, respectively. The following table shows the total number of wells that could be drilled on the 1,697 sections in the project area pursuant to the spacing orders.[4]

Number of Wells per Section Under Applicable Spacing Order	Estimated Percentage of Project Area the Spacing Order Encompasses	Potential Total Number of Wells Assuming 1,697 Sections in the Project Area
4—160-ac. Spacing	35	2,376
8—80-ac. Spacing	40	5,430
9—70-ac. Spacing	10	1,527
16—40-ac. Spacing	15	4,073
Total		**13,406**

Although BLM failed to perform this analysis, it appears that under applicable state and federal land use rules and spacing orders, up to 13,406 wells could be drilled in the project area. The DEIS failed to consider the direct, indirect and cumulative effects of this reasonably foreseeable level of development under the Proposed Action or any of the action alternatives.

Meaningful comparison between alternatives cannot occur as long as the Proposed Action is inaccurately defined and inadequately considered. In adopting the Operators' development projections without performing any independent analysis on proposed figures, BLM failed to take a "hard look" at the Proposed Action, and cannot perform an informed comparison between alternatives.

We urge the BLM to engage in a thorough analysis of the number of wells, and well pads, necessary to develop the target resource. This analysis should include the extent of resource and best available drilling technology, including multiple-well pad development and the drilling reach for directionally drilled wells. Additionally, we believe BLM should use this analysis as the basis for development and adoption of an overall well pad cap number, as a component of Alternative D.

[4] These data are calculated by multiplying 1,697 sections times the estimated percentage of the project area that a spacing order encompasses, and then multiplying the result of that by the number of wells permitted under the applicable spacing order.

B. Direct and Indirect Impacts to Vegetation and Wildlife Habitat, and Surface Disturbance Impacts, are not Considered Appropriately.

1. BLM's analysis of surface impacts ignores the agencies' own conclusions regarding vegetation.

BLM's assertion that, with respect to vegetation, "long-term impacts would be positive, assuming successful re-vegetation" is without current and reliable scientific basis and contradicts the agency's own statements regarding mitigation of surface impacts. DEIS at 4-76. The DEIS itself acknowledges that "the ability to re-establish native vegetation on sensitive soil types…is not well-documented in this area of Wyoming….[T]here is a lack of local seed sources for native forb and shrub species, and the recovery rate to restore native shrubs such as saltbrush and shadscale to their pre-existing condition is unknown." DEIS at 4-73. "Revegetation would likely be difficult in a large portion of the project area due to the high concentration of salts in the soils. Salt concentrations are exacerbated by surface-disturbing activities." DEIS at 4-227.

The BLM's incomplete analysis of impacts and the extent of surface disturbance undermine other portions of the DEIS. "Much of the analysis of impacts for each resource is related to the surface disturbance associated with the Proposed Action and Alternatives…which is over and above the existing disturbance in the project area." DEIS at ES-7. "Extent of impacts to all vegetation cover types would be influenced by the success of mitigation and reclamation efforts and the time period required for disturbed areas to return to pre-existing conditions." DEIS at 4-73. Ineffective and incomplete surface disturbance mitigation will deprive wildlife, livestock, and wild horses of valuable sources of food. DEIS at 4-75 ("Healthy, undisturbed rangeland is recognized by range managers as the best natural defense against invasive-plant establishment and soil loss."). Impacts associated with failed mitigation and ineffective revegetation efforts, including compounding impacts of erosion and lost habitat are not evaluated in the DEIS.

Evidence from the Pinedale Anticline amplifies the difficulty of reclamation in western and southwestern Wyoming. BLM's most recent report on reclamation in this project area shows that 70.5% of the well pads are not moving toward successful reclamation. http://www.blm.gov/wy/st/en/field_offices/Pinedale/anticline/wildlifemtg.html (click on the reclamation link in the February 20, 2013 report). Reasons for poor reclamation success possibly include improper soil preparation, seeding too late or early, mixing top soil with sub-soil, letting soil sit too long without testing or adding needed amendments, hydrocarbons in soil, poor seed quality and sources not locally adapted, and lack of soil moisture retention. The BLM in Pinedale has found these problems are due to inconsistent or inaccurate reporting, questionable reference site locations, a need to address issues sooner, and reclamation is not keeping up with the pace of disturbance. The BLM must consider this best available science as it plans for reclamation in the CD-C project area and ensure these problems are not replicated in order to adequately address direct, indirect, and cumulative impacts.

The agency also failed to consider the "unequivocal" impacts of climate change in its evaluation of the likelihood of successful mitigation and surface reclamation. DEIS at 4-

57. Predicted climate change impacts such as extended drought, severe weather patterns, and escalating water and wind erosion will stress vegetative communities and result in increased plant mortality at baseline conditions. These impacts will have a compounding effect by reducing the efficacy of existing revegetation and surface disturbance mitigation measures. As a result of BLM's failure to consider the effects of climate change on operators' ability to complete revegetation efforts, the DEIS significantly underestimates the total surface disturbance that will result from the Proposed Action and all alternatives.

Even where timing limitations and other environmental protection measures were considered, their mitigating impacts were only analyzed during operations. We believe BLM should, at a minimum, consider implementing these protections during all phases of operation and production. Where appropriate, measures should be imposed as BMPs, COAs, or lease stipulations. We note that the draft Lander resource management plan (RMP) considers this requirement. *See* Lander RMP DEIS at 98 (Record # 4056) (providing that "wildlife seasonal protections from surface-disturbing and disruptive activities apply to maintenance and operations actions when the activity is determined to be detrimental to wildlife").

The BLM's conclusion that the direct and indirect effects on vegetation are "similar under the Proposed Action and all action alternatives" is unsupported by data presented in the DEIS. Under BLM's own analysis, the "scope and intensity of the impacts" to the vegetation resource would be less widespread under Alternative D "because of the expected reduction in surface disturbance." DEIS at 4-73. The DEIS states that surface disturbance under Alternative D would be "approximately 34,449 acres," or 23% less than the Proposed Action. BLM did not explain, or attempt to explain, how it determined that a 23% difference in acres disturbed was negligible, or would result in "similar" impacts. In fact, the DEIS itself emphasized the beneficial direct and indirect effects of undisturbed vegetative cover. DEIS at 4-75.

2. <u>BLM's reliance on "habitat improvement projects" is unsupported by science or analysis.</u>

As part of its consideration of Alternative B, BLM proposes to address threshold surface disturbance exeedances with "habitat improvement projects." The agency describes these "habitat improvement projects" generally as "water developments" and "vegetation treatments such as herbicide treatments, seeding, prescribed burning, cutting/chopping for regeneration, planting shrubs or trees, fencing, establishing food plots, etc.." DEIS at 2-10.

