CENTER for BIOLOGICAL DIVERSITY Because life is good.

December 14, 2015

VIA FAX (303-239-3799)

Ruth Welch, State Director
Colorado State Office
BLM
2850 Youngfield St.
Lakewood, CO 80215

Dear Ms. Welch:

The Center for Biological Diversity (the "Center") hereby files this Protest of the Bureau of Land Management ("BLM")'s planned February 11, 2016 oil and gas lease sale and Determination of NEPA Adequacy ("DNA") DOI-BLM-COS010-2015-0020-DNA pursuant to 43 C.F.R. § 3120.1-3. The Center formally protests the inclusion of each of the following parcels, covering 4,912.33 acres in the Tres Rios Field Office in Dolores and Montezuma Counties:

COC77454
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COC77458

PROTEST

1. Protesting Party: Contact Information and Interests:

This Protest is filed on behalf of the Center for Biological Diversity and their board and members by:

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The Center is a non-profit environmental organization with 50,400 member activists, including members who live and recreate in the Tres Rios planning area, including the Jim Olterman-Lone Cone State Wildlife Area. The Center uses science, policy and law to advocate for the conservation and recovery of species on the brink of extinction and the habitats they need to survive. The Center has and continues to actively advocate for increased protections for species and habitats in the planning area on lands managed by the BLM and Colorado Parks & Wildlife. The lands that will be affected by the proposed lease sale include habitat for listed, rare, and imperiled species that the Center has worked to protect including the Gunnison's sage-grouse. The Center's board, staff, and members use the lands within the planning area, including the lands and waters that would be affected by actions under the lease sale, for quiet recreation (including hiking and camping), scientific research, aesthetic pursuits, and spiritual renewal.

2. Statement of Reasons as to Why the Proposed Lease Sale Is Unlawful:

BLM's proposed decision to lease the parcels listed above is substantively and procedurally flawed for the reasons discussed below.

I. BLM Must End All New Fossil Fuel Leasing and Hydraulic Fracturing.

Expansion of fossil fuel production will substantially increase the volume of greenhouse gases emitted into the atmosphere and jeopardize the environment and the health and well being of future generations. BLM's mandate to ensure "harmonious and coordinated management of the various resources *without permanent impairment of the productivity of the land and the quality of the environment*" requires BLM to limit the climate change effects of its actions.[1] Accordingly, BLM must keep all unleased fossil fuels in the ground by ending new leasing and banning fracking and other unconventional well stimulation methods in the Tres Rios Field Office and all other areas that it manages.

Halting all new leasing is necessary to preserve any reasonable chance of averting catastrophic climate disruption. The internationally agreed-on target for avoiding dangerous climate change and its disastrous consequences is limiting average global temperature rise caused by greenhouse gas pollution to two degrees Celsius (2°C), or 3.6 degrees Fahrenheit.[2] Climate experts have estimated that the world can emit 1,000 gigatons of carbon dioxide (1,000 $GtCO_2$ or 1 trillion tons of CO_2) after 2010 to have a reasonable chance of staying below 2°C of warming.[3] Given uncertainties, coupled with the dire predictions of climate change impacts, a more conservative carbon budget would be more prudent. Nonetheless, using this budget, the IPCC has found that proven fossil fuel reserves amount to **four to seven times more** than what

[1] *See* 43 U.S.C. §§ 1701(a)(7), 1702(c), 1712(c)(1), 1732(a) (emphasis added); *see also id*. § 1732(b) (directing Secretary to take any action to "prevent unnecessary or undue degradation" of the public lands).

[2] The Copenhagen Accord forged under the United Nations Framework Convention on Climate Change talks formally recognized the international objective of limiting warming to 2°C above pre-industrial.

[3] The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change, established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO). In its Fifth Assessment Report, the IPCC reported that the remaining carbon budget to have a "likely" (at least 66%) chance of staying below 2°C is 1000 GtCO2. See IPCC Climate Change 2014 Synthesis Report 63-64, available at http://ar5-syr.ipcc.ch/ipcc/ipcc/resources/pdf/IPCC_SynthesisReport.pdf.

we can afford to burn, to have only a *likely* chance of staying within the 2°C target.[4] In short, the vast majority of *proven* reserves must be kept in the ground for preserving a livable planet. Minimizing new development of these reserves is critical. Opening up new *unleased*, *unproven* areas to exploration and potential extraction—which are deemed unburnable—on the other hand, runs completely counter to staying within the 2°C target.[5]

According to a recent report by EcoShift Consulting commissioned by the Center and Friends of the Earth, unleased, unproven federal fossil fuels represent a significant source of potential greenhouse gas emissions:

- Potential GHG emissions of federal fossil fuels (leased and unleased) if developed would release up to 492 gigatons (Gt) (one gigaton equals 1 billion tons) of carbon dioxide equivalent pollution (CO2e); representing 46 percent to 50 percent of potential emissions from all remaining U.S. fossil fuels.
- Of that amount, up to 450 Gt CO2e have not yet been leased to private industry for extraction;
- Releasing those 450 Gt CO2e (the equivalent annual pollution of more than 118,000 coal-fired power plants) would be greater than any proposed U.S. share of global carbon limits that would keep emissions below scientifically advised levels.[6]

Further, existing federal leases are already a significant source of greenhouse gas emissions. Between 2003 and 2014 approximately 25 percent of all U.S. and three to four percent of global fossil fuel greenhouse gas emissions were attributable to federal fossil fuel production.[7] Halting new leasing within the Tres Rios Field Office and across all BLM lands would represent a significant opportunity to lock away millions of tons of greenhouse gas emissions.

At minimum, BLM must suspend leasing until it has evaluated the potential greenhouse gas impacts of its leasing program. BLM has *never* comprehensively considered the cumulative climate change impacts of all potential fossil fuel extraction across all BLM lands. But climate change is a problem of regional and global proportions resulting from the cumulative greenhouse

[4] *Id*. at 63. In addition, a recent analysis by some of the world's leading climate scientists estimated that burning the Earth's proven fossil fuel reserves (i.e., those that are currently economically recoverable) would emit 4196 $GtCO_2$, over four times the 1000 $GtCO_2$ budget. *See* Raupach M. et al. Sharing a quota on cumulative carbon emissions. Nature Climate Change 4, 873-79 (2014), available at http://www.nature.com/nclimate/journal/v4/n10/full/nclimate2384.html. Analyses by the Carbon Tracker Initiative and Australian Climate Commission estimated that 80% of proven fossil fuel reserves must be kept in the ground to have a reasonable probability (75-80%) of staying below 2°C. This estimate includes only the fossil fuel reserves that are considered currently economically recoverable with a high probability of being extracted. *See* Carbon Tracker Initiative, Unburnable Carbon – Are the world's financial markets carrying a carbon bubble? (2011), available at http://www.carbontracker.org/wp-content/uploads/2014/09/Unburnable-Carbon-Full-rev2-1.pdf; Steffen, Will et al., Australian Climate Commission. The Critical Decade 2013: Climate Change Science, Risks and Responses (2013), available at http://apo.org.au/files/Resource/ClimateCommission_The-Critical-Decade-2013.pdf

[5] Unleased reserves are not considered proven reserves. *See* note 6 below at 9.

[6] EcoShift Consulting et al., The Potential Greenhouse Gas Emissions of U.S. Federal Fossil Fuels (Aug. 2015), available at http://www.ecoshiftconsulting.com/wp-content/uploads/Potential-Greenhouse-Gas-Emissions-U-S-Federal-Fossil-Fuels.pdf,

[7] Climate Accountability Institute. Memorandum to Dunkiel Saunders, Friends of the Earth and Center for Biological Diversity. 2015, available at http://webiva-downton.s3.amazonaws.com/877/3a/7/5721/Exhibit_1-1_ONRR_ProdEmissions_Heede_7May15.pdf.

gas emissions of countless individual sources, which cannot simply be addressed piecemeal on a project-by-project basis. BLM would be remiss to continue leasing when it has never stepped back and taken a hard look at this problem at the appropriate scale. Before allowing more oil and gas extraction in the planning area, BLM must: (1) comprehensively analyze the total greenhouse gas emissions which result from fossil fuel leasing and all other activities on BLM lands, (2) consider their cumulative significance in the context of global climate change, carbon budgets, and other greenhouse gas pollution sources outside the planning area, and (3) formulate measures that avoid or limit their climate change effects. By continuing leasing in the absence of any overall plan addressing climate change BLM is effectively burying its head in the sand.

Exploration and development would likely involve the highly controversial industry practices of hydraulic fracturing or "fracking" and horizontal drilling. As discussed further below these practices deplete enormous water resources, risk toxic spills, contaminate air, and fragment and degrade habitat for species. For areas that are leased but not yet developed, BLM can further limit greenhouse gas emissions and minimize environmental degradation by banning fracking and other unconventional well stimulation practices.

Because continued leasing and fracking are incompatible with slowing the effects of global warming and preserving the health of our public lands, BLM must end new leasing and fracking immediately.

II. BLM's Determination of NEPA Adequacy Is Erroneous.

NEPA regulations and case law require that BLM evaluate all "reasonably foreseeable" direct and indirect effects of its leasing. 40 C.F.R. § 1508.8; *Davis v. Coleman*, 521 F.2d 661, 676 (9th Cir. 1975)*; Center for Biological Diversity, et al. v. Bureau of Land Management, et al.*, 2013 U.S. Dist. LEXIS 52432 (N.D. Cal. March 31, 2013) (holding that oil and gas leases were issued in violation of NEPA where BLM failed to prepare an EIS and unreasonably concluded that the leases would have no significant environmental impact because the agency failed to take into account all reasonably foreseeable development under the leases). Oil and gas leasing is an irrevocable commitment to convey rights to use of federal land – a commitment with readily predictable environmental consequences that BLM is required to address. These include the specific geological formations, greenhouse gas emissions, surface and ground water resources, seismic potential, or human, animal, and plant health and safety concerns present in the area to be leased. Analysis of the consequences of this practice, prior to irrevocable consequences, is therefore required at the leasing stage.

BLM's Determination of NEPA Adequacy improperly tiers to the Tres Rios Resource Management Plan Environmental Impact Statement (RMP EIS or EIS) for environmental analysis of various impacts that the RMP EIS does not address. For example:

- The EIS does not quantify methane leakage from pipelines and other fugitive sources, nor does it adequately discuss mitigation for these greenhouse gas sources. It also fails to quantify GHG emissions from construction, venting, flaring, transportation, refining, and end-user combustion. *See* EIS at 364-65 (quantifying GHGs only from drilling rig engines, hydraulic fracturing engines, compressor engines, and well pad separators/heaters). The EIS also does not provide an analysis of the "social costs of carbon." *See* section III(2) below.

- According to the Grand Junction RMP EIS, COGCC studies indicate that "surface and groundwater contamination, due to oil and gas development…occurred between 1,000 to 1,800 feet from the drilling."[8] NSOs to protect streams and other water bodies are inadequate, in that they require setbacks of only 325 feet for streams and other perennial water bodies and 50 feet for ephemeral streams. FEIS at 247, H-12. For lakes and reservoirs, a setback of only 0.25 mile (1320 feet) is required. FEIS at 247. These setbacks are also inadequate to protect the ESA-listed bonytail, Colorado pikeminnow, humpback chub, and razorback sucker ("endangered fish"), found downstream of the parcels in the tributaries or mainstems of the Dolores and San Juan Rivers, as well as the ESA-listed greenback cutthroat trout found within the planning area. *See* FEIS at 231.

In addition, the Tres Rios RMP EIS does not address effects on local resources that are reasonably foreseeable. For example:

- The RMP EIS acknowledges that "water used for [oil and gas] operations on state and private lands would likely come from ground or surface water sources within the planning area," which "has the potential to place pressure on existing domestic, municipal and agricultural groundwater uses at a time period when municipal demand for water is expected to grow." FEIS at 279. A number of streams are near the parcels for lease, but BLM has failed to analyze the potential for depletion of these streams (including direct effects or indirect effects through depletion of interconnected groundwater).

- The RMP requires an NSO to apply to all state wildlife areas (NSO Exhibit 3.13.1). Parcel 77456 is partially within the Jim Olterman-Lone Cone State Wildlife Area, but the lease sale notice does not indicate application of an NSO to this parcel. Valuable habitat for deer, elk, black bears, and dusky blue grouse would be harmed by drilling within this area. In addition, this NSO only provides that "NSO and other mitigations would be determined by the managing Agencies in cooperation with CPW," but there is no analysis of specific measures that would be applied to oil and gas development within or around parcels overlapping the State Wildlife Area.

- According to BLM's map of the parcels for lease there is very little oil and gas development within the vicinity of the parcels for lease. The sale of these parcels, which all appear to be within about 12 miles or less of each other and surround a cluster of several non-producing leased parcels, could foreseeably result in cumulative impacts to various local resources. This includes cumulative effects on local air quality as a result of increased traffic, drilling, methane venting and leakage, and construction; increased runoff pollution due to greater surface disturbance, new roads, and more vehicle traffic; cumulative effects on valuable habitat for mule deer, elk, and wild turkey due to habitat fragmentation and noise; and industrialization of the landscape and degradation of scenic

[8] Grand Junction Field Office RMP FEIS 6-271.

areas with increased well pads and other oil and gas infrastructure.[9] The Tres Rios RMP EIS did not address cumulative impacts within specific locales.

- Stipulations to protect sensitive plant species, including the "globally critically impaired" cushion bladderpod and Lone Mesa snakeweed, are subject to exceptions, waivers, and modifications without any specific criteria for how these exceptions will be applied. *See* Lease Sale Notice, Attachment D, Exhibit 2.2.1 ("Exceptions, modifications, and waivers would be considered for BLM leases."). Thus, there is no reason to believe that BLM will objectively apply protective measures to areas where they are needed, and no assurance that impacts to sensitive plant species will be mitigated. The same goes for numerous other stipulations attached to the lease parcels. *See generally* Lease Sale Notice, Attachment D. An EIS must reveal the impact of the failure to fully apply lease stipulations to the parcels at issue, including impacts to streams and other surface waters, groundwater, soil, lynx habitat, big game, raptors, state wildlife areas, and visual resources. BLM's environmental review must also address what alternative mitigation measures would be required where exceptions to lease stipulations are granted.

The following sections describe in greater detail foreseeable impacts that BLM must address in an EIS, or at the very least, an Environmental Assessment.

III. Fossil Fuel Development Will Exacerbate Climate Change

BLM cannot ignore the mounting evidence proving that oil and gas operations are a major cause of climate change. This is due to emissions from the operations themselves, and emissions from the combustion of the oil and gas produced. Every step of the lifecycle process for development of these resources results in significant carbon emissions, including but not limited to:

End-user oil and gas combustion emissions. The combustion of extracted oil, gas, and coal will add vast amounts of carbon dioxide to the atmosphere, further heating the climate and moving the Earth closer to catastrophic and irreversible climate change. Though much of the oil is used as gasoline to fuel the transportation sector, the produced oil may also be used in other types of products. The EIS should study all end-uses as contributors to climate change.

Combustion in the distribution of product. To the extent that distribution of raw and end-use products will rely on rail or trucks, the combustion of gasoline or diesel to transport these products will emit significant greenhouse gas emissions.