However, as with mitigation measures in general, the agency did not provide any scientific basis to support the efficacy of the habitat improvement projects proposed. In fact, several peer reviewed reports, included in Appendix 2 to these comments, contradict BLM's claims that "habitat improvements" based on "vegetation treatments" will succeed in the CD-C project area, at least in sagebrush habitats. It is irresponsible and unreasonable to rely on undefined water developments and vague vegetation treatments to mitigate critical-level surface disturbances that are likely to cause damage to species and species habitat.

Rather, science supports vegetation treatments that focus on what is recognized many times in the DEIS as the most significant limiting factor in reclamation in the CD-C project area; restoring shrubs (i.e., sagebrush) in these arid lands. *See, e.g.,* DEIS at ES-10, ES-18, 4-72 to 73, 4-76 (noting the difficulty of restoring shrubs in these soils and environments). The DEIS repeatedly states that reclamation of shrubs typically will not occur during the life of this project. *Id.* Therefore, achieving better restoration of shrubs should be the focus of any "vegetation treatment" projects and the final EIS should so provide.

3. Habitat Fragmentation and Undeveloped Expanses.

BLM's analysis did not consider the specific and magnified value of preserving contiguous undeveloped parcels, nor did the agency fully evaluate the compounding nature of dispersed development, even though landscape modification and habitat fragmentation are key drivers of species loss. *See,* Fischer, J. and D. B. Lindenmayer. 2007. *Landscape modification and habitat fragmentation: a synthesis*. Global Ecology and Biogeography 16(3):265-280. Ecosystem fragmentation causes large changes in the physical environment as well as biogeographic changes. Fragmentation generally results in a landscape that consists of remnant areas of native vegetation surrounded by a matrix of agricultural or other developed land. As a result, fluxes of radiation, momentum (i.e., wind), water, and nutrients across the landscape are altered significantly. These in turn can have important influences on the biota within remnant areas, especially at or near the edge between the remnant and surrounding matrix.

The isolation of remnant areas by clearing also has important consequences for the biota. These consequences vary with the time since isolation, distance from other remnants, and degree of connectivity with other remnants. The influences of physical and biogeographic changes are modified by the size, shape, and position in the landscape of individual remnants, with larger remnants being less adversely affected by the fragmentation process. The dynamics of remnant areas are predominantly driven by factors arising in the surrounding landscape. Saunders, D. A., R. J. Hobbs, and C. R. Margules. 1991. *Biological consequences of ecosystem fragmentation: a review*. Conservation Biology, 5(1):18-32. In addition, extinction cascades are particularly likely to occur in landscapes with low native vegetation cover, low landscape connectivity, degraded native vegetation and intensive land use in modified areas, especially if keystone species or entire functional groups of species are lost.

BLM's analysis of habitat fragmentation in the DEIS is almost nonexistent. There is little or no consideration of the value of contiguous, undeveloped habitats relative to habitats with numerous, scattered disturbances, despite the fact that the DEIS recognizes that "[i]ndirect habitat loss can be substantially greater than the direct loss of habitat to roads and well-pad construction." DEIS at 4-85. We strongly encourage BLM to consider BMPs and plans for development that demonstrate an understanding and avoidance of activities and influences that create and exacerbate the impacts of fragmented ecosystems, as much as the questionable process of mitigation. BLM should analyze and adopt an integrated approach to landscape management that places

conservation reserves in the context of the overall landscape, avoids habitat fragmentation and accommodates seasonal ranges for key species before approving any proposed action. The 400 currently undeveloped sections in the CD-C project area present an excellent opportunity for reducing the impacts of habitat fragmentation, if they remain undeveloped.

4. Master Leasing Plans.

In its evaluation of Alternative B, the agency considered employing "overall development plan[s]," and proposed a number of specific items to be addressed in the plans. DEIS at 2-7. From the discussion, it is unclear whether the BLM also fully considered employing master leasing plan ("MLP") provisions, as authorized in Instruction Memorandum (IM) 2010-117. For example, the MLP provision to unitize leases might be a useful addition to the list of actions specified on pages 2-7 to 2-8 of the DEIS. MLPs and associated considerations should be evaluated in connection with each proposed alternative.

5. Population thresholds lack scientific basis.

In addition to new or expanded mitigation measures, Alternative B proposes "surface disturbance thresholds" that attempt to address "instances in the future where natural gas development is even more intense locally than currently anticipated or where overall impacts are greater than expected." DEIS at 2-8. We applaud the agency for including methods to address such "unintended" and unanticipated consequences, and believe that these methods should be adopted as part of any approved action.

However, if BLM adopts a plan involving population thresholds, BLM must address known problems with the approach. Concerns highlighted in peer-reviewed literature that are not addressed in the DEIS include: (1) concerns that exceedance of these thresholds might not be detected until it was too late to remedy the effects; (2) whether actions needed to be taken at a certain time and the specified actions are enforceable; and (3) this attempt at adaptive management might be more appropriately characterized as contingency planning. M.A. Nie and C.A. Schultz. 2012. *Decision Making Triggers in Adaptive Management*. Conservation Biology 26(6): 1137—1144 (presenting a review of the Pinedale Anticline mitigation matrix). The BLM should fully consider the problems that have attended the "mitigation matrix" on the Pinedale Anticline if population thresholds are met or exceeded. The mitigation matrix on the Pinedale Anticline has been the subject of considerable study and modification due to limitations and problems in the initial provisions, and the BLM Rawlins Field Office should ensure such problems do not attend the CD-C population thresholds and accompanying mitigation responses.

C. Water and Groundwater Impacts Not Adequately Analyzed.

1. Assumptions regarding technology and regulatory compliance unsupported, unreasonable.

BLM makes unsupported assumptions about operator practices in the agency's analysis of groundwater and surface water impacts. For the proposed action and each alternative, the DEIS states that operators will employ "state-of the art drilling and well completion techniques", "state-of-the-art pit and pipeline construction techniques," and will comply with the BMPs and COAs related to drilling, well completion and fluid handling. *See, e.g.* DEIS 4-33; 4-34; 4-36. Based on these assumptions, BLM concludes that the proposed action and all alternatives will not impact groundwater or surface water resources.

However, BLM admits that implementation of BMPs and COAs cannot be realistically anticipated. As the agency acknowledged, "[g]iven that there could be up to 30 companies operating within the project area, each with a unique approach to environmental protection measures, implementation of the BMPs and COAs will not be uniform." DEIS 4-23. BLM's assumption that all operators will adopt the most advanced technology available for drilling, well completion, and fluids management in the absence of any regulatory mandate and vigorous enforcement is misplaced and misinformed, at best. At least 5,000 existing wells will not be subject to such BMPs and COAs, and BLM offers no evidence, regulatory authority or operator statements to support the assertion that all new wells will follow advanced guidelines or adopt new technology. Therefore, we urge the agency to consider impacts to groundwater and surface water resources assuming less than 100% adoption of "state-of-the art" techniques, BMPs and COAs, and less than 100% compliance with federal and state law.

To allow for proper interpretation and analysis of this assumption, BLM must provide the public with comprehensive details of what is meant by the term "state-of-the-art techniques." While commenters may encourage the use of certain techniques such as closed-loop systems for wastewater management, neither the agency nor these groups can realistically evaluate the proposed plan, other alternatives and their respective impacts until specific measures are described in detail.

Although BLM identifies potential impacts to surface and groundwater resources from surface spills of fracking fluids, wastewater disposal, and problems with casing and cement jobs resulting in loss of wellbore integrity, the agency's rules for fracking are not final, and there is considerable doubt that the rule previously proposed will be passed unchanged. BLM should share the revised rule as soon as it is available, and revise its consideration of operator activity, to the extent changes in the rule, as compared to the withdrawn version, impact chemical disclosure requirements, wellbore integrity standards, air quality and emissions controls, water and wastewater management, and surface disturbance rules. Even if the rules were finalized before adoption of plans for this development, the agency cannot assume 100% compliance with federal and state rules, including adoption of BMPs and COAs, and provides no reasonable basis for that assumption.

BLM underestimates likely impacts to groundwater when it limits the zone of consideration to 500 feet from the wellbore, at stimulation intervals, and fails to justify this assumption. DEIS 4-30 ("It is expected that fracking effects would not extend beyond 500 feet from the well bore (EPA 2002)"). Plumes from surface spills and leaks could travel much further and easily impact shallow aquifers.

The DEIS states that, in connection with the proposed action, "30 additional injection wells and 20 other water handling facilities is planned in order to dispose of produced water related to the action alternatives." DEIS 4-31. It is unclear to the commenters where the agency obtained this figure, and we are concerned about its accuracy. This uncertainty is due, in part, to the agency's admission that "the Operators have not identified the anticipated well class or reservoirs capable of taking injected water at the volumes needed by the production rates projected in the area." DEIS 4-31.

Despite BLM's lack of clarity on the specific issue of how many treatment facilities will be needed, the agency failed to consider at least three significant impacts of inevitable wastewater treatment activity. First, although at least some of the "other water handling" facilities will use evaporative treatment methods, the DEIS omits consideration of air quality impacts associated with evaporation of wastewater, impacts on birds and other wildlife, and increased risks associated with spills and leakage from the facilities. DEIS 4-31. Second, BLM failed to consider reasonably foreseeable impacts associated with disposal and treatment of potentially hazardous and toxic solids remaining after evaporation. Third, the agency's analysis of current permitting parameters for existing injection wells does not take into account the cumulative impacts of 30 or more additional injection wells, which could receive between 30,000 barrels per day (1,410 acre ft/year) to 990,000 barrels per day (46,560 acre ft/year). BLM provides no support for the presumption that WDEQ can or will maintain existing UIC permitting levels to accommodate exponential increases in demand for subsurface volume.

2. <u>Conflicting Statements and Vague Volumetric Estimate of Potential Water Use Undermines Analysis.</u>

BLM's analysis of water use and impacts to groundwater contains conflicting statements. The Proposed Action description specifically prescribes the operators' use of produced water "to the greatest extent possible [to] conserve freshwater aquifers." DEIS 2-2. Indeed, the DEIS states that the 14.3 to 25.1 million barrels of water necessary for drilling, completion and well pad and road construction for all 8,950 contemplated wells within the project area (DEIS 4-27) "would come from existing and new water-supply wells within the project area, as well as from produced-water sources." DEIS 2-2, respectively.

In contrast, the agency relies on information provided by Operators to suggest that produced water will not be available for use in the project area. BLM states, "[d]ue to technological difficulties and regulatory constraints related to water quality, relatively little produced water can be beneficially used at this time (based on information provided by the Operators)." DEIS p. 4-27. The DEIS did not contain citations or

appendices detailing this information, allegedly provided by the operators. Insofar as BLM relies on this information in its assumptions or conclusions regarding water use, BLM must provide the source and substance for review. It is critical that the agency make public these sources due to the contradictory statements contained in the DEIS.

This conflict must be resolved before BLM can realistically estimate project water demand and associated impacts. If operators will not use produced water to supplement groundwater and freshwater sources, demand for groundwater rights in the project area will exceed anticipated volumes. Groundwater depletion in excess of the agency's estimates will negatively impact "springs and flowing wells that are important local water sources for livestock, wildlife, and wild horses," and "could lead to depletions to the Colorado River system." DEIS 4-28. These unanticipated consequences conflict with Rawlins RMP management objectives. *Id.* The severity of the impact is dependent on the quantity of groundwater withdrawal, an issue at which BLM has yet to take the required "hard look."

Compounding the agency's uncertainty regarding the extent of groundwater withdrawal and associated impacts is the DEIS's treatment of potential "coalbed natural gas" (CBNG) wells. DEIS at 2-1. Prompted by producers, the Proposed Action contemplates up to 500 coal bed methane wells in the project area. Appendix B, at 5. Although operators provided the agency with detailed information regarding construction and operations from CBNG wells, the agency failed to analyze direct, indirect and cumulative impacts associated with any CBNG wells. For example, although the agency acknowledges that CBM production uses more water than traditional drilling and production techniques, the DEIS does not consider the cumulative effects of any additional CBM wells on water supplies in the project area. *See,* DEIS Appendix B, at 4 (5); DEIS 4-21. Wastewater impacts associated with potential CBNG are likewise ignored. *Id.* The agency must consider the reasonably foreseeable CBNG impacts on water supplies, and wastewater management in its analysis of the Proposed Action and other action alternatives.