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[9] *See* Rocky Mountain Wild, Assessment of Biological Impact (ABI) Screen for Colorado February 2016 Lease Sale Notice and associated maps of species habitat and sensitive areas. ABI screen available at http://rockymountainwild.org/_site/wp-content/uploads/15-142_COFeb2016LeaseSaleNoticeScreen.xlsx. Maps available at http://rockymountainwild.org/_site/wp-content/uploads/15-142_COFeb2016LeaseSale_Map_1.pdf, http://rockymountainwild.org/_site/wp-content/uploads/15-142_COFeb2016LeaseSale_Map_2.pdf, http://rockymountainwild.org/_site/wp-content/uploads/15-142_COFeb2016LeaseSale_Map_3.pdf, http://rockymountainwild.org/_site/wp-content/uploads/15-142_COFeb2016LeaseSale_Game_Map_1.pdf, http://rockymountainwild.org/_site/wp-content/uploads/15-142_COFeb2016LeaseSale_Game_Map_2.pdf, http://rockymountainwild.org/_site/wp-content/uploads/15-142_COFeb2016LeaseSale_Game_Map_3.pdf.

Emissions from Refineries and Production. Oil and gas must undergo intensive refinery and production processes before the product is ready for consumption. Refineries and their auxiliary activities constitute a significant source of emissions.

Vented emissions. Oil and gas wells and coal mining operations may vent gas that flows to the surface at times where the gas cannot otherwise be captured and sold. Vented gas is a significant source of greenhouse gas emissions and can also pose a safety hazard.

Combustion during construction and extraction operations. Operators rely on both mobile and stationary sources of power to construct and run their sites. The engines of drilling or excavation equipment, pumps, trucks, conveyors, and other types of equipment burn large amounts of fuel to operate. Carbon dioxide, methane, and nitrous oxide (another potent greenhouse gas) are emitted from oxidized fuel during the combustion process. Engines emit greenhouse gases during all stages of oil and gas recovery, including drilling rig mobilization, site preparation and demobilization, completion rig mobilization and demobilization, well drilling, well completion (including fracking and other unconventional extraction techniques), and well production. Transportation of equipment and chemicals to and from the site is an integral part of the production process and contributes to greenhouse gas emissions. Gas flaring is another important source of carbon dioxide emissions.

Fugitive emissions. Potent greenhouse gases can leak as fugitive emissions at many different points in the production process, especially in the production of gas wells. Recent studies suggest that previous estimates significantly underestimate leakage rates.[10]

Natural gas emissions are generally about 84 percent methane.[11] Methane is a potent greenhouse gas that contributes substantially to global climate change. Its global warming potential is approximately 34 times that of carbon dioxide over a 100 year time frame and at least 86 times that of carbon dioxide over a 20 year time frame.[12] Oil and gas operations release large amounts of methane. While the exact amount is not clear, EPA has estimated that "oil and gas systems are the largest human-made source of methane emissions and account for 37 percent of methane emissions in the United States and is expected to be one of the most rapidly growing sources of anthropogenic methane emissions in the coming decades."[13] That proportion is based on an estimated calculation of methane emissions, rather than measured actual emissions, which indicate that methane emissions may be much greater in volume than calculated.[14]

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[10] Brandt, A. R. *et al.*, Methane leaks from North American natural gas systems, *343* Science 733 *(2014);* Miller, S. M. et al. Anthropogenic Emissions of Methane in the United States, Proc. Natl. Acad. Sci. Early Edition, DOI: 10.1073/pnas.1314392110 (2013) ("Miller 2013").

[11] Brown Memo to EPA at 3; Power, Thomas, The Local Impacts of Natural Gas Development in Valle Vidal, New Mexico, University of Montana (2005) ("Power").

[12] Intergovernmental Panel on Climate Change, Chapter 8: Anthropogenic and Natural Radiative Forcing in Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Table 8.7 (2013); Howarth, Robert, et al., Methane and the greenhouse-gas footprint of natural gas from shale formations, Climactic Change (Mar. 31, 2011) ("Howarth 2011"); Shindell, Drew, Improved Attribution of Climate Forcing to Emissions, 326 Science 716 (2009).

[13] U.S. Environmental Protection Agency, Natural Gas STAR Program, Basic Information, Major Methane Emission Sources and Opportunities to Reduce Methane Emissions ("USEPA, Basic Information"); *see also* Petron, Gabrielle, et al., Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study, 117 Journal of Geophysical Research (2012).

[14] Miller, S. M. et al. Anthropogenic Emissions of Methane in the United States, Proc. Natl. Acad. Sci. Early

For natural gas operations, production generates the largest amount; however, these emissions occur in all sectors of the natural gas industry, from drilling and production, to processing, transmission, and distribution.[15] Fracked wells leak an especially large amount of methane, with some evidence indicating that the leakage rate is so high that shale gas is worse for the climate than coal.[16] In fact, a research team associated with the National Oceanic and Atmospheric Administration recently reported that preliminary results from a field study in the Uinta Basin of Utah suggest that the field leaked methane at an eye-popping rate of nine percent of total production.[17]

For the oil industry, emissions result “primarily from field production operations . . . , oil storage tanks, and production-related equipment . . . .”[18] Emissions are released as planned, during normal operations and unexpectedly due to leaks and system upsets.[19] Significant sources of emissions include well venting and flaring, pneumatic devices, dehydrators and pumps, and compressors.[20]

BLM’s environmental analysis must address the following:

1. Sources of Greenhouse Gases

In performing a full analysis of climate impacts, BLM must consider all potential sources of greenhouse gas emissions (e.g. greenhouse gas emissions generated by transporting large amounts of water for fracking). BLM should also perform a full analysis of all gas emissions that contribute to climate change, including methane and carbon dioxide. The EIS should calculate the amount of greenhouse gas that will result on an annual basis from (1) each of the fossil fuels that can be developed within the areas for lease, (2) each of the well stimulation or other extraction methods that can be used, including, but not limited to, fracking, acidization, acid fracking, and gravel packing, and (3) cumulative greenhouse gas emissions expected over the long term (expressed in global warming potential of each greenhouse pollutant as well as CO_2 equivalent), including emissions throughout the entire fossil fuel lifecycle discussed above.

2. Effects of Climate Change

Edition, DOI: 10.1073/pnas.1314392110 (2013); PSE Healthy Energy Science Summary, “Climate Impacts of Methane Losses from Modern Natural Gas & Petroleum Systems,” October 2015 (noting 3.8% methane loss from natural gas drilling to distribution based on atmospheric measurements; loss rates above 2.8% negate any climate benefit associated with lower carbon dioxide emissions during fuel combustion).

[15] USEPA, Basic Information.

[16] Howarth 2011; Brune, Michael, Statement of Sierra Club Executive Director Michael Brune Before the Committee on Oversight & Government Reform (May 31, 2012); Wang, Jinsheng, et al., Reducing the Greenhouse Gas Footprint of Shale (2011); Alvarez, Ramon et al., Greater focus needed on methane leakage from natural gas infrastructure, Proc of Nat'l Acad. Science Early Edition (Feb 13, 2012) at 3; *see also* Howarth, Robert, et al., Venting and Leaking of Methane from Shale Gas Development: Response to Cathles et al., (2012); Hou, Deyi, et al., Shale gas can be a double-edged sword for climate change, Nature Climate Change at 386 (2012)

[17] Tollefson, Jeff, Methane leaks erode green credentials of natural gas, Nature News (Jan 2, 2013).

[18] Williams, Megan & Cindy Copeland, Earthjustice, Methane Controls for the Oil and Gas Production Sector (2010).

[19] *Id.*

[20] USEPA, Basic Information.

In addition to quantifying the total emissions that would result from the lease sale, an EIS should consider the social costs of these emissions, resulting from climate disruption's ecological and social effects. Although cost-benefit analysis is not necessarily the ideal or exclusive method for assessing contributions to an adverse effect as enormous, uncertain, and potentially catastrophic as climate change, BLM does have tools available to provide one approximation of external costs and has previously performed a "social cost of carbon" analysis in prior environmental reviews.[21] Its own internal memo identifies one available analytical tool: "For federal agencies the authoritative estimates of [social cost of carbon] are provided by the 2013 technical report of the Interagency Working Group on Social Cost of Carbon, which was convened by the Council of Economic Advisers and the Office of Management and Budget."[22] As explained in that report:

> The purpose of the "social cost of carbon" (SCC) estimates presented here is to allow agencies to incorporate the social benefits of reducing carbon dioxide (CO_2) emissions into cost-benefit analyses of regulatory actions that impact cumulative global emissions. The SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change.[23]

Leasing and development of unconventional wells could exact extraordinary financial costs to communities and future generations, setting aside the immeasurable loss of irreplaceable, natural values that can never be recovered. The EIS must provide an accounting of these potential costs in addition to the social cost of carbon.

Development of oil and gas resources will fuel climate disruption and undercut the needed transition to a clean energy economy. The no-action alternative is therefore not only reasonable but also imperative.

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[21] *See High Country Conserv'n Advocates v. United States Forest Serv.*, 2014 U.S. Dist. Lexis 87820 (D. Colo. 2014) (invalidating environmental assessment ["EA"] for improperly omitting social cost of carbon analysis, where BLM had included it in preliminary analysis); Taylor, P. "BLM crafting guidance on social cost of carbon -- internal memo," Greenwire, April 15, 2015, available at http://www.eenews.net/greenwire/stories/1060016810/; BLM Internal Memo from Assistant Director of Resources and Planning Ed Roberson ("Roberson Internal Memo"), April 2015, available at http://www.eenews.net/assets/2015/04/15/document_gw_01.pdf (noting "some BLM field offices have included estimates of the [social cost of carbon] in project-level NEPA documents") (accessed July 29, 2015); *see also* Council on Environmental Quality, Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts, p. 18, available at www.whitehouse.gov/administration/eop/ceq/initiatives/nepa/ghg-guidance (accessed Jul 29, 2015) (quantitative analysis required if GHGs > 25k tons/yr).

[22] BLM, Roberson Internal Memo.

[23] *See* Interagency Working Group on Social Cost of Carbon, United States Government, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866, May 2013, available at https://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf (accessed July 29, 2015); *see also* Interagency Working Group on Social Cost of Carbon, United States Government, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, Feb. 2010, available at http://www.epa.gov/otaq/climate/regulations/scc-tsd.pdf (accessed July 29, 2015).

IV. The Dangers of Hydraulic Fracturing and Horizontal Drilling

If any of the leased parcels reach the development phase, there is a reasonably foreseeable probability that the controversial practice of hydraulic fracturing would be employed. Fracking brings with it all of the harms to water quality, air quality, the climate, species, and communities associated with traditional oil and gas development, but also brings increased risks in many areas. Analysis of the consequences of this practice, prior to irrevocable consequences, is therefore required at the leasing stage.

Elements of these technologies have been used individually for decades. However, the combination of practices employed by industry recently is new: "Modern formation stimulation practices have become more complex and the process has developed into a sophisticated, engineered process in which production companies strive to design a hydraulic fracturing treatment to emplace fracture networks in specific areas."[24]

Hydraulic fracturing, a dangerous practice in which operators inject toxic fluid underground under extreme pressure to release oil and gas, has greatly increased industry interest in developing tightly held oil and gas deposits such as those in the proposed lease area. The first aspect of this technique is the hydraulic fracturing of the rock. When the rock is fractured, the resulting cracks in the rock serve as passages through which gas and liquids can flow, increasing the permeability of the fractured area. To fracture the rock, the well operator injects hydraulic fracturing fluid at tremendous pressure. The composition of fracturing fluid has changed over time. Halliburton developed the practice of injecting fluids into wells under high pressure in the late 1940s;[25] however, companies now use permutations of "slick-water" fracturing fluid developed in the mid-1990s.[26] The main ingredient in modern fracturing fluid (or "frack fluid") is generally water, although liquefied petroleum has also been used as a base fluid for modern fracking.[27] The second ingredient is a "proppant," typically sand, that becomes wedged in the fractures and holds them open so that passages remain after pressure is relieved.[28] In addition to the base fluid and proppant, a mixture of chemicals are used, for purposes such as increasing the viscosity of the fluid, keeping proppants suspended, impeding bacterial growth or mineral deposition.[29]

Frack fluid is hazardous to human health, although industry's resistance to disclosing the full list of ingredients formulation of frack fluid makes it difficult for the public to know exactly how dangerous.[30] A congressional report sampling incomplete industry self-reports found that

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[24] Arthur, J. Daniel et al., Hydraulic Fracturing Considerations for Natural Gas Wells of the Marcellus Shale at 2 (Sep. 2008) ("Arthur") at 9.
[25] Tompkins, *How will High-Volume (Slick-water) Hydraulic Fracturing of the Marcellus (or Utica) Shale Differ from Traditional Hydraulic Fracturing?* Marcellus Accountability Project at 1 (Feb. 2011).
[26] New York State Department of Environmental Conservation, *Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs* at 5-5 (Sep. 7, 2011) ("NYDEC SGEIS") at 5-5.
[27] *Id.*; Arthur at 10; United States House of Representatives, Committee on Energy and Commerce, Minority Staff, *Chemicals Used in Hydraulic Fracturing* (Apr. 2011) ("Waxman 2011b").
[28] Arthur at 10.
[29] Arthur at 10.
[30] Waxman 2011b; *see also* Colborn, Theo et al., Natural Gas Operations for a Public Health Perspective, 17 Human

"[t]he oil and gas service companies used hydraulic fracturing products containing 29 chemicals that are (1) known or possible human carcinogens, (2) regulated under the Safe Drinking Water Act for their risks to human health, or (3) listed as hazardous air pollutants under the Clean Air Act."[31] Recently published scientific papers also describe the harmfulness of the chemicals often in fracking fluid. One study reviewed a list of 944 fracking fluid products containing 632 chemicals, 353 of which could be identified with Chemical Abstract Service numbers.[32] The study concluded that more than 75 percent of the chemicals could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems; approximately 40 to 50 percent could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37 percent could affect the endocrine system; and 25 percent could cause cancer and mutations.[33] Another study reviewed exposures to fracking chemicals and noted that trimethylbenzenes are among the largest contributors to non-cancer threats for people living within a half mile of a well, while benzene is the largest contributor to cumulative cancer risk for people, regardless of the distance from the wells.[34]

The impacts associated with the fracking-induced oil and gas development boom has caused some jurisdictions to place a moratorium or ban on fracking. For instance, in 2011 France became the first country to ban the practice.[35] In May, Vermont became the first state to ban fracking. Vermont's governor called the ban "a big deal" and stated that the bill "will ensure that we do not inject chemicals into groundwater in a desperate pursuit for energy."[36] New York State halted fracking within its borders in 2008, continued the moratorioum in 2014 and banned the practice in 2015, stating "New York State officially banned fracking for natural gas by issuing its final environmental impact statement, concluding a seven-year review. The environmental agency said fracking posed risks to land, water, natural resources and public health."[37] [38] Also, New Jersey's legislature recently passed a bill that would prevent fracking waste, like toxic wastewater and drill cuttings, from entering its borders,[39] and Pennsylvania, ground zero for the fracking debate, has banned "natural-gas exploration across a swath of suburban Philadelphia . . . ."[40] Numerous cities and communities, like Buffalo, Pittsburgh, Raleigh, Woodstock, and Morgantown have banned fracking.[41]

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and Ecological Risk Assessment 1039 (2011) ("Colborn 2011"); McKenzie, Lisa et al., Human Health Risk Assessment of Air Emissions form Development of Unconventional Natural Gas Resources, Sci Total Environ (2012), doi:10.1016/j.scitotenv.2012.02.018 ("McKenzie 2012").

[31] Waxman 2011b at 8.

[32] Colborn 2011 at 1.

[33] Colborn 2011 at 1.

[34] McKenzie 2012 at 5.

[35] Castelvecchi, Davide, *France becomes first country to ban extraction of natural gas by fracking*, Scientific American (Jun. 30, 2011).

[36] CNN Staff Writer, *Vermont first state to ban fracking*, CNN U.S. (May 17, 2012).

[37] Public News Service - NY, *Cuomo Declares: No Fracking for Now in NY.* See: http://www.publicnewsservice.org/2014-12-18/health-issues/cuomo-declares-no-fracking-for-now-in-ny/a43579-1 .