IV. BLM SHOULD ADOPT ALTERNATIVE D AS THE PREFERRED ALTERNATIVE, WITH MODIFICATIONS.

Based on the options presented in the DEIS, and corresponding analysis, we recommend that BLM adopt Alternative D, with modifications, as its preferred alternative. The selected plan should include the following elements:

- Enhanced Resource Protections, as described in Alternative B;
- Surface disturbance limits on active well pads within the project area, as described in Alternative C, using unitization of leases or lease suspensions to accomplish this;
- Emphasis on directional drilling as described in Alternative D, with estimated reaches in excess of the 2,500 feet currently assumed;
- Maintenance of continuous blocks of undeveloped land, and preventing development on the 400 undeveloped sections in the project area;

- Other BMPs for well integrity, emissions controls, water and wastewater handling, and noise, light and visual mitigation measures. *See,* "Doing it Right: Designing Oil and Gas Development Projects to Safeguard Wyoming's Outdoor Heritage," Appendix 3 to these comments.

Pursuant to NEPA, the hybrid alternative we request here could be adopted without a need for supplemental NEPA analysis because the environmental impact of these options has already been addressed in this DEIS. There is an extensive body of case law supporting this proposition, and under the Council on Environmental Quality NEPA regulations, supplementation is only required when a proposal is changed such that there are substantial changes in the proposed action relative to environmental concerns, or there are significant new circumstances or information. 40 C.F.R. § 1502.9(c)(1)(i)-(ii).

A. Alternative A.

The Proposed Action cannot be adopted as BLM's preferred alternative for at least two reasons. First, the agency failed to take a hard look at the proposed development. Second, Alternative A would produce the "most impact" or "extreme impact[s]" in all evaluated categories, and yields no benefits above those provided by other evaluated alternatives which all satisfy the purpose and need of the proposed action and allow full recovery of the estimated natural gas resource with fewer adverse impacts. *See* DEIS at 2-1, 4-2, 4-219 (stating that all action alternatives meet the purpose and need for the project and allow full recovery of the natural gas resource).

B. Benefits of Alternative B.

BLM admitted that all Alternatives discussed in the DEIS allow full development of the oil and gas resource. They would also meet the purpose and need that has been defined for this project. "The BLM believes that the Proposed Action and the action alternatives all have elements that would address the project purpose and need . . . ." DEIS at 2-1, 4-2. And, "[u]nder the Proposed Action and all action alternatives, the fluid mineral resources of the CD-C project area would be developed fully—12.02 Tcf of natural gas and 167.3 million barrels of liquids—in the context of known reserves and current extraction technologies." *Id.* at 4-219.

Based on the agency's conclusion regarding purpose and need, the mitigation measures discussed in Alternative B for Enhanced Resource Protection are not in conflict with full development of the fluid resource and meeting the stated purpose and need for this project. Given the benefits to vegetative communities, habitat, and wildlife in the project area that flow from the Enhanced Resource Protection measures, there is no basis for rejecting these resource protections, mitigation measures, BMPs, and limits on disturbance. Thus, there is no reason to omit any of the Enhanced Resource Protection elements outlined in Alternative B from any final action adoption.

C. Benefits of Alternative C.

In addition, a modified version of Alternative C that provides for lease unitization and/or lease suspensions as a means to regulate surface disturbance levels could also be adopted as a component of Alternative D because these limitations on surface disturbance would help BLM meet its obligation to minimize adverse environmental impacts, while still allowing for full development of the gas resource and meeting the project purpose and need. Suspension of leases has been successfully employed in the Pinedale Anticline project area as a means to reduce development pressure in some areas where 127,740 acres in the "flanks" receive special protection including 49,930 acres with suspended leases, effectively creating a low density development area. Suspension of leases was also used by BLM in the Jack Morrow Hills area during the development of the land use plan for that area. BLM can require both suspension and unitization of leases if it believes such will accomplish conservation objectives. *See* 30 U.S.C. § 226(m) (permitting lease unitization); 43 C.F.R. §§ 3103.4-4 (permitting suspension of leases "in the interest of conservation of natural resources"), 3161.2 (permitting unitization and suspension of leases). Therefore, lease suspension and/or unitization should be utilized as means to manage development density in the CD-C project area, and be adopted as a component of Alternative D.

D. Benefits of Alternative D.

Alternative D is superior to other alternatives because it satisfies the purpose and need of the proposed action and is more consistent with BLM's mandate to minimize adverse impacts of development. As the agency states, Alternative D is best suited to "minimize surface disturbance and to reduce habitat loss and wildlife disruption" and would "reduce habitat fragmentation and ongoing disturbance." DEIS 4-21. Any other selection will require significant justification from the agency, as well as scientific evidence and analysis not contained in this DEIS.

By utilizing infrastructure that already exists in the project area, and permitting single access corridors for required roads, pipelines, and electrical power distribution, indirect and cumulative impacts will also be avoided rather than mitigated. This is not the case for any other alternative. Due to the low probability of successful mitigation in the project area, a point acknowledged by the agency in all sections of the affected environment analysis, adverse impact avoidance is preferable to mitigation. Consolidating impacts by requiring directional drilling as proposed in Alternative D presents the best opportunity to diminish the potential for species extinction cascades and other serious and irreversible adverse impacts that occur in landscapes with low native vegetation cover, low landscape connectivity, degraded native vegetation and intensive land use in modified areas.

However, as a modification or supplement to Alternative D, the BLM should establish a limit on the number of well pads that can be drilled. Such a limit has been applied in the Pinedale Anticline project area in Sublette County. In the Pinedale Anticline project area, a 4,399 well project, no more than 600 well pads can be developed in the project area. Record of Decision Final Supplemental Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project at 6. The agency's failure to consider this option in the current DEIS is a significant shortcoming.

Numerous industry technical reports show current technology would allow directional drilling reaches considerably greater than the approximately 2,500 foot reach currently envisioned or assumed under Alternative D, where one well pad per section (there are 1,697 sections in the project area) could be drilled.[5] Thus, a cap on the number of well pads well below 1,697 should be possible, and would have significant environmental benefits.

V. CONCLUSION.

Thank you for considering these comments and the expert comments on air quality issues. We look forward to remaining involved in the CD-C NEPA process.

Sincerely,

Bruce Pendery,
Wyoming Outdoor Council

And on Behalf of:

Jon Goldstein
Environmental Defense Fund

Amy Mall
Natural Resources Defense Council

Connie Wilbert
The Sierra Club

cc (w/o Appendix 2): Governor Matt Mead
Ken Distler, EPA

[5] Putting in place a limit on the number of well pads that can be developed would also have the benefit of reducing air pollution emissions. There is concern that utilizing directional drilling rather than vertical drilling can increase air pollution emissions due to the increased time of drilling. However, if a limit on the number of well pads that can be developed was set at well below the current 1,697 well pad limit, this concern could be abated; and moreover, if the additional mitigation measures we argued for in section II.B. above so as to minimize adverse environmental impacts were put in place, this concern could be further eliminated.

Appendix 1

Appendix 2

Appendix 3

Doing it Right: Designing Oil and Gas Development Projects to Safeguard Wyoming's Outdoor Heritage

Wyoming Outdoor Council
Bruce Pendery and Lisa McGee

Wyoming has world-class energy resources and world-class natural resources. To ensure the Wyoming we love remains an incredible place to live and visit, the Wyoming Outdoor Council has established a balanced, two-pronged approach when it comes to energy development on public lands and federally owned minerals. There are some areas that are too valuable to our state for recreation, wildlife habitat, or other sustainable uses to risk losing to industrial development. These areas, which we often refer to as Heritage Landscapes, are places where development should not occur. You can see the Heritage Landscapes on our website at http://www.wyomingoutdoorcouncil.org/html/what_we_do/public_lands/heritage_landscapes.shtml.

In areas where energy development is not inappropriate, it should be "done right." That means safeguards should be put in place to protect human health, our clear skies and clean water, open space, and wildlife habitat. This review deals with this second category of lands, lands where oil and gas development must be "done right." These represent the majority of the public lands and federally owned minerals in Wyoming.

This report focuses on practices that are designed to minimize the impacts oil and gas development can have. Each project and every landscape is unique, and this report is not intended to be a one-size-fits-all set of recommendations. Because new technologies and better science are being developed every day, this report is a starting point. And because one practice or technique may be appropriate in some places, but not in others, permitting agencies must tailor project design features appropriately in order to ensure development is "done right" every time. There are several stages that precede an oil and gas development proposal on public land and federally owned minerals. Although many of our "doing it right" suggestions focus on practices and strategies agencies can require, and companies can undertake, at the drilling stage, there are two prior opportunities to condition development, and both are also critically important.

Land and Resource Management Plans

On public lands and federally owned mineral estates, the first opportunity citizens have to ensure oil and gas development is "done right" is during the planning stage. Both the Bureau of Land Management (BLM) and the Forest Service are required by law to develop overarching plans that guide land management decisions. Known as resource management plans on BLM lands and forest plans on National Forest lands, these documents are revised every fifteen years or so. Within plan revision processes, the public is asked to weigh in about appropriate uses on specific lands. An environmental impact statement, which considers a range of alternatives and the impacts associated with them, accompanies a land use plan.

Although BLM and National Forest lands are managed for multiple uses, not all uses can coexist on the same acreage. For this reason, plans designate areas suitable or unsuitable for certain types of uses. An area of crucial moose winter range for example, or a popular recreation area, may be unsuitable and eventually determined to be unavailable for future oil and gas development. If lands are made available for oil and gas development, various stipulations and conditions may be recommended for certain parcels within available lands.[6] Depending on the values at stake, sometimes doing it right means not doing it at all.

Oil and Gas Leasing

Once lands are designated available for leasing, the BLM and the Forest Service may receive requests from interested companies or individuals to lease various parcels for oil and gas development.[7] The agencies will consider whether to lease (or in the Forest Service's case whether to consent to have the BLM lease) the parcels. If the agencies decide to lease, there is opportunity to prepare additional environmental analysis. The agencies will also determine what stipulations to attach to the lease at that time. Stipulations define the basic terms of the lease contract. Many of the suggestions discussed below can be incorporated at the leasing stage in the form of no surface occupancy stipulations, stipulations that limit the times of the year companies can access certain areas, or stipulations that control surface use in other ways like creating buffers around sensitive areas. Stipulations are not the only terms or restrictions placed on a leaseholder; all federal oil and gas leases are issued "subject to" the terms and conditions of lease (which include significant environmental protection provisions) and all state and federal statutes, regulations, and other formal orders.

Drilling Stage

After public lands are leased, a company must file an Application for Permit to Drill (APD) that outlines its plans to drill and to disturb the surface. There is usually site-specific environmental analysis at this time, which can result in the addition of conditions of approval. These are additional terms a company must comply with in order to be granted permission to drill. This stage of the oil and gas development process, the drilling stage, is the focus of this report.

Many of the "doing it right" suggestions below can be added as conditions of approval at the APD stage or as stipulations during earlier stages when lands are leased. Listed below are

[6] There is no mandate that the agencies must lease available lands. Plans are designed to be visionary, "big picture" documents that guide management actions; but they do not typically make final decisions themselves. However, it is most always the case that lands made unavailable for leasing within a plan will not be leased during the life of the plan. Agencies have the ability to amend plans if circumstances warrant. Further environmental analysis is needed to amend a plan.

[7] The BLM has adopted guidance for how it will conduct oil and gas leasing. This Instruction Memorandum puts in place a number of requirements to ensure environmental protection prior to leasing. One of the most important provisions requires the development of "Master Leasing Plans" if certain requirements are met, and an MLP must consider a number of ways to reduce the impacts of oil and gas development, including not developing the area.

suggested actions and technologies that if implemented have the potential to minimize threats to wildlife, air and water quality, and human health.[8]

Safeguarding Wyoming's Wildlife

In Wyoming, we live in a place that still supports large, free-roaming wildlife populations. Wyoming's wildlife is diverse and bountiful. Our outdoor heritage is rooted in our appreciation for wildlife, and the many opportunities we have to encounter wildlife. The Wyoming Outdoor Council's goal is to ensure that if oil and gas development is authorized that it is conducted in a manner that safeguards wildlife to the greatest extent possible. Depending on the values at stake, sometimes doing it right might mean not leasing an area in the first place. In addressing how best to conserve wildlife in places that are already leased and facing oil and gas development proposals, the Wyoming Game and Fish Department has developed recommendations, which are based on the following prioritized approach:
The approach recommended to protect and maintain important wildlife resources … sets forth the following priority of actions: 1) avoid the impact; 2) minimize the impact through appropriate planning and management actions; 3) mitigate the impact by providing replacement or substitute resources; and 4) provide financial compensation only when no reasonable alternative is available to avoid, minimize or mitigate the impact.[9]

We support attempting to avoid the impacts in the first place and minimizing impacts through appropriate planning and management action. That is why the planning and leasing stages are so important. But there is also much that can be done to condition development at the drilling stage in order to mitigate impacts. The following are practices that agencies may require and/or companies may voluntarily adopt in order to safeguard wildlife.

1) Wildlife:
    a. Collect species-specific baseline data:
        i. Collect sufficient baseline data on all species of concern prior to development so that there is a full understanding of the species' needs.
    b. Reduce ground disturbance:
        i. Maintain large tracts of undeveloped/roadless lands by clustering development/consolidating infrastructure;
        ii. Drill multiple wells per pad;

[8] Three additional sources of information about practices that can help reduce the impacts of oil and gas drilling are the University of Colorado's website on oil and gas best management practices (BMPs), the EPA's Natural Gas STAR Program website, and the Earthworks Oil and Gas Accountability Project's website. These websites can be found at http://www.oilandgasbmps.org/, http://www.epa.gov/gasstar/, and http://www.earthworksaction.org/bestpractices.cfm.