[38] RT Network. June 30, 2015. *It's official: New York bans fracking.* https://www.rt.com/usa/270562-new-york-fracking-ban/ .

[39] Tittel, Jeff, *Opinion: Stop fracking waste from entering New Jersey's borders* (Jul 14, 2012).

[40] Philly.com, *Fracking ban is about our water*, The Inquirer (Jul. 11, 2012).

[41] *CBS, Pittsburgh Bans Natural Gas Drilling*, CBS/AP (Dec 8, 2010); Wooten, Michael *City of Buffalo Bans Fracking* (Feb. 9, 2011); The Raleigh Telegram, *Raleigh City Council Bans Fracking Within City Limits* (Jul. 11, 2012); Kemble, William, *Woodstock bans activities tied to fracking*, Daily Freeman (Jul. 19, 2012); MetroNews.com, *Morgantown Bans Fracking* (June 22, 2011),

Notwithstanding the grave impacts that these practices have on the environment, this new combination of multi-stage slickwater hydraulic fracturing and horizontal drilling (hereinafter "fracking") has made it possible to profitably extract oil and gas from formations that only a few years ago were generally viewed as uneconomical to develop.[42] In large part through the use of fracking, the oil and gas sector is now producing huge amounts of oil and gas throughout the United States, rapidly transforming the domestic energy outlook. Fracking is occurring in the absence of any adequate federal or state oversight. The current informational and regulatory void on the state level makes it even more critical that the BLM perform its legal obligations to review, analyze, disclose, and avoid and mitigate the impacts of its oil and gas leasing decisions.

V. All Oil and Gas Operations Pose Risks to Water Resources

Oil and gas operations, including hydraulic fracturing and other unconventional stimulation methods, are significant threats to water resources.

A. Hydraulic Fracturing and Other Unconventional Stimulation Methods

While much remains to be learned about fracking,[43] it is clear that the practice poses major dangers to water resources. **A**cross the U.S., in states where fracking or other types of unconventional oil and gas recovery has occurred, surface water and groundwater have been contaminated. Recent studies have concluded that water contamination attributed to unconventional oil and gas activity has occurred in several states, including Colorado,[44] Wyoming,[45] Texas,[46] Pennsylvania,[47] Ohio,[48] and West Virginia.[49] Despite this danger, fracking

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http://www.wvmetronews.com/news.cfm?func=displayfullstory&storyid=46214.

[42] CITI, *Resurging North American Oil Production and the Death of the Peak Oil Hypothesis* at 9 (Feb. 15, 2012) ("CITI"); USEIA 2011 at 4; Orszag, Peter, *Fracking Boom Could Finally Cap Myth of Peak Oil* (Jan. 31, 2011) ("Orszag").

[43] United States Government Accountability Office, Unconventional Oil and Gas Development – Key Environmental and Public Health Requirements (2012); United States Government Accountability Office, Oil and Gas – Information on Shale Resources, Development, and Environmental and Public Health Risks (2012).

[44] Trowbridge, A. *Colorado Floods Spur Fracking Concerns*, CBS News, Sept. 17, 2013, available at http://www.cbsnews.com/8301-201_162-57603336/colorado-floods-spur-fracking-concerns/ ("Trowbridge 2013") (accessed July 30, 2015).

[45] U.S. Environmental Protection Agency, Draft Investigation of Ground Water Contamination near Pavillion, Wyoming (2011) ("USEPA Draft Pavillion Investigation").

[46] Fontenot, Brian et al., An Evaluation of Water Quality in Private Drinking Water Wells Near Natural Gas Extraction Sites in the Barnett Shale Formation, Environ. Sci. Technol., 47 (17), 10032–10040 DOI: 10.1021/es4011724, available at http://pubs.acs.org/doi/abs/10.1021/es4011724 ("Fontenot 2013").

[47] Jackson, Robert et al., Increased Stray Gas Abundance in a Subset of Drinking Water Wells near Marcellus Shale Gas Extraction, Proc. Natl. Acad. of Sciences Early Edition, doi: 10.1073/pnas.1221635110/-/DCSupplemental (2013) ("Jackson 2013").

[48] Ohio Department of Natural Resources, Report on the Investigation of the Natural Gas Invasion of Aquifers in Bainbridge Township of Geauga County, Ohio (Sep. 2008) ("ODNR 2008").

[49] Begos, K, *Four States Confirm Water Pollution*, Associated Press, January 5, 2014, http://www.usatoday.com/story/money/business/2014/01/05/some-states-confirm-water-pollution-from-drilling/4328859/ (accessed July 29, 2015); *see also* U.S. EPA, Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources, External Review Draft (June 2015) ("EPA 2015"), available at http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=523539 (accessed July 30, 2015)..

remains essentially unregulated in many states. Around the country, federal and state laws have not kept pace with the dramatic growth in drilling and impacts.[50]

1. Surface Water Contamination

Surface waters can be contaminated in many ways from unconventional well stimulation. In addition to storm water runoff, surface water contamination may also occur from chemical and waste transport, chemical storage leaks, and breaches in pit liners.[51] The spilling or leaking of fracking fluids, flowback, or produced water is a serious problem. Harmful chemicals present in these fluids can include volatile organic compounds ("VOCs"), such as benzene, toluene, xylenes, and acetone.[52] As much as 25 percent of fracking chemicals are carcinogens,[53] and flowback can even be radioactive.[54] As described below, contaminated surface water can result in many adverse effects to wildlife, agriculture, and human health and safety. It may make waters unsafe for drinking, fishing, swimming and other activities, and may be infeasible to restore the original water quality once surface water is contaminated. BLM should consider this analysis in the EIS.

i. Chemical and Waste Transport

Massive volumes of chemicals and wastewater used or produced in oil and gas operations have the potential to contaminate local watersheds. Between 2,600 to 18,000 gallons of chemicals are injected per hydraulically fracked well depending on the number of chemicals injected.[55]

Several billions of gallons of wastewater are produced by oil and gas production per year.[56] Onshore oil and gas operations in the United States create about 56 million barrels of produced water *per day*.[57] California wells, for instance, produced roughly 3 billion barrels of wastewater in 2011, which is about 15 times the amount of oil the state produced.[58]

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[50] NRDC, In Fracking's Wake: New Rules are Needed to Protect Our Health and Environment from Contaminated Wastewater (2012).
[51] Vengosh, Avner et al., A Critical Review of the Risks to Water Resources from Unconventional Shale Gas Development and Hydraulic Fracturing in the United States, Environ. Sci. Technol., DOI: 10.1021/es405118y (2014) ("Vengosh 2014").
[52] U.S. Environmental Protection Agency, Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources (Nov. 2011) ("EPA Plan to Study Fracking Impacts").
[53] Colborn 2011.
[54] EPA Plan to Study Fracking Impacts; White, Ivan E., Consideration of radiation in hazardous waste produced from horizontal hydrofracking, National Council on Radiation Protection (2012).
[55] EPA 2015 at ES-12.
[56] California Division of Oil, Gas, and Geothermal Resources, 2011 Preliminary Report of California Oil and Gas Production Statistics at 3 (Apr. 2012); California Department of Conservation Division of Oil, Gas, and Geothermal Resouces, Producing Wells and Production of Oil, Gas, and Water by County - 2011, Excerpted from Final Report of 2011 California Oil and Gas Production Statistics (2012).
[57] U.S. Government Accountability Office, Energy-Water Nexus: Information on the Quantity, Quality, and Management of Water Produced during Oil and Gas Production, Report to the Ranking Member, Committee on Science, Space and Technology, House of Representatives at 13 (January 2012).
[58] California Division of Oil, Gas, and Geothermal Resources, 2011 Preliminary Report of California Oil and Gas Production Statistics at 3 (Apr. 2012); California Department of Conservation Division of Oil, Gas, and Geothermal Resouces, Producing Wells and Production of Oil, Gas, and Water by County - 2011, Excerpted from Final Report

Approximately 2,019 billion gallons of wastewater are produced by oil and gas production per year in Colorado.[59] This waste can reach fresh water aquifers and drinking water.[60]

Fluids must be transported to and/or from the well, which presents opportunities for spills.[61] Unconventional well stimulation relies on numerous trucks to transport chemicals to the site as well as collect and carry disposal fluid from the site to processing facilities. A U.S. GAO study found that up to 1,365 truck loads can be required just for the drilling and fracturing of a single well pad[62] while the New York Department of Conservation estimated the number of "heavy truck" trips to be about 3,950 per horizontal well (including unloaded and loaded trucks).[63] Accidents during transit may cause leaks and spills that result in the transported chemicals and fluids reaching surface waters. Chemicals and waste transported by pipeline can also leak or spill. There are also multiple reports of truckers dumping waste uncontained into the environment.[64]

Surface pits are a major source of pollution. In California, pollution from an unlined surface pit killed numerous almond trees.[65] Also, New Mexico data shows 743 instances of groundwater contamination over the last three decades.[66] Underground waste injection wells are another major threat. This is of particular concern because the U.S. EPA has found that DOGGR's Class II underground injection well program to be insufficiently protective of groundwater resources.[67]

COGCC data show that numerous spills have occurred in Dolores, Montezuma, La Plata, San Miguel, and other counties within the Tres Rios planning area, including spills that have

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of 2011 California Oil and Gas Production Statistics (2012).

[59] EPA 2015 at 8-5.

[60] Natural Resources Defense Council, Petition for Rulemaking Pursuant to Section 6974(a) of the Resource Conservation and Recovery Act Concerning the Regulation of Wastes Associated with the Exploration, Development, or Production of Crude Oil or Natural Gas or Geothermal Energy at 17 (Sep. 8, 2010) ("NRDC Petition for Rulemaking").

[61] Warco, Kathy, *Fracking truck runs off road; contents spill*, Observer Reporter (Oct 21, 2010).

[62] U.S. Government Accountability Office, *Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks*, GAO 12-732 (2012) at 33.

[63] New York Department of Environmental Conservation, *Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*, Ch. 6 Potential Environmental Impacts (2011) at 6-303.

[64] Kusnetz, Nicholas, *North Dakota's Oil Boom Brings Damage Along with Prosperity* at 4, ProPublica (June 7, 2012) ("Kusnetz North Dakota"); E&E News, Ohio man pleads not guilty to brine dumping (Feb. 15, 2013).

[65] See/Speak No Fracking at 6; *see also* Miller, Jeremy, Oil and Water Don't Mix with California Agriculture, High Country News (2012);

[66] New Mexico Oil and Conservation Division, OGAP Analysis of data provided in New Mexico Energy, Minerals and Natural Resources Dep't, Oil and Conservation Div., Cases Where Pit Substances Contaminated New Mexico's Ground Water (2008); *see generally* NRDC Petition for Rulemaking; Nicholas, Kusnetz, *A Fracking First in Pennsylvania: Cattle Quarantine*, ProPublica (July 2, 2010).

[67] NRDC Petition for Rulemaking at 20; Walker, James, California Class II UIC Program Review, Report submitted to Ground Water Office USEPA Region 9 at 119 (Jun. 2011); U.S. Environmental Protection Agency Region IX, Letter from David Albright, Manager Ground Water, to Elena Miller, State Oil and Gas Supervisor Dept of Conservation re California Class II Underground Injection Control (UIC) Program Review final report (July 18, 2011); Miller, Elena, Letter from Elena M. Miller, State Oil and Gas Supervisor, California Division of Oil, Gas, & Geothermal Resources to The Honorable Fran Pavley, California State Senate re hydraulic fracturing in California (February 16, 2011).

reached surface and groundwater.[68] The data suggest that existing spill prevention measures are not adequate to minimize spills.

Produced waters that fracking operations force to the surface from deep underground can contain high levels of total dissolved solids, salts, metals, and naturally occurring radioactive materials.[69] Flowback waters (i.e., fracturing fluids that return to the surface) may also contain similar constituents along with fracturing fluid additives such as surfactants and hydrocarbons.[70] Given the massive volumes of chemicals and wastewater produced and their potentially harmful constituents, the potential for environmental disaster is real.

Also, many other extremely harmful spills and releases occur before those wastes reach storage or disposal sites, including spills from equipment failures, accidents, negligence, or intentional dumping.[71] Construction of oil and gas infrastructure, such as well pads and roads, can also harm water quality by increasing sediment levels.[72]

The EIS should evaluate how often accidents can be expected to occur, and the effect of chemical and fluid spills. Such analysis should also include identification of the particular harms faced by communities near oil and gas field. The EIS must include specific mitigation measures and alternatives based on a cumulative impacts assessment, and the particular vulnerabilities of environmental justice communities in both urban and rural settings.

ii. On-site Chemical Storage and Processing

Thousands of gallons of chemicals can be potentially stored on-site and used during hydraulic fracturing and other unconventional well stimulation activities.[73] These chemicals can be susceptible to accidental spills and leaks. Natural occurrences such as storms and earthquakes may cause accidents, as can negligent operator practices.

Some sites may also use on-site wastewater treatment facilities. Improper use or maintenance of the processing equipment used for these facilities may result in discharges of contaminants. Other spill causes include equipment failure (most commonly, blowout preventer failure, corrosion and failed valves) and failure of container integrity.[74]

The EIS should examine and quantify the risks to human health and the environment associated with on-site chemical and wastewater storage, including risks from natural events and

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[68] *See* COGCC data, available at http://cogcc.state.co.us/data.html (click “spill/release” and Dolores, Montezuma, La Plata, Archuleta, and Mesa counties).
[69] Brittingham, Margaret C. et al. Ecological Risks of Shale Oil and Gas Development to Wildlife, Aquatic Resources and their Habitats. *Environ. Sci. Technol.* 2014, 48, 11034-11047, p. 11039.
[70] *Id*.
[71] California Dept. of Fish and Game, Environmental Incident Report: Vintage Production California LLC Tar Creek Crude Oil and Produced Water Spills, January 30, 2007 and February 6, 2007.
[72] Entrekin, Sally, et al., Rapid Expansion of Natural Gas Development Poses a Threat to Surface Waters, 9 Front Ecol Environ 503, 507 (2011) (“Entrekin”).
[73] EPA 2015 at ES-10.
[74] EPA 2015 at ES-11.

negligent operator practices. Again, such analysis must also include an analysis of potential impacts faced by environmental justice communities in both rural and urban settings.

2. Groundwater Contamination

Studies have reported many instances around the country of groundwater contamination due to surface spills of oil and gas wastewater, including fracking flowback.[75] Fracking and other unconventional techniques likewise pose inherent risks to groundwater due to releases below the surface, and these risks must be properly evaluated.[76] Once groundwater is contaminated, it is very difficult, if not impossible, to restore the original quality of the water. As a result, in communities that rely on groundwater drinking water supplies, groundwater contamination can deprive communities of usable drinking water. Such long-term contamination necessitates the costly importation of drinking water supplies.