[9] Recommendations for Development of Oil and Gas Resources in Important Wildlife Habitats, Wyoming Game and Fish Department, Revised April 2010, at 4. This report can be found at http://gf.state.wy.us/downloads/doc/O&G%20Recommendations%20April%202010%20with%20changes%20identified.pdf

iii. Phase development, i.e., no new well pads until other pads are reclaimed in part or in full;
iv. Construct irregularly shaped/contoured well pads that blend with the landscape;
v. Require interim reclamation of pads after drilling is completed;
vi. Consider alternative access points to ensure minimal roadbuilding, or require road building in less sensitive areas;
vii. Gate single-purpose roads (i.e., new access roads) and close/reclaim all unnecessary roads;
viii. If an area is particularly sensitive (e.g., steep slopes, unstable soil, roadless, etc.) require helicopter access instead of new road construction;
ix. Require ancillary facilities (work camps, water treatment facilities, etc.) to be located off site in less sensitive areas.

c. Avoid and/or provide adequate buffers for road or well pad construction in sensitive areas such as:
i. Known migration/stopover habitat;
ii. Big game crucial winter range;
iii. Sage-grouse core areas;
iv. Critical habitat for Endangered Species Act listed species or other agency-recognized sensitive species;
v. Key parturition areas;
vi. Den sites;
vii. Raptor nests and foraging areas; and
viii. Wetland and riparian areas.

d. Implement timing limitations:
i. Prohibit access during key times of the year such as in parturition habitats, crucial wintering areas, denning sites, and migration/stopover times.
ii. To the extent possible, these timing limitations should be applied for the life of the project, not only during the drilling stage.
iii. Remote monitoring and/or shutting in wells for part of the year may be required.
iv. Timing of operations may be controlled and limited to periods of the day when wildlife are less active.

e. Additional practices to minimize impacts to wildlife:
i. Prohibit open reserve fluid pits in favor of closed loop systems;
ii. Install mufflers or noise reduction devices on compressor stations and other mechanical equipment;
iii. Require workers to carpool to reduce truck traffic;
iv. Install a centralized liquids gathering system to reduce truck traffic;
v. Require training of employees about respectful and safe wildlife practices;
vi. Prohibit workers from carrying firearms to prevent poaching;
vii. Restrict the use of lighting, to be used at night only, to periods when people are present on the site and as required by safety regulations;
viii. Bury pipelines and power lines.

f. Monitoring, adaptive management and enforcement:

i. For species of concern, baseline data should be collected throughout the life of the project (drilling, production, and reclamation).
ii. Population thresholds or triggers should be established, and if met, pre-determined, specific management responses should be required.
iii. Clear consequences should be outlined and agreed to prior to drilling authorization if thresholds are exceeded. Consequences could include slowing the pace of development or disallowing new disturbances if warranted.
iv. Adequate oversight and an active presence by regulatory agencies are necessary to ensure all mitigation measures are being implemented.

g. Mitigation:
   i. Establish a mitigation plan for loss of habitat.
   ii. Onsite mitigation is preferable to offsite mitigation.

h. Reclamation:
   i. Require interim (i.e., partial) reclamation of well pads as soon as possible.
   ii. Require adequate bonding to ensure the protection of resources after the close of production.
   iii. Clear standards should be set and enforced regarding the extent to which the surface area must be returned to its pre-development condition.
   iv. Pre-disturbance ecological conditions should be reestablished.
   v. Require the use of appropriate native plants for reseeding efforts.
   vi. Monitor for several years after reseeding to determine whether reclamation was successful.

Protecting Wyoming's Air Quality

Historically Wyoming has enjoyed some of the cleanest air and clearest skies in the country. In fact, until recently, the air quality in Wyoming was said to be some of the best in the world—rivaling rural, mountainous countries like Tibet. In areas of the state with some of the most concentrated oil and gas developed, however, all of that has changed. The formerly clear skies and 100-mile mountaintop views from the Pinedale area are now often marred by haze. And, dangerous levels of ozone have been recorded, resulting in the state's recommendation to the Environmental Protection Agency (EPA) that some areas in the western part of the state are not in attainment of the national ambient air quality standards. In a 2009 technical report, the Air Quality Division of the Wyoming Department of Environmental Quality attributed high ozone levels in this part of the state to local oil and gas operations.[10]

The Wyoming Outdoor Council believes clean air and clear skies are essential components in keeping people in Wyoming healthy and providing for our high quality of life. State and federal agencies must do a better job of addressing air quality issues and ensuring air quality is something Wyoming can boast about again. Wyoming citizens should not have to sacrifice these values when there are practices and technologies agencies can require oil and gas companies to implement to ensure air quality is protected.

[10] *See* http://deq.state.wy.us/aqd/Ozone%20Main.asp for access to this report and other information on high ozone levels in the Pinedale area.

1) Air:
    a. Comply with existing laws, regulations and policies aimed to safeguard air quality:
        i. In areas now facing violations of the Clean Air Act due to existing oil and gas development, it is reasonable to question whether new oil and gas drilling projects can and should be authorized.
            1. Denying or pacing development is an option within areas that are not meeting standards.
        ii. In areas out of compliance with existing ozone standards, companies must adhere to Wyoming's state policy regarding offsets for nitrogen oxides (NOx) and volatile organic compounds (VOCs), precursors to the formation of ground-level ozone, a regulated air pollutant.
    b. Accept additional safeguards to protect human health:
        i. There could be stricter standards for ozone or NOx and VOCs, or new regulations that may be designed to regulate all immobile oilfield equipment owned and/or operated by a single company as a single source.

        ii. Companies should show a commitment to "doing it right."

    c. Conduct air quality monitoring and prepare modeling of future impacts:
        i. Monitor existing air quality to establish baseline data before new projects are authorized.
        ii. Modeling should be prepared to assess whether new development will be likely to violate existing laws and regulations that control pollution and protect visibility.
            1. Specific project design features should be incorporated within the modeling.
        iii. As a condition of project approval, monitoring throughout the life of the project should be conducted and established thresholds or triggers should be set with tangible consequences if exceeded.
                1. This can mean adjusting the rate, timing and places of development.
                2. Project design features and best management practices may be refined accordingly.
    d. Adhere to BLM's "Best Management Practices" recommendations to protect air quality[11] and the Forest Service's techniques for reducing emissions from oil and gas activities.[12] These include:
        i. Reducing tailpipe emissions and fugitive dust from truck traffic by:

[11] Many of the following recommendations come from BLM's May 9, 2011, Air Resource Best Management Practices for Fluid Mineral report at http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/bmps.Par.60203.File.dat/WO1_Air%20Resource_BMP_Slideshow%2005-09-2011.pdf.