Groundwater contamination can occur in a number of ways, and the contamination may persist for many years.[77] Surface spills and poorly constructed or abandoned wells are recognized as one of the most likely ways by which contaminants may reach groundwater. Faulty well construction, cementing, or casing,[78] as well as the injection of fracking waste underground, can all lead to leaks.[79] Improper well construction and surface spills are cited as a confirmed or potential cause of groundwater contamination in numerous incidents at locations across the U.S. including but not limited to Colorado,[80] Wyoming,[81] Pennsylvania,[82] Ohio,[83] West Virginia,[84] and Texas.[85] Also, fluids may contaminate groundwater by migrating through newly created or natural fractures.[86] These sorts of problems at the well are not uncommon. Dr. Ingraffea of Cornell has noted an 8.9 percent failure rate for wells in the Marcellus Shale.[87] Also,

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[75] *See, e.g.*, Fontenot 2013, Jackson 2013.
[76] Vengosh 2014.
[77] Myers, Tom, Potential Contamination Pathways from Hydraulically Fractured Shale to Aquifers, National Groundwater Association (2012).
[78] NRDC, Water Facts at 2; Food & Water Watch 2012 at 7.
[79] Kusnetz, North Dakota; Lustgarten, Abraham, Polluted Water Fuels a Battle for Answers, ProPublica (2012); Lustgarten, Abraham, Injection Wells: The Poison Beneath Us, ProPublica at 2 (2012); Lustgarten, Abraham, Whiff of Phenol Spells Trouble, ProPublica (2012).
[80] Gross, Sherilyn A. et al., Abstract: Analysis of BTEX groundwater concentrations from surface spills associated with hydraulic fracturing operations, 63 J. Air and Waste Mgmt. Assoc. 4, 424 doi: 10.1080/10962247.2012.759166 (2013).
[81] USEPA Draft Pavillion Investigation.
[82] Darrah, Thomas H. et al., Noble Gases Identify the Mechanisms of Fugitive Gas Contamination in Drinking-Water Wells Overlying the Marcellus and Barnett Shales, Proc. Natl. Acad. Of Sciences Early Edition, doi: 10.1073/pnas.1322107111 (2014) ("Darrah 2014").
[83] Begos, Kevin, *Some States Confirm Water Pollution from Oil, Gas Drilling*, Seattle Times Jan. 6, 2014, http://www.seattletimes.com/business/some-states-confirm-water-pollution-from-oil-gas-drilling/ (accessed July 29, 2015) ("Begos, Seattle Times, Jan 6, 2014"). *See also,* ODNR 2008, *supra.*
[84] Begos, Seattle Times, Jan 6. 2014.
[85] Darrah 2014.
[86] U.S. Environmental Protection Agency, Draft Investigation of Ground Water Contamination near Pavillion, Wyoming (2011) ("EPA Draft Pavillion Investigation."); Warner, Nathaniel R., et al., Geochemical Evidence for Possible Natural Migration of Marcellus Formation Brine to Shallow Aquifers in Pennsylvania, PNAS Early Edition (2012).
[87] Ingraffea, Anthony R., Some Scientific Failings within High Volume Hydraulic Fracturing Proposed Regulations 6 NYCRR Parts 550-556, 560, Comments and Recommendations Submitted to the NYS Dept. of Environmental

the Draft EPA Investigation of Ground Water Contamination near Pavillion, Wyoming, found that chemicals found in samples of groundwater were from fracked wells.[88] These results have been confirmed with follow-up analyses.[89] Moreover, another study based on modeling found that active transport of fracking fluid from a fracked well to an aquifer could occur in less than 10 years.[90]

Fracking fluid can also spill at the surface during the fracking process. For instance, mechanical failure or operator error during the process has caused leaks from tanks, valves, and pipes.[91] At the surface, pits or tanks can leak fracking fluid or waste.[92]

Mechanical integrity, which refers to an absence of leakage pathways through the casing and cement, can degrade over time, eventually leading to mechanical integrity failures that may impact groundwater. Older wells that may not have been designed to withstand the stresses of hydraulic fracturing but which are reused for this purpose are especially vulnerable.[93] A well in which stimulation operations are being conducted may also "communicate" with nearby wells, which may lead to groundwater contamination, particularly if the nearby wells are improperly constructed or abandoned.[94] Nearby active and abandoned wells provided additional pathways for contamination. In the last 150 years, as many as 12 million "holes" have been drilled across the United States in search of oil and gas, many of which are old and decaying, or are in unknown locations.[95] Fracking can contaminate water resources by intersecting one of those wells. For instance, one study found at least nineteen instances of fluid communication in British Columbia and Western Alberta.[96]

Current federal rules do not ensure well integrity. The well casing can potentially fail over time and potentially create pathways for contaminants to reach groundwater. Well casing

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Conservation (Jan 8, 2013).

88 EPA Draft Pavillion Investigation.

89 Drajem, Mark, *Wyoming Water Tests in Line with EPA Finding on Fracking*, Bloomberg (Oct. 11, 2012); U.S. Environmental Protection Agency, Investigation of Ground Water Contamination near Pavillion, Wyoming Phase V Sampling Event - Summary of Methods and Results (September 2012); Myers, Tom, Review of DRAFT: Investigation of Ground Water Contamination near Pavillion Wyoming Prepared by the Environmental Protection Agency, Ada OK (Apr. 30, 2012).

90 Myers, Tom, Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers (Feb. 2012).

91 Natural Resources Defense Council, Water Facts: Hydraulic Fracturing can potentially Contaminate Drinking Water Sources at 2 (2012) ("NRDC, Water Facts"); Food & Water Watch, The Case for a Ban on Fracking (2012) ("Food & Water Watch 2012") at 5.

92 *See, e.g.*, E&E Staff Writer, Fracking Fluid leaks from wellhead in Colo., E&E News (Feb 14, 2013). ("At least 84,000 gallons of water contaminated from hydraulic fracturing seeped from a broken wellhead and into a field . . . ."); Michaels, Craig, et al., Fractured Communities: Case Studies of the Environmental Impacts of Industrial Gas Drilling, Riverkeeper (2010).at 12; NRDC Petition for Rulemaking at 20.

93 EPA 2015 at 6-11.

94 *See* Detrow, Scott. (2012) *Perilous Pathways: How Drilling Near An Abandoned Well Produced a Methane Geyser*, StateImpact Pennsylvania, National Public Radio (October 9, 2012), available at https://stateimpact.npr.org/pennsylvania/2012/10/09/perilous-pathways-how-drilling-near-an-abandoned-well-produced-a-methane-geyser/ (accessed July 29, 2015); Alberta Energy Board, Directive 083: Hydraulic Fracturing – Subsurface Integrity, Alberta Energy Regulator (2013), *available at* http://www.aer.ca/documents/directives/Directive083.pdf.

95 Kusnetz, Nicholas, *Deteriorating Oil and Gas Wells Threaten Drinking Water, Homes Across the Country*, ProPublica (April 4, 2011).

96 BC Oil & Gas Commission, Safety Advisory 2010-03, Communication During Fracture Stimulation (2010).

failure can occur due to improper or negligent construction. The EIS should study the rates of well casing failures over time and evaluate the likelihood that well casing failures can lead to groundwater contamination.

Chemicals and naturally occurring substances can also migrate to groundwater through newly created fractures underground. Many unconventional techniques intentionally fracture the formation to increase the flow of gas or oil. New cracks and fissures can allow the additives or naturally occurring elements such as natural gas to migrate to groundwater. "[T]he increased deployment of hydraulic fracturing associated with oil and gas production activities, including techniques such as horizontal drilling and multi-well pads, may increase the likelihood that these pathways could develop," which, "in turn, could lead to increased opportunities for impacts on drinking water sources."[97] Fluids can also migrate through pre-existing and natural faults and fractures that may become pathways once the fracking or other method has been used.

Further, according to the EPA, "evidence of any fracturing-related fluid migration affecting a drinking water resources…could take years to discover."[98] The EIS must consider long-term studies on the potential for fluid migration through newly created subsurface pathways. Fluid migration is of particular concern when oil and gas operations are close to drinking water supplies.

Unfiltered drinking water supplies, such as drinking water wells, are especially at risk because they have no readily available means of removing contaminants from the water. Even water wells with filtration systems are not designed to handle the kind of contaminants that result from unconventional oil and gas extraction.[99] In some areas hydraulic fracturing may occur at shallower depths or within the same formation as drinking water resources, resulting in direct aquifer contamination. [100] The EIS must disclose where the potential for such drilling exists.

Setbacks may not be adequate to protect groundwater from potential fracking fluid contamination. A recent study by the University of Colorado at Boulder suggests that setbacks of even up to 300-feet may not prevent contamination of drinking water resources.[101] The study found that 15 organic compounds found in hydraulic fracturing fluids may be of concern as groundwater contaminants based on their toxicity, mobility, persistence in the environment, and frequency of use. These chemicals could have 10 percent or more of their initial concentrations remaining at a transport distance of 300 feet, the average "setback" distance in the U.S. The effectiveness and feasibility of the RMP's setbacks must be evaluated. As described above on p. 5, setbacks of at 1,800 feet at minimum are required to prevent contamination of water resources.

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[97] EPA 2015 at 6-55.

[98] EPA 2015 at 6-56 – 6-57.

[99] Physicians Scientist & Engineers for Healthy Energy, Letter from Robert Howarth Ph.D. and 58 other scientists to Andrew M. Cuomo, Governor of New York State re: municipal drinking water filtration systems and hydraulic fracturing fluid (Sept 15, 2011), *available at* http://www.psehealthyenergy.org/data/Cuomo_ScientistsLetter_15Sep20112.pdf (accessed July 29, 2015).

[100] EPA 2015 at ES-15.

[101] University of Colorado--Boulder, New study identifies organic compounds of potential concern in fracking Fluids (July 1, 2015), available at http://www.colorado.edu/news/releases/2015/06/30/newstudyidentifiesorganiccompoundspotentialconcernfrackingfluids (accessed July 29, 2015).

3. Disposal of Drilling and Fracking Wastes

Finally, disposal of wastes from oil and gas operations can also lead to contamination of water resources. Potential sources of contamination include:

- leaching from landfills that receive drilling and fracking solid wastes;
- spreading of drilling and fracking wastes over large areas of land;
- wastewaters discharged from treatment facilities without advanced "total dissolved solids" removal processes, or inadequate capacity to remove radioactive material removal; and
- breaches in pits or underground disposal wells.[102]

The EIS must evaluate the potential for contamination from each of these disposal methods.

B. More Intensive Oil and Gas Development Will Increase Storm Water Runoff

Oil and gas operations require land clearance for access roads, pipelines, well pads, drilling equipment, chemical storage, and waste disposal pits. As a result, new oil and gas development will cause short-term disturbance as well as long-term disturbance within the planning area. While undisturbed land can retain greater amounts of water through plants and pervious soil, land that has been disturbed or developed may be unable to retain as much water, thereby increasing the volume of runoff. The area of land that is able to retain water will be significantly decreased if unconventional oil and gas extraction methods are permitted to expand.

Water from precipitation and snowmelt can serve as an avenue through which contaminants travel from an operation site to sensitive areas, including population centers. Contaminated water runoff may seep into residential areas, polluting streets, sidewalks, soil, and vegetation in urban areas, adversely affecting human health. Thus, not only do these oil and gas activities create pollution, they create greater conduits for storm water runoff to carry those pollutants from the operation site, into areas in which significant harm can be caused.

Rapid runoff, even without contaminants, can harm the environment by changing water flow patterns and causing erosion, habitat loss, and flooding. Greater runoff volumes may also increase the amount of sediment that is carried to lakes and streams, affecting the turbidity and chemical content of surface waters. Because a National Pollutant Discharge Elimination System permit is not required for oil and gas operations,[103] it is particularly important that the impact of runoff is considered as part of the NEPA process.

C. Fossil Fuel Development Depletes Enormous Amounts of Water

Some unconventional extraction techniques, most notably fracking, require the use of tremendous amounts of freshwater. Typically between 2 and 5.6 million gallons of water are

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[102] EPA 2015, 8-20, 8-36, 8-48, 8-65, 8-70.
[103] 33 U.S.C. § 1342(l)(2).

required to frack each well.[104] Such high levels of water use are unsustainable. Water used in large quantities may lead to several kinds of harmful environmental impacts. The extraction of water for fracking can, for example, lower the water table, affect biodiversity, harm local ecosystems, and reduce water available to communities.[105]

Withdrawal of large quantities of freshwater from streams and other surface waters will undoubtedly have an impact on the environment.[106] Withdrawing water from streams will decrease the supply for downstream users, such as farmers or municipalities. Rising demand from oil and gas operators has already led to increased competition for water between farmers and oil and gas operators. In some regions of the state, farmers have had to fallow fields due to astronomical water prices.[107] For example, in prior years, farmers in Colorado have paid at most $100 per acre-feet of water in auctions held by cities with excess supplies, but in 2013 energy companies paid $1200 to $2,900 per acre-feet.[108] Reductions in stream flows may also lead to downstream water quality problems by diminishing the water bodies' capacity for dilution and degradation of pollutants. The EIS must examine these issues.

Furthermore, withdrawing large quantities of water from subsurface waters to supply oil and gas production will likely deplete and harm aquifers. Removing water from surface water or directly from underground sources of water faster than the rate that aquifers can be replenished will lower the volume of water available for other uses. Depletion can also lead to compaction of the rock formation serving as an aquifer, after which the original level of water volume can never be restored.[109] Depleted aquifer water resources may also adversely affect agriculture, species habitat and ecosystems, and human health.

The freshwater in the area therefore would be greatly affected by the increased demand for water if fracking and other unconventional oil and gas extraction are permitted. A no-leasing-no-fracking alternative would preserve scarce water resources and keep critical sources of drinking water in the planning area safe and clean. The EIS must analyze where water will be sourced, how much, and the effects on water sources under different alternatives. All of these effects must be analyzed in the context of increasing water scarcity in the state due to climate change, drought, and increasing population growth.

D. Oil and Gas Developments Harm Aquatic Life and Habitat

When streams and other surface waters are depleted, the habitat for countless plants and animals will be harmed, and the depletion places tremendous pressure on species that depend on having a constant and ample stream of water. Physical habitats such as banks, pools, runs, and

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[104] U.S. Government Accountability Office 2012 at 17.

[105] International Energy Agency, Golden Rules for the Golden Age of Gas at 31-32 (2012).

[106] *See* Entrekin, Sally et al., Rapid Expansion of Natural Gas Development Poses a Threat to Surface Waters, 9 Front Ecol. Environ. 9, 503 (2011); EPA 2015 at 4-16.

[107] Healy, Jack. For Farmers in the West, Oil Wells are Thirsty Rivals, The New York Times (Sept. 5,2012), available at http://www.nytimes.com/2012/09/06/us/struggle-for-water-in-colorado-with-rise-in-fracking.html?_r=0 (accessed July 29, 2015); Burke, Garance. Fracking fuels water fights in nation's dry spots, Associated Press (June 17, 2013), available at http://news.yahoo.com/fracking-fuels-water-fights-nations-dry-spots-133742770.html.

[108] *Id*.

[109] Freyman 2013.

glides (low gradient river sections) are important yet susceptible to disturbance with changing stream flows. Altering the volume of water can also change the water's temperature and oxygen content, harming some species that require a certain level of oxygenated water. Decreasing the volume of streamflow and stream channels by diverting water to fracking would have a negative impact on the environment and should be included in the EIS.

The physical equipment itself that is designed to intake and divert water may also pose a threat to certain wildlife. If not properly designed, such equipment and intake points may be a risk to wildlife.

E. Harm to Wetlands

High volume removal of surface or groundwater can result in damage to wetlands, which rely on ample water supplies to maintain the fragile dynamics of a wetland habitat. Damage can also occur from spills of chemicals or wastewater, filling operations, and sediment runoff.[110] BLM in its environmental document must fully vet the impacts from every potential aspect of the proposed sale.

Many plant and animal species depend on wetland habitats, and even small changes can lead to significant impacts. Wetlands provide a variety of "eco-service" functions, including water purification, protection from floods, and functioning as carbon sinks.[111] The ecological importance of wetlands is unquestionable, and their full protection is paramount. The EIS must analyze these potential impacts to wetlands, and the related, potential indirect impacts that may stem from such impacts.

VI. Oil and Gas Operations Harm Air Quality

Oil and gas operations emit numerous air pollutants, including volatile organic compounds (VOCs), NO_X, particulate matter, hydrogen sulfide, and methane. Fracking operations are particularly harmful, emitting especially large amounts of pollution, including air toxic air pollutants. Permitting fracking and other well stimulation techniques will greatly increase the release of harmful air emissions in these and other regions. On the other hand, a no-leasing-no-fracking alternative would prevent further degradation of local air quality, respiratory illnesses, premature deaths, hospital visits, as well as missed school and work days.

A. Types of Air Emissions

[110] U.S. Department of Justice, *Trans Energy Inc. to Restore Streams and Wetland Damaged by Natural Gas Extraction Activities in West Virginia* (Sep. 2, 2014), http://www.justice.gov/opa/pr/trans-energy-inc-restore-streams-and-wetland-damaged-natural-gas-extraction-activities-west (accessed July 29, 2015); *See also*, Pennsylvania Department of Environmental Protection, Commonwealth of Pennsylvania, *DEP Fines Seneca Resources Corp. $40,000 for Violations at Marcellus Operation in Tioga County* (Jul. 10, 2010), http://www.portal.state.pa.us/portal/server.pt/community/newsroom/14287?id=14655&typeid=1 (accessed July 29, 2015).

[111] U.S. Environmental Protection Agency, Wetlands and People, http://water.epa.gov/type/wetlands/people.cfm (accessed July 29, 2015).

Unconventional oil and gas operations emit large amounts of toxic air pollutants,[112] also referred to as Hazardous Air Pollutants, which are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects.[113] The reporting requirements recently implemented by the California South Coast Air Quality Management District ("SCAQMD") have shown that at least 44 chemicals known to be air toxics have been used in fracking and other types of unconventional oil and gas recovery in California.[114] Through the implementation of these new reporting requirements, it is now known that operators have been using several types of air toxics in California, including crystalline silica, methanol, hydrochloric acid, hydrofluoric acid, 2-butoxyethanol, ethyl glycol monobutyl ether, xylene, amorphous silica fume, aluminum oxide, acrylic polymer, acetophenone, and ethylbenzene. Many of these chemicals also appear on the U.S. EPA's list of hazardous air pollutants.[115] EPA has also identified six "criteria" air pollutants that must be regulated under the National Ambient Air Quality Standards (NAAQS) due to their potential to cause primary and secondary health effects. Concentrations of these pollutants—ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead—will likely increase in regions where unconventional oil and gas recovery techniques are permitted.

VOCs, from car and truck engines as well as the drilling and completion stages of oil and gas production, make up about 3.5 percent of the gases emitted by oil or gas operations.[116] The VOCs emitted include the BTEX compounds – benzene, toluene, ethyl benzene, and xylene – which are listed as Hazardous Air Pollutants.[117] There is substantial evidence showing the grave harm from these pollutants.[118] Recent studies and reports confirm the pervasive and extensive amount of VOCs emitted by unconventional oil and gas extraction.[119] In particular, a study covering sites near oil and gas wells in five different states found that concentrations of eight volatile chemicals, including benzene, formaldehyde and hydrogen sulfide, exceeded risk-based comparison values under several operational circumstances.[120] Another study determined that vehicle traffic and engine exhaust were likely the sources of intermittently high dust and benzene concentrations observed near well pads.[121] Recent studies have found that oil and gas operations are likely responsible for elevated levels of hydrocarbons such as benzene downwind of the

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[112] Sierra Club et al. comments on New Source Performance Standards: Oil and Natural Gas Sector; Review and Proposed Rule for Subpart OOOO (Nov. 30, 2011) ("Sierra Club Comments") at 13.

[113] http://www3.epa.gov/airtoxics/allabout.html#what

[114] Center for Biological Diversity, Air Toxics One Year Report, p. 1 (June 2014).

[115] U.S. Environmental Protection Agency, The Clean Air Act Amendments of 1990 List of Hazardous Air Pollutants, Technology Transfer Network Air Toxics Web Site, http://www.epa.gov/ttnatw01/orig189.html (accessed July 29, 2015).

[116] Brown, Heather, Memorandum to Bruce Moore, U.S.EPA/OAQPS/SPPD re Composition of Natural Gas for use in the Oil and Natural Gas Sector Rulemaking, July 28, 2011 ("Brown Memo") at 3.

[117] 42 U.S.C. § 7412(b).

[118] Colborn 2011; McKenzie 2012; Food & Water Watch 2012.

[119] McCawley, M., Air, Noise, and Light Monitoring Plan for Assessing Environmental Impacts of Horizontal Gas Well Drilling Operations (ETD-10 Project), West Virginia University School of Public Health, Morgantown, WV (2013) ("McCawley 2013"), available at http://www.dep.wv.gov/oil-and-gas/Horizontal-Permits/legislativestudies/Documents/WVU%20Final%20Air%20Noise%20Light%20Protocol.pdf; Center for Biological Diversity, Dirty Dozen: The 12 Most Commonly Used Air Toxics in Unconventional Oil Development in the Los Angeles Basin (Sept. 2013).

[120] Macey, G.P. et al., (2014). Air Concentrations of Volatile Compounds Near Oil and Gas Production: A Community-Based Exploratory Study, 13 Environmental Health 82 (2014) at 1.

[121] McCawley 2013.

Denver-Julesburg Fossil Fuel Basin, north of Denver.[122] Another study found that oil and gas operations in this area emit approximately 55% of the VOCs in northeastern Colorado. [123]

VOCs can form ground-level (tropospheric) ozone when combined with nitrogen oxides (“NO_X”), from compressor engines, turbines, other engines used in drilling, and flaring,[124] and sunlight. This reaction can diminish visibility and air quality and harm vegetation. Tropospheric ozone can also be caused by methane, which is leaked and vented at various stages of unconventional oil and gas development, as it interacts with nitrogen oxides and sunlight.[125] In addition to its role as a greenhouse gas, methane contributes to increased concentrations of ground-level ozone, the primary component of smog, because it is an ozone precursor.[126] Methane’s effect on ozone concentrations can be substantial. One paper modeled reductions in various anthropogenic ozone precursor emissions and found that “[r]educing anthropogenic CH_4 emissions by 50% nearly halves the incidence of U.S. high-O_3 events . . . .”[127] Like methane, VOCs and NO_X are also ozone precursors; therefore, many regions around the country with substantial oil and gas operations are now suffering from extreme ozone levels due to heavy emissions of these pollutants.[128] Ozone can result in serious health conditions, including heart and lung disease and mortality.[129] A recent study of ozone pollution in the Uintah Basin of northeastern Utah, a rural area that experiences hazardous tropospheric ozone concentrations, found that oil and gas operations were responsible for 98 to 99 percent of VOCs and 57 to 61 percent of NO_X emitted from sources within the Basin considered in the study’s inventory.[130]

Oil and gas operations can also emit hydrogen sulfide. The hydrogen sulfide is contained in the natural gas and makes that gas “sour.”[131] Hydrogen sulfide may be emitted during all stages of operation, including exploration, extraction, treatment and storage, transportation, and

[122] Pétron, G. et al., Hydrocarbon Emissions Characterization in the Colorado Front Range – A Pilot Study, 117 J. GEOPHYSICAL RESEARCH D04304 (2012), at 8, 13 (“Pétron 2012).
[123] Gilman, J.B. et al., Source Signature of Volatile Organic Compounds from Oil and Natural Gas Operations in Northeastern Colorado, 47 ENVTL. SCI & TECH. 1297, 1303 (2013).
[124] *See, e.g.*, U.S. Environmental Protection Agency, Oil and Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution: Background Technical Support Document for Proposed Standards at 3-6 (July 2011); Armendariz, Al, Emissions for Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements (2009) (“Armendariz”) at 24.
[125] Fiore, Arlene et al., Linking Ozone Pollution and Climate Change: The Case for Controlling Methane, 29 Geophys. Res Letters 19 (2002).
[126] U.S. Environmental Protection Agency, Oil and Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews Proposed Rule, 76 Fed. Reg 52,738 (Aug 23, 2011).
[127] Fiore, Arlene et al., Linking ozone pollution and climate change: The case for controlling methane, 29 Geophys. Res Letters 19 (2002); *see also* Martin, Randal et al., Final Report: Uinta Basin Winter Ozone and Air Quality Study Dec 2010 - March 2011 (2011) at 7.
[128] Armendariz at 1, 3, 25-26; Wendy Koch, *Wyoming's Smog Exceeds Los Angeles' Due to Gas Drilling*, USA Today (May 9, 2011); Craft, Elena, Environmental Defense Fund, Do Shale Gas Activities Play a Role in Rising Ozone Levels? (2012); Colorado Dept. of Public Health and Environment, Conservation Commission, Colorado Weekly and Monthly Oil and Gas Statistics (July 6, 2012) at 12.
[129] U.S. Environmental Protection Agency, Integrated Science Assessment (ISA) for Ozone (O3) and Related Photochemical Oxidants (2013).
[130] Lyman, Seth and Howard Shorthill, Final Report: 2012 Uintah Basin Winter Ozone & Air Quality Study, Utah Department of Environmental Quality (2013); *see also* Gilman, Jessica et al., Source signature of colatile organic compounds from oil and natural gas operations in northeastern Colorado, Envtl Sci and Technology (Jan 14, 2013), DOI: 10.1021/es304119a.
[131] Sierra Club Comments.

refining. Long−term exposure to hydrogen sulfide is linked to respiratory infections, eye, nose, and throat irritation, breathlessness, nausea, dizziness, confusion, and headaches.[132]

The oil and gas industry is also a major source of particulate matter. The heavy equipment regularly used in the industry burns diesel fuel, generating fine particulate matter[133] that is especially harmful.[134] Vehicles traveling on unpaved roads also kick up fugitive dust, which is particulate matter.[135] Further, both NO_X and VOCs, which as discussed above are heavily emitted by the oil and gas industry, are also particulate matter precursors.[136] Some of the health effects associated with particulate matter exposure are "premature mortality, increased hospital admissions and development of chronic respiratory disease."[137]

Fracking results in additional air pollution that can create a severe threat to human health. One analysis found that 37 percent of the chemicals found at fracked gas wells were volatile, and that of those volatile chemicals, 81 percent can harm the brain and nervous system, 71 percent can harm the cardiovascular system and blood, and 66 percent can harm the kidneys.[138] Also, the SCAQMD has identified three areas of dangerous and unregulated air emissions from fracking: (1) the mixing of the fracking chemicals; (2) the use of the silica, or sand, as a proppant, which causes the deadly disease silicosis; and (3) the storage of fracking fluid once it comes back to the surface.[139] Preparation of the fluids used for well completion often involves onsite mixing of gravel or proppants with fluid, a process which potentially results in major amounts of particulate matter emissions.[140] Further, these proppants often include silica sand, which increases the risk of lung disease and silicosis when inhaled.[141] Finally, as flowback returns to the surface and is deposited in pits or tanks that are open to the atmosphere, there is the potential for organic compounds and toxic air pollutants to be emitted, which are harmful to human health as described above.[142]

The EIS should study the potential for oil and gas operations sites in the planning area to emit such air toxics and any other pollutants that may pose a risk to human health, paying particular attention to the impacts of air pollution on environmental justice communities that

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[132] USEPA, Office of Air Quality Planning and Standards, Report to Congress on Hydrogen Sulfide Air Emissions Associated with the Extraction of Oil and Natural Gas (EPA-453/R-93-045) at i (Oct. 1993) ("USEPA 1993").
[133] Earthworks, Sources of Oil and Gas Pollution (2011).
[134] Bay Area Air Quality Management District, Particulate Matter Overview, Particulate Matter and Human Health (2012).
[135] U.S. Environmental Protection Agency, Regulatory Impact Analysis for the Proposed Revisions to the National Ambient Air Quality Standards for Particulate Matter (June 2012), http://www.epa.gov/ttnecas1/regdata/RIAs/PMRIACombinedFile_Bookmarked.pdfat 2-2, ("EPA RIA")
[136] EPA RIA at 2-2.
[137] U.S. Environmental Protection Agency, National Ambient Air Quality Standards for Particulate Matter Proposed Rule, 77 Fed. Reg. 38,890, 38,893 (June 29, 2012).
[138] Colborn 2011 at 8.
[139] South Coast Air Quality Management District, Draft Staff Report on Proposed Rule 1148.2 - Notification and Reporting Requirements for Oil and Gas Wells and Chemical Suppliers (January 2013).at 15 ("SCAQMD Revised Draft Staff Report PR1148-2").
[140] *Id.*
[141] South Coast Air Quality Management District, Response to Questions re Air Quality Risks of Hydraulic Fracturing in California, Submission to Joint Senate Hearing (2013) at 3.
[142] SCAQMD Revised Draft Staff Report PR1148-2 at 15.

already bear the burden of disproportionately high levels of air pollution. The EIS should rely on the most up-to-date information regarding the contribution of oil and gas operations to VOC and air toxics levels. Recent studies in Weld County show that existing emissions inventories likely underestimate the contribution of oil and gas operations to VOC levels by a factor of two.[143] Further, researchers have found that existing emissions inventories vastly underestimate the contribution of oil and gas operations to hazardous air pollution concentrations in Weld County, suggesting that the health risk assessments conducted using these inventories are similarly inaccurate and therefore underestimate exposures and health risks.[144] This study estimated benzene emission rates and other VOCs using air quality measurements taken from an airplane over Weld County. Current inventories estimating benzene emissions from oil and gas operators in the study area underestimated emissions by four to nine times. The study suggests that other hazardous air pollutants (such as toluene, ethylbenzene, etc.) could similarly be underestimated and that oil and gas sites could be a bigger source of benzene than vehicle emissions, previously thought to be the largest source in the area.

B. Sources of Air Emissions

Harmful air pollutants are emitted in all stages of unconventional oil and gas recovery, including drilling, completion, well stimulation, production, and disposal. Drilling and casing the wellbore require substantial power from large equipment. The engines used typically run on diesel fuel, which emits particularly harmful types of air pollutants when burned. Similarly, high-powered pump engines are used in the fracturing and completion phase. This too can amount in large volumes of air pollution. Flaring, venting, and fugitive emissions of gas are also a potential source of air emissions. Gas flaring and venting can occur in both oil and gas recovery processes when underground gas rises to the surface and is not captured as part of production. Fugitive emissions can occur at every stage of extraction and production, often leading to high volumes of gas being released into the air. Methane emissions from oil and gas production is as much as 270 percent greater than previously estimated by calculation.[145] Recent studies show that emissions from pneumatic valves (which control routine operations at the well pad by venting methane during normal operation) and fugitive emissions are higher than EPA estimates.[146]

Evaporation from pits can also contribute to air pollution. Pits that store drilling waste, produced water, and other waste fluid may be exposed to the open air. Chemicals mixed with the wastewater—including the additives used to make fracking fluids, as well as volatile hydrocarbons, such as benzene and toluene, brought to the surface with the waste—can escape into the air through evaporation. Some pits are equipped with pumps that spray effluents into the

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[143] *Id*. at 1302; Pétron 2012 at 1, 18 (noting state and federal inventories likely underestimate hydrocarbon emissions from oil and gas operations by as much as factor of two).

[144] Pétron, G. et al., A New Look at Methane and Non-Methane Hydrocarbon Emissions from Oil and Natural Gas Operations in the Colorado Denver-Julesburg Basin, accepted for publication, online May 7, 2014, J. GEOPHYSICAL RESEARCH: ATMOSPHERES, available at http://onlinelibrary.wiley.com/doi/10.1002/2013JD021272/abstract.

[145] Miller 2013.

[146] Allen 2013; Harriss, Robert et al. Using Multi-Scale Measurements to Improve Methane Emission Estimates from Oil and Gas Operations in the Barnett Shale Region, Texas, Environ. Sci. Technol., 2015, 49 (13), pp 7524–7526.

air to hasten the evaporation process. Even where waste fluid is stored in so-called "closed loop" storage tanks, fugitive emissions can escape from tanks.