[12] Emissions Reduction Techniques for Oil and Gas Activities. U. S. Forest Service. 2011. Available at http://www.fs.fed.us/air/documents/EmissionReduction-072011x.pdf.

1. Directional drilling.
2. Centralized water storage and delivery.
3. Centralized fracturing (fracking) pads with "hard line frac pipes" that can serve multiple wells.
4. Offsite centralization of production.
5. Use of liquids gathering systems.
6. Remote monitoring and well automation.
7. Carpooling workers in vans.
8. Applying water to dirt roads.
9. Applying chemicals to dirt roads.
10. Lowering speed limits.
11. Preventing dust by chip seal/asphalt.

ii. Reducing emissions during the drilling stage by:
1. Requiring Tier 4 diesel drill rigs or the equivalent (e.g., natural gas or electric drill rigs).
2. Prohibiting venting and flaring of gases during drilling stage and requiring "green completions" to recapture emissions.

iii. Reducing emissions during the production stage by:
1. Installing chemical pumps rather than pneumatic pumps.
2. Monitoring of wells with remote telemetry.
3. Using electricity, rather than diesel engines, to power compressor stations if the presence of overhead power lines doesn't pose a threat to wildlife or visual resources.
4. Updating seals, hatches, and valves to minimize VOC fugitive emissions.
5. Requiring the use of enclosed tanks rather than open pits to contain fugitive VOC emissions.
6. Using "vapor recovery units" on oil, condensate, and produced water tanks to reduce fugitive VOC emissions.
7. Optimizing glycol circulation in dehydrators to reduce methane emissions.
8. Capture and recycle methane by installing "flash tank separators."[13]
9. Use "selective catalytic reduction" technology in compressor (and drill rig) engines.
10. Replace "wet seals" with "dry seals" in centrifugal compressors.
11. Replace compressor rod packing at frequent intervals.
12. Replace "high-bleed" pneumatic devices with "low-bleed" devices and install retrofit bleed reduction kits on high bleed devices.

[13] For additional technical methods to reduce methane emissions *see Cost Effective Methane Emissions Reductions for Small and Midsize Natural Gas Producers*, Roger Fernandez, et al. published in the June 2005 issue of the Journal of Petroleum Technology. The report can be found at: http://www.oilandgasbmps.org/docs/GEN07-Cost-EffectiveMethaneEmissionsReductionsforSmallandMidsizeNaturalGasProducers.pdf.

13. Install "plunger lift systems" and "automated systems" in gas wells.

iv. Monitoring at the well head:

1. Implement a "directed inspection and maintenance" and "infrared leak detection" program.
    - Leaks can be detected with infrared cameras, organic vapor analyzers, soap solutions, and ultrasonic leak detectors.
    - Leaks can be measured using calibrated bagging, rotameters, and high volume samplers.

e. Adhere to Wyoming Department of Environmental Quality (DEQ) best available control technology (BACT) requirements for oil and gas development[14] and the offsets policy for ozone precursor emissions.[15] These provisions include:

i. 98 percent control of emissions from tank flashing, dehydration units, pneumatic pumps, and produced water tanks in the Jonah/Pinedale Anticline Development Area (JPDA).

ii. Additional controls in the JPDA for pneumatic controllers, well completions, blow downs/venting, and truck loading.

iii. Similar controls are applicable in other parts of the state, especially in Concentrated Development Areas in the southwest quarter of the state.

iv. Offsetting increases in NO_X emissions at a 1.1:1 ratio and increases in VOC emissions at a 1.5:1 ratio in Sublette County.

Safeguarding Wyoming's Clean Water and Protecting Water Reserves

Clean and abundant water is essential for the health of Wyoming residents, for our fish and wildlife populations, and for agricultural production. Oil and gas development can threaten the quality of surface waters and groundwater in several ways. Water contamination can occur through direct spills, leaking pits and tanks coupled with stormwater runoff, erosion and sedimentation, well blow-outs or underground migration of fluids and gases during drilling, and hydraulic fracturing ("fracking") operations. Although the stated goal in all development proposals is that contamination should not occur, human error and technical failure is not uncommon. For this reason, adherence to the highest operational standards is critical to prevent and remedy these serious problems.

Oil and gas development also requires vast quantities of water, and in the case of coalbed methane development, millions of gallons of groundwater are brought to the surface as a consequence of extracting natural gas. Depletion of aquifers is a concern to nearby landowners, whose water wells may be drawn down. In addition, the disposal of such large amounts of often salty water into streambeds can negatively affect water quality, fish and amphibians, and

[14] The DEQ's BACT requirements are available at http://deq.state.wy.us/aqd/oilgas.asp.

[15] The offsets policy is available at http://deq.state.wy.us/aqd/Ozone%20NSR%20Policy.asp.

vegetation. Careful planning and siting as well as proper disposal methods for produced water should be incorporated into any oil and gas development proposal.

1) Water:
    a. Comply with existing laws, regulations and policies aimed to safeguard water quality:
        i. Adhere to voluntary agreements not to use diesel fuel in fracking fluids.[16]
        ii. Support proposed regulation of all injections of fracking fluids under safe drinking water law designed to protect underground sources of drinking water.
        iii. Comply with the Wyoming Oil and Gas Conservation Commission's regulations regarding disclosure of fluids used in fracking.
        iv. Rules regarding stormwater runoff and any needed Clean Water Act permitting should be adhered to.
    b. Information gathering:
        i. Conduct groundwater/aquifer characterization, including areas (residential wells, springs, recharge areas) potentially affected within and down gradient of the project area.
        ii. Based on characterization results:
            1. Groundwater modeling will be used to adjust drilling based on projected impacts to springs, surface water, and groundwater.
            2. Groundwater monitoring wells will be established.
            3. Pre-drilling groundwater sampling in key aquifers will be conducted to establish a baseline.
            4. Limits will be established on the number of supply water wells that will be drilled. Locations and depths will be based on the groundwater characterization study and will inform the decision regarding concentration of facilities/footprint.
            5. Provide nearby property owners with information prior to development identifying the recommended water testing parameters/constituents for their private wells, to assist in their water quantity and quality baseline testing, if they so choose.
                - A Water Well Mitigation Agreement should be offered to owners of wells and springs that could potentially be affected by drilling operations.[17]

[16] One such agreement can be found at http://www.epa.gov/ogwdw000/uic/pdfs/moa_uic_hyd-fract.pdf.