As mentioned above, increased truck traffic will lead to more air emissions. Trucks capable of transporting large volumes of chemicals and waste fluid typically use large engines that run on diesel fuel. Air pollutants from truck engines will be emitted not only at the well site, but also along truck routes to and from the site.

C. Impact of Increased Air Pollution

The potential harms resulting from increased exposure to the dangerous air pollutants described above are serious and wide ranging. The negative effects of criteria pollutants are well documented and are summarized by the U.S. EPA's website:

> *Nitrogen oxides* (NOx) react with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. NO_x and volatile organic compounds react in the presence of heat and sunlight to form ozone.
>
> *Particulate matter* (PM) - especially fine particles - contains microscopic solids or liquid droplets that are so small that they can get deep into the lungs and cause serious health problems. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including: premature death in people with heart or lung disease, increased mortality, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.[147]
>
> *Sulfur Dioxide* (SO_2) – has been shown to cause an array of adverse respiratory effects including bronchoconstriction and increased asthma symptoms.[148] Studies also show a connection between short-term exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics.[149]
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> *Carbon Monoxide* (CO) can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues. At extremely high levels, CO can cause death.[150] Exposure to CO can reduce the oxygen-carrying capacity of the blood. People with several types of heart disease already have a reduced capacity for pumping oxygenated blood to the heart, which can cause them to experience myocardial ischemia

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[147] U.S. Environmental Protection Agency, Particulate Matter, (PM) http://www.epa.gov/airquality/particlepollution/health.html (accessed July 30, 2015); Ostro, Bart et al., Long-term Exposure to Constituents of Fine Particulate Air Pollution and Mortality: Results from the California Teachers Study, 118 Environmental Health Perspectives 3 (2010)

[148] U.S. Environmental Protection Agency, Sulfur Dioxide http://www.epa.gov/airquality/sulfurdioxide/health.html, available at (accessed July 29, 2015).

[149] *Id.*

[150] U.S. Environmental Protection Agency, Carbon Monoxide, available at http://www.epa.gov/airquality/carbonmonoxide/health.html (accessed July 29, 2015).

> (reduced oxygen to the heart), often accompanied by chest pain (angina), when exercising or under increased stress.[151] For these people, short-term CO exposure further affects their body's already compromised ability to respond to the increased oxygen demands of exercise or exertion.[152]
>
> *Ozone* (O_3) can trigger or worsen asthma and other respiratory ailments.[153] Ground level ozone can have harmful effects on sensitive vegetation and ecosystems. Ozone may also lead to loss of species diversity and changes to habitat quality, water cycles, and nutrient cycles.

Air toxics and hazardous air pollutants, by definition, can result in harm to human health and safety. The full extent of the health effects of exposure is still far from being complete, but already there are numerous studies that have found these chemicals to have serious health consequences for humans exposed to even minimal amounts. The range of illnesses that can result are summarized in a study by Dr. Theo Colburn, which charts which chemicals have been shown to be linked to certain illnesses.[154]

Natural gas drilling operations result in the emissions of numerous non-methane hydrocarbons (NMHCs) that have been linked to numerous adverse health effects. A recent study that analyzed air samples taken during drilling operations near natural gas wells and residential areas in Garfield County, detected 57 chemicals between July 2010 and October 2011, including 44 with reported health effects.[155] For example:

> Thirty-five chemicals were found to affect the brain/nervous system, 33 the liver/metabolism, and 30 the endocrine system, which includes reproductive and developmental effects. The categories with the next highest numbers of effects were the immune system (28), cardiovascular/blood (27), and the sensory and respiratory systems (25 each). Eight chemicals had health effects in all 12 categories. There were also several chemicals for which no health effect data could be found.[156]

The study found extremely high levels of methylene chloride, which may be used as cleaning solvents to remove waxy paraffin that is commonly deposited by raw natural gas in the region. These deposits solidify at ambient temperatures and build up on equipment.[157] While none of the detected chemicals exceeded governmental safety thresholds of exposure, the study

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[151] *Id.*
[152] *Id.*
[153] U.S. Environmental Protection Agency, Ground Level Ozone, available at http://www.epa.gov/airquality/ozonepollution/health.html (accessed July 29, 2015).
[154] Colborn, Theo et al., Natural Gas Operations from a Public Health Perspective, 17 Human and Ecological Risk Assessment 1039 (2011) ("Colborn 2011"); Colborn, Theo, et al., An Exploratory Study of Air Quality near Natural Gas Operations, Human and Ecological Risk Assessment: An International Journal doi:10.1080/10807039.2012.749447 (2012); *see* note 120 & accompanying text below.
[155] Colborn et al. An Exploratory Study of Air Quality Near Natural Gas Operations, Human and Ecological Risk Assessment: An International Journal, Vol. 20, Iss. 1, 2014, pp. 21-22 (pages refer to page numbers in attached manuscript and not journal pages) ("Colborn 2014), available at http://www.tandfonline.com/doi/full/10.1080/10807039.2012.749447.
[156] Colborn 2014, p. 11.
[157] *Id.*, p. 10.

noted that such thresholds are typically based on "exposure of a grown man encountering relatively high concentrations of a chemical over a brief time period, for example, during occupational exposure."[158] Consequently, such thresholds may not apply to individuals experiencing "chronic, sporadic, low-level exposure," including sensitive populations such as children, the elderly, and pregnant women.[159] For example, the study detected polycyclic aromatic hydrocarbon (PAH) levels that could be of "clinical significance," as recent studies have linked low levels of exposure to lower mental development in children who were prenatally exposed.[160] In addition, government safety standards do not take into account "the kinds of effects found from low-level exposure to endocrine disrupting chemicals…, which can be particularly harmful during prenatal development and childhood.[161]

The EIS should incorporate a literature review of the harmful effects of each of these chemicals known to be used in fracking and other unconventional oil and gas extraction methods. Without knowing the effects of each chemical, the EIS cannot accurately project the true impact of unconventional oil and gas extraction.

D. Air Modeling

BLM should use air modeling to understand what areas and communities will most likely be affected by air pollution. It is crucial to gather independent data rather than relying on industry estimates, which may be inaccurate or biased. Wind and weather patterns, and atmospheric chemistry, determine the fate and transport of air pollution over a region, over time. The EIS should be informed by air modeling to show where the air pollution will flow.

VII. Impacts to Sensitive Species of Plants and Wildlife

The areas for sale are relatively pristine and contain very few oil and gas wells. New development would significantly impact ESA-listed Gunnison's sage grouse habitat, potential lynx habitat, elk migration corridors and production areas, mule deer migration corridors, and wild turkey production and winter concentration areas.[162] Sensitive state-protected areas are at risk. Several parcels (COC77455, COC77456, COC77457) cover most of the Jim Olterman-Lone Cone State Wildlife Protection Area, which provides habitat for deer, elk, black bears, and dusky blue grouse. Another parcel significantly overlaps the Plateau Creek Potential Conservation Area, in which two rare and "globally critically impaired" plants are found—the cushion bladderpod and Lone Mesa snakewood. In addition, water depletions would impact the endangered fish.

The expansion of oil and gas development activities will harm these species through habitat destruction and fragmentation, stress and displacement caused by development-related activities (e.g., construction and operation activities, truck traffic, noise and light pollution), surface water depletion leading to low stream flows, water and air contamination, introduction of

[158] *Id*., pp. 11-12.
[159] *Id*. p. 12.
[160] *Id*., p. 10-11.
[161] *Id*., p. 12.
[162] *See* Rocky Mountain Wild ABI Screen and associated maps, note 9 above.

invasive species, and climate change. These harms can result in negative health effects and population declines. Studies and reports of observed impacts to wildlife from unconventional oil and gas extraction activities are summarized in the Center's "Review of Impacts of Oil and Gas Exploration and Development on Wildlife," submitted herewith.[163] Because the allowance of destructive oil and gas extraction runs contrary to BLM's policy of managing resources in a manner that will "protect the quality of…ecological…values" and "provide…habitat for wildlife,"[164] a no fracking alternative minimizing industrial development and its harmful effects on wildlife must be considered.

The EIS must disclose how oil and gas drilling within the vicinity of these sensitive habitat areas will affect these species.

A. Habitat Loss

Oil and gas development creates a network of well pads, roads, pipelines, and other infrastructure that lead to direct habitat loss and fragmentation, as well as displacement of wildlife from these areas due to increased human disturbance. Habitat loss occurs as a result of a reduction in the total area of the habitat, the decrease of the interior-to-edge ratio, isolation of one habitat fragment from another, breaking up of one habitat into several smaller patches of habitat, and decreasing the average size of a habitat patch. New research has revealed the extent of this habitat loss. For example, in the western United States, the amount of high-quality habitat for the pronghorn has shrunk drastically due to oil and gas development.[165] A recent study shows that oil and gas development causes significant habitat loss to mule deer in the Piceance Basin of Colorado:

> Energy development drove considerable alterations to deer habitat selection patterns, with the most substantial impacts manifested as avoidance of well pads with active drilling to a distance of at least 800 m. Deer displayed more nuanced responses to other infrastructure, avoiding pads with active production and roads to a greater degree during the day than night. In aggregate, these responses equate to alteration of behavior by human development in over 50% of the critical winter range in our study area during the day and over 25% at night.[166]

Significant habitat for elk and mule deer are adjacent to the proposed parcels for lease but there is no analysis of specific measures to address impacts to these species.

The indirect effects from unconventional oil and gas development can often be far greater than the direct disturbances to habitat. The impacts from the well site—including noise, light,

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[163] *See* Center for Biological Diversity, Review of Impacts of Oil and Gas Exploration and Development on Wildlife (June 20, 2015). This review presents the findings of numerous studies and reports on the impacts of hydraulic fracturing on wildlife.
[164] 43 U.S. Code § 1701(a)(8).
[165] Beckmann, J.P. et al. Human-mediated shifts in animal habitat use: Sequential changes in pronghorn use of a natural gas field in Greater Yellowstone, 147 Biological Conservation 1:222 (2012).
[166] Northrup, J. M. et al. Quantifying spatial habitat loss from hydrocarbon development through assessing habitat selection patterns of mule deer, Global Change Biology (Aug. 2015), available at http://onlinelibrary.wiley.com/doi/10.1111/gcb.13037/epdf.

and pollution—extend beyond the borders of the operation site and will consequently render even greater areas uninhabitable for some wildlife. Species dependent on having an "interior" habitat will lose their habitat as operation sites or other infrastructure fragment previously buffered and secluded areas. These and other indirect effects can be far greater than the direct disturbances to land. In the Marcellus shale of Pennsylvania, for instance, research shows that 8.8 acres of forest on average are cleared for each drilling pad along with associated infrastructure, but after accounting for ecological edge effects, each drilling station actually affected 30 acres of forest.[167]

While individual well sites may cause some disturbance and destruction, the cumulative impacts of oil and gas production using unconventional methods must receive attention as well. While the actual well pads may only occupy a small proportion of a particular habitat, their impact can be much greater when their aggregate impact is considered. As discussed above, interior habitats will be destroyed by removing the buffer between the interior habitat and the operation site.

B. Water Depletion

Water depletion also affect species whose habitats are far removed from the actual well site. Because of the high volume of water required for even a single well that uses unconventional extraction methods, the cumulative water depletion has a significant impact on species that rely on water sources that serve to supply oil and gas operations. In addition, water depletion adversely impacts water temperature and chemistry, as well as amplifies the effects of harmful pollutants on wildlife that would otherwise be diluted without the depletion.

C. Contamination from Wastewater Causing Harm and Mortality

Accidental spills or intentional dumping of wastewater contaminate surface water and cause large-scale harm to wildlife. Numerous incidents of wastewater contamination from pipelines, equipment blowouts, and truck accidents have been reported, and have resulted in kills of fish, aquatic invertebrates, and trees and shrubs, as well as negative health effects for wildlife and domestic animals. Contamination incidents that have occurred actually demonstrate that wildlife harm from contamination is a real, not just theoretical, impact that must be considered. In 2013, a company admitted to dumping wastewater from fracking operations into the Acorn Fork Creek in Kentucky, causing a massive fish kill.[168] Among the species harmed was the blackside dace, a threatened minnow species.[169] An analysis of water quality of Acorn Creek and fish tissues taken shortly after the incident was exposed showed the fish displayed general signs of stress and had a higher rate of gill lesions, than fish in areas not affected by the dumping.[170] The discharge of fracking wastewater into the Susquehanna River in Pennsylvania is suspected

[167] Johnson, N., Pennsylvania energy impacts assessment: Report 1: Marcellus shale natural gas and wind, Nature Conservancy – Pennsylvania Chapter (2010) at 10.
[168] Vaidyanathan, Gayathri, *Fracking Spills Cause Massive Ky. Fish Kill*, E&E News, Aug. 29. 2013, http://www.eenews.net/greenwire/2013/08/29/stories/1059986559 (accessed July 30, 2015).
[169] *Id.*
[170] Papoulias, D.M. and A.L. Velasco. Histopathological analysis of fish from Acorn Fork Creek, Kentucky, exposed to hydraulic fracturing fluid releases, 12 Southwestern Naturalist (Special Issue 4):92 (2013).

to be the cause of fish abnormalities, including high rates of spots, lesions, and intersex.[171] In West Virginia, the permitted application of hydrofracturing fluid to an area of mixed hardwood forest caused extensive tree mortality and a 50-fold increase in surface soil concentrations of sodium and chloride.[172]

In addition, open air pits that store waste fluid pose risks for wildlife that may come into contact with the chemicals stored in the pits. Already, there have been several documented cases of animal mortality resulting from contact with pits. A field inspection of open pits in Wyoming found 269 bird carcasses, the likely cause of death being exposure to toxic chemicals stored in the open pits.[173] Open pits can also serve as breeding grounds for mosquitoes, which serve as a vector for West Nile virus, a threat to humans and animals alike. In Wyoming, an increase of ponds led to an increase of West Nile virus among greater sage-grouse populations.[174] Recently, new information has come to light that operators in California have been dumping wastewater into hundreds of unpermitted open pits.[175] The EIS must take into account the impact of both unpermitted, illegal waste pits as well as those that are regulated.

D. Invasive Species

Invasive species may be introduced through a variety of pathways that would be increasingly common if oil and gas activity is allowed to expand. Machinery, equipment, and trucks moved from site to site can carry invasive plant species to new areas. In addition, materials such as crushed stone or gravel transported to the site from other locations may serve as a conduit for invasive species to migrate to the well site or other areas en route.

Aquatic invasive species may also spread more easily given the large amounts of freshwater that must be transported to accommodate new drilling and extraction techniques. These species may be inadvertently introduced to new habitats when water is discharged at the surface. Alternatively, hoses, trucks, tanks, and other water use equipment may function as conduits for aquatic invasive species to access new habitats.

E. Climate Change

Anthropogenic climate change poses a significant threat to biodiversity.[176] Climate disruption is already causing changes in distribution, phenology, physiology, genetics, species

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[171] Piette, Betsy, BP Oil Spill, Fracking Cause Wildlife Abnormalities, Workers World (April 27, 2012) *available at* http://www.workers.org/2012/us/bp_oil_spill_fracking_0503/; Pennsylvania Fish & Boat Commission, Ongoing Problems with the Susquehanna River smallmouth bass, a Case for Impairment (May 23, 2012), www.fish.state.pa.us/newsreleases/2012press/senate_susq/SMB_ConservationIssuesForum_Lycoming.pdf
[172] Adams, Mary Beth, Land Application of Hydrofracturing Fluids Damages a Deciduous Forest Stand in West Virginia, 40 Journal of Environmental Quality 1340 (2011).
[173] *See, e.g.*, Ramirez, P. Jr., Bird Mortality in Oil Field Wastewater Disposal Facilities, 46 Environ Mgmt 5: 820 (2010).
[174] Zou, Li et al., Mosquito Larval Habitat Mapping Using Remote Sensing and GIS: Implications of Coalbed Methane Development and West Nile Virus, 43 J. Med. Entomol. 5:1034 (2006).
[175] Cart, Julie. *Hundreds of Illicit Oil Wastewater Pits Found in Kern County*, (Feb. 26, 2015), *available at* http://www.latimes.com/local/lanow/la-me-ln-pits-oil-wastewater-20150226-story.html.
[176] Warren, R. et al.,Quantifying the benefit of early climate change mitigation in avoiding biodiversity loss, 3 Nature Climate Change 678 (2013) ("Warren 2013").

interactions, ecosystem services, demographic rates, and population viability: many animals and plants are moving poleward and upward in elevation, shifting their timing of breeding and migration, and experiencing population declines and extinctions.[177] Because climate change is occurring at an unprecedented pace with multiple synergistic impacts, climate change is predicted to significantly increase extinction risk for many species. The IPCC concludes that it is extremely likely that climate change at or above 4°C will result in substantial special extinction.[178] Other studies have predicted similarly severe losses: 15-37 percent of the world's plants and animals committed to extinction by 2050 under a mid-level emissions scenario[179]; the extinction of 10 to 14 percent of species by 2100 if climate change continues unabated.[180] Another recent study predicts the loss of more than half of the present climatic range for 58 percent of plants and 35 percent of animals by the 2080s under the current emissions pathway, in a sample of 48,786 species.[181] Because expansion of oil and gas production in the planning area will substantially increase the emissions of greenhouse gases, this activity will further contribute to the harms from climate change to wildlife and ecosystems.

F. Population-level Impacts

Oil and gas development has been linked to population-level impacts on wildlife, including lower reproductive success of sage grouse and declines in the abundance of songbirds and aquatic species. For example, young greater-sage grouse avoided mating near infrastructure of natural-gas fields, and those that were reared near infrastructure had lower annual survival rates and were less successful at establishing breeding territories compared to those reared away from infrastructure.[182] In Wyoming, an increasing density of wells was associated with decreased numbers of Brewer's sparrows, sage sparrows, and vesper sparrows.[183] In the Fayetteville Shale of central Arkansas, the proportional abundance of sensitive aquatic taxa, including darters, was negatively correlated with gas well density.[184] The EIS must consider the population-level impacts that oil and gas development may have on wildlife in the proposed areas for lease.

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[177] Cahill, A.E. et al., How Does Climate Change Cause Extinction? Proceedings of the Royal Society B, doi:10.1098/rspb.2012.1890 (2012); Chen, I. et al., Rapid range shifts of species associated with high levels of climate warming, 333 Science 1024 (2011); Maclean, I.M.D., and R.J. Wilson, Recent ecological responses to climate change support predictions of high extinction risk, 108 Proc. Natl. Acad. Sci. Early Edition 12337 (2011) ("Maclean and Wilson 2011"); Parmesan, C., Ecological and Evolutionary Responses to Recent Climate Change, 37 Annual Review of Ecology Evolution & Systematics 637 (2006); Parmesan, C., and G. Yohe, A globally coherent fingerprint of climate change impacts across natural systems, 421 Nature 37 (2003); Root, T.L. et al., Fingerprints of Global Warming on Wild Animals and Plants, 421 Nature 57 (2003); Warren, Rachel et al., Increasing Impacts of Climate Change Upon Ecosystems with Increasing Global Mean Temperature Rise, 106 Climatic Change 141 (2011). ("Warren 2011").

[178] Intergovernmental Panel on Climate Change, *Climate Change 2014: Synthesis Report, Summary for Policy Makers IPCC Fifth Assessment Synthesis Report*, 18 (2014).

[179] Thomas, C.D. et al., Extinction Risk from Climate Change, 427 Nature 8:145 (2004).

[180] Maclean and Wilson 2011.

[181] Warren 2013.

[182] Holloran, M.J. et al., Yearling Greater Sage-Grouse Response to Energy Development in Wyoming, 74 Journal of Wildlife Management 1:65 (2010).

[183] Gilbert, Michelle M. & Anna D. Chalfoun, Energy Development Affects Populations of Sagebrush Songbirds in Wyoming, 75 The Journal of Wildlife Management 4:816 (2011).

[184] Green, Jessie J. et al., Abstract: Examining Community Level Variables of Fishes in Relation to Natural Gas Development, Southeastern Fishes Council, Annual Meeting Program, November 8 - 9, 2012, New Orleans, Louisiana (2012).

G. Endangered, Threatened, and Sensitive Species

BLM must perform an adequate environmental review of the impacts of oil and gas development on ESA-listed species, including the Gunnison sage-grouse, Colorado greenback cutthroat trout, and the endangered fish. In addition, it must perform an adequate section 7 consultation under the Endangered Species Act to ensure that the lease sale does not jeopardize the continued existence of these species.

1. BLM Must Analyze the Lease Sale's Impacts on Recovery of Gunnison Sage-Grouse

Rocky Mountain Wild's review of 2014 Colorado Parks and Wildlife GIS data indicates that Parcel COC77454 contains historic habitat for the Gunnison sage-grouse.[185] The parcel in question appears to consist of a small area of BLM-managed surface at the edge of the San Juan National Forest. The proposed stipulation CO-34 for this parcel contains general language notifying the prospective lessee that listed species and/or habitat may be present, but contains no specific provisions to mitigate impacts to Gunnison sage-grouse, and the DNA contains no analysis whatsoever of the nature of and impacts to habitat on this parcel. The DNA has no information as to when use of the historic habitat was last observed, its current condition, proximity to other occupied habitats, suitability for restoration and/or re-occupation, or its potential role in the recovery of the species.

Although the parcel in question does not appear to contain listed critical habitat or currently-occupied habitat, it appears to be located approximately ten miles east of the currently-occupied Unit 1, Monticello-Dove Creek population and its corresponding designated critical habitat.[186] Importantly, however, the critical habitat designation does not include BLM or Forest Service lands, which are assumed to be protected by the planning and Section 7 consultation processes.

The recently-revised Tres Rios RMP was found to be likely to adversely effect Gunnison sage-grouse and its critical habitat.[187] BLM is also currently in the process of preparing range-wide plan revisions and an accompanying EIS to "incorporate clear and consistent conservation measures" into its planning for Gunnison sage-grouse habitat.[188]

The Gunnison sage-grouse, *Centrocercus minimus*, was listed as threatened under the Endangered Species Act in November 2014.[189] Habitat loss and fragmentation is the primary

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[185] Rocky Mountain Wild, Assessment of Biological Impact Screen for Colorado February 2016 Lease Sale Notice, *available at* http://rockymountainwild.org/_site/wp-content/uploads/15-148_COMay2016LeaseSaleEAScreen.xlsx
[186] *See* U.S. Fish and Wildlife Service, Final Rule, Designation of Critical Habitat for Gunnison Sage-Grouse, 79 Fed. Reg. 69,312; 69,340-41; 69,357 (Nov. 20., 2014).
[187] *See* Bureau of Land Management, Record of Decision, Tres Rios Resource Management Plan Revision I-16 (2015);
[188] BLM, Notice of Intent To Incorporate Gunnison Sage-Grouse Conservation Measures Into the Bureau of Land Management Land Use Plans, Colorado and Utah and Prepare an Associated Environmental Impact Statement , 79 Fed. Reg. 42,033 (July 18, 2014).
[189] U.S. Fish and Wildlife Service, Final Rule, Threatened Status for Gunnison Sage-Grouse, 79 Fed. Reg. 69,192

cause of the species' decline in abundance and distribution.[190] The listing decision found substantial negative effects on Gunnison sage-grouse from oil and gas development, including both direct loss of habitat, and more significantly, disruption from habitat fragmentation:

> Energy development impacts sage grouse and sagebrush habitats through direct habitat loss from well pad construction, seismic surveys, roads, powerlines and pipeline corridors, and 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 degradation and fragmentation (Suter 1978, pp. 6–13; Aldridge 1998, p.12; Braun 1998, pp. 144–148; Aldridge and Brigham 2003, p. 31; Knick *et al.* 2003, pp. 612, 619; Lyon and Anderson 2003, pp. 489–490; Connelly *et al.* 2004, pp. 7–40 to 7–41; Holloran 2005, pp.56–57; Holloran *et al.* 2007, pp. 18–19; Aldridge and Boyce 2007, pp. 521–522; Walker *et al.* 2007a, pp. 2652–2653; Zou *et al.* 2006, pp. 1039–1040; Doherty *et al.* 2008, p. 193; Leu and Hanser 2011, pp. 270–271). Increased human presence resulting from oil and gas development can also impact sagegrouse either through avoidance of suitable habitat or disruption of breeding activities (Braun *et al.* 2002, pp. 4–5; Aldridge and Brigham 2003, pp. 30–31; Aldridge and Boyce 2007, p.518; Doherty *et al.* 2008, p. 194).
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> Habitat fragmentation resulting from oil and gas development infrastructure, including access roads, may have greater effects on sage-grouse than habitat loss associated with drill sites. Energy development and associated infrastructure works cumulatively with other human activity or development to decrease available habitat and increase fragmentation. Greater sage-grouse leks had the lowest probability of persisting (40–50 percent) in a landscape with less than 30 percent sagebrush within 6.4 km (4 mi) of the lek. These probabilities were even less in landscapes where energy development also was a factor (Walker *et al.* 2007a, p. 2652).[191]

The Dove Creek, Colorado area in particular has been a principle area of sagebrush loss[192] and oil and gas development is identified as a stressor likely to increase in the future.[193]

Significantly, the Fish and Wildlife Service found that the Monticello-Dove Creek population only barely exceeds the population and habitat requirements necessary to sustain a viable population[194]and that currently-occupied population may not be enough to sustain the long-term viability of that population:

(Nov. 20, 2014). As BLM is no doubt aware, this decision is currently the subject of pending litigation by both the Protester and the State of Colorado. *See Center for Biological Diversity v. U.S. Fish and Wildlife Service*, No. 1:15-cv-00130-CMA (D. Colo. amended complaint filed April 21, 2015).

[190] Final Listing Rule, 79 Fed. Reg. at 69,227.

[191] *Id*. at 69,255-56.

[192] *Id.* at 69,228.

[193] *Id.* at 69,256.

[194] Final Critical Habitat Rule, 79 Fed. Reg. at 69,316.

> Two other populations—Monticello-Dove Creek and San Miguel Basin—slightly exceeds [minimum viable habitat] amount. This suggests that currently occupied habitat alone may not be sufficient to maintain long-term viability for at least three and possibly five of the six populations included in this final designation. Declining trends in the abundance of Gunnison sage-grouse outside of the Gunnison Basin further indicate that currently occupied habitat for the five satellite populations included in this final designation may be less than the minimum amount of habitat necessary for their long-term viability. Therefore, we consider the designation of unoccupied critical habitat, including areas outside the CSA in the Monticello population area, essential for conservation of the species.

79 Fed. Reg. 69,316. As best we can ascertain, however, neither this DNA, nor the Tres Rios RMP Revision FEIS, address the question of whether the area west of Fish Creek subject to proposed COC77454 is potentially suitable for habitat or species restoration or recovery and therefore potentially essential for the conservation of the Monticello-Dove Creek population or the species as a whole.

Under the ESA, 16 U.S.C. §1536(a)(2), action agencies must consult with the Fish and Wildlife Service to evaluate the effects and cumulative effects of a proposed project on listed species and critical habitat in the formal consultation process.[195] The courts have held that:

> An agency's failure to adequately consider recovery needs in its adverse modification or jeopardy analysis renders the agency's determination arbitrary and capricious. *Gifford Pinchot Task Force*, 378 F.3d at 1070 (critical habitat); *Nat'l Wildlife Fed'n*, 524 F.3d at 933–34 (explaining that although recovery impacts alone may not necessarily require a jeopardy finding, an agency must consider recovery)

Nw. Envtl. Advocates v. EPA, 855 F. Supp. 2d 1199, 1223 (D. Or. 2012) Here, the Service has acknowledged that unoccupied habitat may be essential to recover the Gunnison sage-grouse as a whole and the Monticello-Dove Creek population in particular. Yet neither the DNA for the proposed lease sale nor the Tres Rios RMP FEIS to which it tiers contains any analysis of whether the area in question is suitable and/or necessary for recovery of a viable Gunnison sage-grouse Dove Creek population. The DNA makes no mention whatsoever of unoccupied Gunnison sage-grouse habitat. The mere inclusion of a stipulation that BLM "may recommend modifications" pursuant to future ESA Section 7 consultation does not satisfy either BLM's requirement to consult now, at the time of lease issuance, or to analyze the effects of its actions under NEPA.

2. BLM Must Analyze the Impacts of New Drilling on the Endangered Fish

Under section 7 of the Endangered Species Act, BLM must consult with Fish and Wildlife Service regarding the impacts of increased drilling and associated water depletions on the endangered fish. Leasing of the parcels at issue would foreseeably entail significant water

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[195] 50 C.F.R. §402.14(g)(3).

depletions within the Dolores River watershed and adversely affect endangered fish that inhabit areas downstream of the lease areas, such as the Dolores River and its tributaries. While the 2008 "Programmatic Biological Opinion for Water Depletions Associated with Bureau of Land Management's Fluid Mineral Program within the Upper Colorado River Basin in Colorado" (PBO) is designed to address any depletions resulting from oil and gas development within the Tres Rios Field Office and other western Colorado field offices, BLM can no longer rely on that consultation for its section 7 compliance. The PBO did not consider the likely increase in horizontal drilling and other unconventional drilling practices that deplete enormous amounts of water to develop the Gothic Shale Gas Play (GSGP) and the Paradox Leasing Analysis Area. Nor did it consider the use of these water-intensive practices throughout the rest of the programmatic action area, including the Grand Junction, Little Snake, White River, and Colorado River Valley Field Offices.[196] To the extent that approval of the lease sale would rely on the PBO, such reliance is arbitrary and cannot constitute BLM's section 7 compliance. BLM must either reinitiate consultation on the PBO or initiate section 7 consultation on the lease sale.

BLM's Programmatic Biological Assessment (PBA) which informed the PBO estimated very low average water use per well within the Dolores River Basin. The PBA assumed that 1.1 acre-feet per well would be used to develop a single conventional well within the San Juan Public Lands Center, which includes the Dolores River Basin, and that a total of 700 wells would be developed over a 15-year period within this sub-watershed of the Upper Colorado River Basin.[197]

The Tres Rios RMP EIS--published in 2013, five years after the PBO was adopted--however, reveals the potential for water use within the Dolores River Basin that could be many times higher than this amount:

> Substantial quantities of water are projected to be used in the drilling, fracturing, and completion process for both the GSGP and Paradox conventional development (Table 3.5.4). The major river basins affected by the projected development in the PLAA are the Dolores and San Juan River Basins. GSGP gas wells in the Paradox Basin would use approximately 7.9 to 13.1 acre-feet of water per well in the drilling and completion process. This level of water consumption is 6 to 11 times the amount of water used to drill and complete a conventional gas well and 11 to 18 times the amount of water used to drill and complete a CBM gas well. Paradox conventional gas wells would use 3.3 acre-feet of water per well in the drilling and completion process. This level of water use is 2.5 times the amount of water used to drill and complete other conventional wells and five times the amount of water used to drill and complete a CBM well.[198]

The Tres Rios RMP EIS estimates the total amount of water depletions within the Dolores River Basin under existing and future leases over a 15-year period to be between 7,444 and 8,840 acre-

[196] BLM Instruction Memorandum CO-2011-022 (April 11, 2011) ("All of the estimates in the PBO were based on using conventional vertical drilling technology.").
[197] PBA at 8.
[198] Tres Rios RMP EIS at 244.

feet, or approximately 496 acre-feet to 589 acre-feet per year.[199] This annual depletion rate is approximately ten times the amount of depletions that the PBA projected would occur in the San Juan Public Lands Center (51.8 acre-feet per year), despite that the PBA's estimated annual rate for this area includes development in other watersheds and not just the Dolores River Basin.[200]

Water use within other areas of the Upper Colorado River Basin have also been grossly underestimated, because they fail to take into account increased horizontal drilling that could be used to develop the Mancos/Mowry and Niobrara shale plays, as well as the water depletion impacts of hydraulic fracturing.[201] For example, under the Grand Junction RMP, over half of all wells developed within the GJFO could be horizontal wells, but the PBO did not take into account the greater water use of such wells.[202] Water depletion records maintained by the BLM Colorado State Office, indicate that horizontal wells depleted an average of 13.34 acre-feet of water per well between 2011 and 2014,[203] but the PBO assumed that within the Grand Junction planning area 0.77 acre-feet per well would be depleted.[204] The increased water use within the Grand Junction planning area and other parts of the upper Colorado River Basin could alter the Service's analysis of the lease sale's effects on the endangered fish, as all BLM-authorized fluid mineral development activity within the Basin is part of a single programmatic action that impacts the endangered fish. Failure to take into account this new information would be arbitrary.