[17] *See* Coalbed Methane Best Management Practices: A Handbook at 13, Western Governors' Association April 2006 at http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/oil_and_gas.Par.1132.File.dat/CoalBedMethane_WGA_2006.pdf.

6. Develop a groundwater pollution prevention and monitoring plan to be implemented during the life of the project through an agency-community team and with public review and comment.
7. Monitor water wells throughout the life of the project.

iii. Acquire baseline data for surface water quality:
1. Map wetlands, flood plains and riparian areas and include classification of streams and flows.
2. As a result of the mapping,
- Test surface water quality in any streams in the project area prior to any development.
- Establish a storm water pollution prevention plan for construction, with runoff and erosion controls factored in. Adhere to best management practices in the plan.
- Monitor surface water quality for the life of the project.

iv. Public disclosure of chemicals used:
1. Require full disclosure of all chemicals (using CAS numbers for identification) used in drilling and fracking operations.
- Include disclosure of the ingredients,
- Disclosure of the proportions of chemicals (i.e. the "formula"),
- Made a certain length of time before fracturing operations are scheduled to begin (e.g., 90 days advance notice), and
- Do not accept trade secret exemptions to the disclosure requirement.
* Or, if trade secret exemptions are made, allow disclosure of trade secrets to regulatory agencies and to health care professionals (whenever exposure has occurred) on as as-needed basis.

- Require notification to affected landowners where drilling/ fracking is scheduled to occur.

v. Project design features that can safeguard water resources:
1. Apply NSO stipulations (or don't lease areas) that overlie sole source aquifers or other important sources of drinking water.
2. Require well pads to be sufficiently setback from all streams, riparian areas, wetlands, springs, groundwater wells and homes.
- At least a 1/2 mile, or possibly 1-mile.
3. Require back flow prevention devices to be installed and used on all water supply wells and locked to prevent unauthorized use.
4. No open pits whatsoever should be allowed in favor of tanks and a closed loop system.
5. All wastes should be gathered and disposed of in proper locations off-site.
6. In coalbed methane production, produced water should be re-injected into the same aquifer or formation (or into an aquifer or formation of equal or lesser quality) to prevent degrading higher water quality and prevent surface water degradation.

7. Development should be prohibited in areas of steep slopes or unstable soils.
8. Require good well integrity.
    - Properly case, plug and abandon all wells no longer in use.
    - Properly case and screen all wells that are in current use.
    - Ensure that all water wells have good well integrity from top to bottom, to insure that excursions of fluids into those wells from other pressurized wells will not occur.

Supporting Communities and Our Small Town Quality of Life

In Wyoming, we treasure our small towns and safe, livable communities. An influx of temporary, non-resident workers—characteristic of oil and gas development—can have significant impacts on communities. Many towns around the state are experiencing increased crime and traffic, high housing costs, impacts to county and town roads and other infrastructure as well as overloaded services as a result of increased oil and gas development. Housing and non-energy related workforce shortages can be severe.

Although there is no easy solution to the societal consequences of oil and gas development, careful pacing of leasing and drilling may alleviate some of the adverse realities associated with a "boom and bust" economy. Phased development and proper long-range planning can help ensure that economic benefits of oil and gas development are realized into the future, not only for a short time. Special funding may also be required to maintain adequate social services, like law enforcement, medical clinics, and schools.

Special issues with Split Estate Lands

In Wyoming approximately 12.9 million acres of privately owned land (48 percent of all private land in Wyoming) is "split estate." This means that the federal government owns and controls the minerals underlying a piece of ground while a private landowner, often a farmer or rancher, controls the surface. The federal government can and does lease many of these split estate lands for oil and gas development. Obviously this creates important and difficult land management issues.

While this more complicated legal situation comes into play when there is a split estate, the BLM is still permitted and even obligated to protect surface resources on a split estate when it approves oil and gas drilling. If there are sage-grouse leks, or crucial big winter ranges, or sensitive aquatic resources, the agency must still take steps to protect these resources. That is, the "doing it right" provisions listed above can and should be applied to split estates as a condition of federal approval for drilling operations.

That said, a surface owner of split estate lands has special rights and a special role. Generally speaking the oil and gas operating company must demonstrate it has arrived at a surface owner agreement, received a waiver from the surface owner for access to the leased lands, arrived at a compensation agreement for damages to crops or tangible improvements, or in lieu thereof, the BLM can ensure an adequate bond is posted, as required by the Stock Raising

Homestead Act, which is the law that governs operations on many split estates. Moreover, the surface owner is entitled to participate in on-site visits to the proposed drilling location, and this affords the landowner an opportunity to have input regarding surface use protection provisions and reclamation specifications. The BLM is sensitive to this landowner input. The surface owner of a split estate has a special opportunity to ensure oil and gas development is "done right" on his or her property.

Wyoming has a law that affords split estate owners additional rights. This law, the Wyoming Surface Owner Accommodation Act, W.S. § 30-5-401 *et seq.*, provides that:

- 30 days notice must be given prior to obtaining access to private lands to allow for negotiations that allow activities with the least impact.
- Requires fair compensation to landowners for economic losses, including lost land value.
- Requires oil and gas companies to negotiate with landowners to plan oil and gas activities that could affect their lands, including placement of roads, pipelines, well sites, traffic patterns, etc.
- Where agreement cannot be reached, provisions for bonding are provided.

This law opens up additional opportunities to ensure oil and gas development is "done right" on privately owned surface lands. The BLM should commit to abiding by this Wyoming law.

Conclusion

If the above practices and procedures were fully applied, oil and gas development could occur in many areas of Wyoming, and in a way that makes the social and environmental impact of this activity acceptable to many citizens. Consequently, the BLM and the Forest Service should require and fully implement these practices.[18] Requiring these procedures is a means to not only ensure needed environmental protections, but also to maintain support for oil and natural gas development, and the oil and gas industry, among the citizens of Wyoming.

[18] Staff at the Wyoming Outdoor Council have developed a report that outlines the rights the agencies have to require these measures, and in fact their obligation to require them. *See* Bruce M. Pendery, *BLM's Retained Rights: How Requiring Environmental Protection Fulfills Oil and Gas Lease Obligations*, 40 ENVTL. L. 599 (2010). Available at: http://law.lclark.edu/law_reviews/environmental_law/past_issues/volume_40/40-2.php.