H. Metrics

BLM should conduct a full assessment of the direct and indirect impacts of unconventional oil and gas development activities on wildlife and ecosystems through a suite of comprehensive studies on all species and ecosystems that could be affected. The studies should be particularly detailed for federally and state listed species, federal and state candidates for listing, and state species of special concern. The studies should address the following impacts: (1) habitat loss, degradation, and fragmentation, including edge effects; (2) water depletion; (3) air and water contamination; (4) introduction of invasive species; (5) climate change impacts; (6) health and behavioral effects such as increased stress and changes in life history behaviors; (7) changes in demographic rates such as reproductive success and survival; and (8) potential for population-level impacts such as declines and extirpations. These studies should consider these harms individually and cumulatively.

VIII. Unconventional Extraction Techniques and Underground Wastewater Disposal Pose Seismic Risks

If oil and gas development is allowed to proliferate in the planning area, increased unconventional oil and gas extraction and underground waste injection will increase the risk of

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199 *Id*. at 245.
200 The San Juan Public Lands Center includes the Columbine, Uncompahgre, and Gunnison Field Offices, Dolores Public Lands Center, and Pagosa Springs Public Lands Center. PBA at 8.
201 *See* Center for Biological Diversity Protest of White River RMP (April 27, 2015) at 3-9; Center for Biological Diversity Protest of Grand Junction RMP (2015) (May 11, 2015) at 3-9.
202 *See id*.
203 BLM 2011-2014 Water Depletion Logs submitted to Fish & Wildlife Service.
204 PBA at 8.

induced seismicity. Induced seismic events could damage or destroy property and cause injuries or even death, especially in a state where earthquakes are rare and communities are typically not prepared for them. A no-leasing-no-fracking alternative would minimize these risks, while continued leasing and unconventional well development would increase them.

Research has shown that in regions of the central and eastern United States where unconventional oil and gas development has proliferated in recent years, earthquake activity has increased dramatically.[205] More than 300 earthquakes with magnitude (M) ≥ 3 occurred between 2010 through 2012, compared with an average of 21 per year between 1967 and 2000.[206] Moreover, although earthquakes with magnitude (M) ≥ 5.0 are very uncommon east of the Rocky Mountains, the number per year recorded in the midcontinent increased 11-fold between 2008 and 2011, compared to 1976 to 2007.[207] Mid-continent states experiencing elevated levels of seismic activity include Arkansas, Colorado, New Mexico, Ohio, Oklahoma, Texas, and Virginia.[208]

Research has linked much of the increased earthquake activity and several of the largest earthquakes in the U.S. midcontinent in recent years to the disposal of wastewater into deep injection wells, which is well-established to pose a significant seismic risk.[209] Much of the fracking wastewater is a byproduct of oil and gas production and is routinely disposed of by injection into wells specifically designed and approved for this purpose. The injected fluids push stable faults past their tipping points, and thereby induce earthquakes.[210] In 2015, a study published in *Science* found that, the unprecedented increase in earthquakes in the U.S. mid-continent began in 2009 has been caused solely by the instability caused by fluid injection wells associated with fracking waste disposal.[211] To put an exclamation point on this finding, a 4.7 magnitude earthquake struck northern Oklahoma that was felt in 7 additional states, leading the Oklahoma Geological Survey to reiterate the connection between disposal wells and earthquakes and to shut down the most high risk wells.[212] Earthquakes at magnitudes (M) that are felt (M3 and M4) or destructive (M4 and M5) have been attributed to wastewater injection wells in at least five states - Arkansas, Colorado, Ohio, Oklahoma, and Texas. The largest of these was a M5.7 earthquake in Prague, Oklahoma, which was the biggest in the state's history, destroying 14 homes and injuring two people.[213] Other large earthquakes attributed to wastewater injection include an M5.3 in Colorado,[214] M4.9 in Texas,[215] M4.7 in Arkansas,[216] and M3.9 in Ohio.[217]

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[205]Ellsworth, W.L. Injection-Induced Earthquakes, 341 Science 1225942 (2013) ("Ellsworth 2013"); Keranen, Katie et al., Potentially Induced Earthquakes in Oklahoma, USA: Links Between Wastewater Injection and the 2011 Mw5.7 Earthquake Sequence, Geology doi:10.1130/G34045.1 (March 26, 2013) ("Keranen 2013").
[206]Ellsworth 2013.
[207]Keranen 2013.
[208]Ellsworth 2013.
[209] *Id*.
[210] Lamont-Doherty Earth Observatory, Columbia University. Distant Quakes Trigger Tremors at U.S. Waste-Injection Sites, Says Study. July 11, 2013. Available at: https://www.ldeo.columbia.edu/news-events/distant-quakes-trigger-tremors-us-waste-injection-sites-says-study.
[211] M. Weingarten, S. Ge, J. W. Godt, B. A. Bekins, and J. L. Rubinstein. June 19, 2015. High-rate injection is associated with the increase in U.S. mid-continent seismicity. Science, VOL 348 ISSUE 6241, pages 1336-1340.
[212] Chow, Lorraine. November 19, 2015. Strong Earthquake Rattles Oklahoma, Felt in 7 Other States. https://ecowatch.com/2015/11/19/oklahoma-earthquake-fracking/
[213]Ellsworth 2013, Keranen 2013.
[214] Rubinstein, J.L. et al., The 2001–present triggered seismicity sequence in the Raton Basin of southern

The proliferation of unconventional oil and gas development, including increases in extraction and injection, will increase earthquake risk in the areas for lease. Accordingly, the EIS must fully assess the risk of induced seismicity cause by all unconventional oil and gas extraction and injection activities, including wastewater injection wells.

The analysis should assess the following issues based on guidance from the scientific literature, the National Research Council,[218] and the Department of Energy[219]:

(1) whether existing oil and gas wells and wastewater injection wells in the area covered by the RMP have induced seismic activity, using earthquake catalogs (which provide an inventory of earthquakes of differing magnitudes) and fluid extraction and injection data collected by industry;

(2) the region's fault environment by identifying and characterizing all faults in these areas based on sources including but not limited to the USGS Quaternary Fault and Fold database and the most recent Colorado Geological Survey Fault Activity Map GIS layer. In its analysis, BLM should assess its ability to identify all faults in these areas, including strike-slip faults and deep faults that can be difficult to detect;

(3) the background seismicity of oil- and gas-bearing lands including the history of earthquake size and frequency, fault structure (including orientation of faults), seismicity rates, failure mechanisms, and state of stress of faults;

(4) the geology of oil- and gas-bearing lands including pore pressure, formation permeability, and hydrological connectivity to deeper faults;

(5) the hazards to human communities and infrastructure from induced seismic activity; and

(6) the current state of knowledge on important questions related to the risk and hazards of induced seismicity from oil and gas development activities, including:

  (a) how the distance from a well to a fault affects seismic risk (i.e., locating wells in close proximity to faults can increase the risk of inducing earthquakes);

Colorado/northern New Mexico, 104 Bull. Seismol. Soc'y of America 5 (2014).

215 Brown, W.A. et al. Abstract: Investigating the cause of the 17 May 2012 M4.8 earthquake near Timpson, East Texas, Abstract 84 Seismol. Res. Lett 374 (2013).

216 Horton, S., Disposal of Hydrofracking Waste Fluid by Injection into Subsurface Aquifers Triggers Earthquake Swarm in Central Arkansas with Potential for Damaging Earthquake, 83 Seismol. Res. Lett. 2 (2012).

217 Kim, Won-Young, Induced Seismicity Associated with Fluid Injection into a Deep Well in Youngstown, Ohio, 118 J. of Geophys. Res.: Solid Earth 3506 (February 1, 2013).

218 National Research Council, *Induced Seismicity Potential in Energy Technologies*. National Academies Press (2012).

219 U.S. Department of Energy, *Protocol for Addressing Induced Seismicity Associated with Enhanced Geothermal Systems*, DOE/EE-0662 (2012); U.S. Department of Energy, *Best Practices for Addressing Induced Seismicity Associated with Enhanced Geothermal Systems - Draft* (2013).

(b) how fluid injection and extraction volumes, rates, and pressures affect seismic risk;

(c) how the density of wells affects seismic risk (i.e., a greater density of wells affects a greater volume of the subsurface and potentially contacts more areas of a single fault or a greater number of faults);

(d) the time period following the initiation of injection or extraction activities over which earthquakes can be induced (i.e., studies indicate that induced seismicity often occurs within months of initiation of extraction or injection although there are cases demonstrating multi-year delays);

(e) how stopping extraction or injection activities affects induced seismicity (i.e., can induced seismicity be turned off by stopping extraction and injection and over what period, since studies indicate that there are often delays—sometimes more than a year—between the termination of extraction and injection activities and the cessation of induced earthquake activity);

(f) the largest earthquake that could be induced by unconventional oil and gas development activities in areas covered by the RMP, including earthquakes caused by wastewater injection; and

(g) whether active and abandoned wells are safe from damage from earthquake activity over the short and long-term.

IX. Fossil Fuel Development Will Impact Land Use

Increased oil and gas extraction and production have the potential to dramatically and permanently change the landscape of the areas for lease, which are relatively pristine and are unspoiled by oil and gas development. Countless acres of land will likely be leveled to allow for the construction and operation of well pads and related facilities such as wastewater pits. Roads may have to be constructed or expanded to accommodate trucks transporting chemicals and the large quantities of water needed for some recovery methods. Transmission lines and other utilities may also be required. The need for new distribution, refining, or waste treatment facilities will expand industrial land use. With new roads and other industrial infrastructure, certain areas could open up to new industrial or extractive activities, permanently changing the character and use of the land.

The conversion of substantial acreages from rural or natural landscapes to industrial sites will also mar scenic views throughout the planning area. Given BLM's failure to ensure full reclamation of idle wells and the difficulty of restoring sites to their original condition, scenic resources may be permanently impaired.

X. BLM Must Prepare an Environmental Impact Statement

NEPA demands that a federal agency prepare an EIS before taking a "'major [f]ederal action[] significantly affecting the quality' of the environment." *Kern v. U.S. Bureau of Land Mgmt.*, 284 F.3d 1062, 1067 (9th Cir. 2002). In order to determine whether a project's impacts may be “significant,” an agency may first prepare an Environmental Assessment (“EA”). 40 C.F.R. §§ 1501.4, 1508.9. If the EA reveals that “the agency’s action may have a significant effect upon the . . . environment, an EIS must be prepared.” *Nat’l Parks & Conservation Ass’n v. Babbitt*, 241 F.3d 722, 730 (9th Cir. 2001) (internal quotations omitted). If the agency determines that no significant impacts are possible, it must still adequately explain its decision by supplying a “convincing statement of reasons” why the action’s effects are insignificant. *Blue Mountains Biodiversity Project v. Blackwood*, 161 F.3d 1208, 1212 (9th Cir. 1998). Further, an agency must prepare all environmental analyses required by NEPA at “the earliest possible time.” 40 C.F.R. § 1501.2. “NEPA is not designed to postpone analysis of an environmental consequence to the last possible moment,” but is “designed to require such analysis as soon as it can reasonably be done.” *Kern*, 284 F.3d at 1072.

BLM is therefore required under NEPA to prepare an EIS to support this proposed project. This is especially true in light of the likelihood that fracking would occur on the leases. *Center for Biological Diversity, et al. v. Bureau of Land Management, et al.*, 2013 U.S. Dist. LEXIS 52432; 43 ELR 20076 (N.D. Cal. March 31, 2013) (holding that oil and gas leases were issued in violation of NEPA where BLM failed to prepare an EIS and failed to properly address the significance factors for context and intensity in 40 C.F.R. § 1508.27).

In considering whether the lease sale would have significant effects on the environment, NEPA’s regulations require BLM to evaluate ten factors regarding the “intensity” of the impacts. 40 C.F.R. § 1508.27(b). The Ninth Circuit has held that the existence of any “one of these factors may be sufficient to require preparation of an EIS.” *Ocean Advocates*, 402 F.3d at 865; *Nat’l Parks & Conservation Ass’n*, 241 F.3d at 731. Several of these “significance factors” are implicated in the lease sale and clearly warrant the preparation of an EIS:

> The degree to which the effects on the quality of the human environment are likely to be highly controversial.
>
> The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
>
> The degree to which the proposed action affects public health or safety.
>
> The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

40 C.F.R. § 1508.27(b)(4), (5), (2) & (9). *See Center for Biological Diversity, et al. v. Bureau of Land Management, et al.*, 2013 U.S. Dist. LEXIS 52432; 43 ELR 20076 (N.D. Cal. March 31, 2013) (holding that BLM failed to properly address the significance factors regarding controversy and uncertainty that may have been resolved by further data collection (citing *Native Ecosystems Council v. U.S. Forest Serv.*, 428 F.3d 1233, 1240 (9th Cir. 2005)). Here, individually and considered as a whole, there is no doubt that significant effects may result from the lease sale; thus, NEPA requires that BLM should have prepared an EIS for the action.

i. The effects on the human environment will be highly controversial

A proposal is highly controversial when "substantial questions are raised as to whether a project . . . may cause significant degradation" of a resource, *Nw. Envtl. Def. Ctr. v. Bonneville Power Admin.*, 117 F.3d 1520, 1536 (9th Cir. 1997), or when there is a "substantial dispute [about] the size, nature, or effect of the" action. *Blue Mtns. Biodiversity*, 161 F.3d at 1212. A "substantial dispute exists when evidence, raised prior to the preparation of [a] . . . FONSI, casts serious doubt upon the reasonableness of an agency's conclusions." *Nat'l Parks & Conserv. Ass'n*, 241 F.3d at 736. When such a doubt is raised, "NEPA then places the burden on the agency to come forward with a 'well-reasoned explanation' demonstrating why those responses disputing the EA's conclusions 'do not . . . create a public controversy.'" *Id.* See also *Center for Biological Diversity, et al. v. Bureau of Land Management, et al.*, 2013 U.S. Dist. LEXIS 52432, 839; 43 ELR 20076 (N.D. Cal. March 31, 2013).

Here, the controversy regarding the lease sale is fully evident. This comment letter provides abundant evidence that oil and gas operations can cause significant impacts to human health, water resources, air quality, imperiled species, and seismicity. The potential for these significant impacts to occur is particularly clear in light of the potential for fracking to result from the lease sale.

Fracking is among the top, if not the most controversial energy issue facing America today. The controversy spans the public arena, scientific discourse, local governments, and the halls of Congress. At the request of Congress, EPA is conducting a study into the effects of fracking on drinking and ground water.[220] Similarly, the New York Draft DEC concluded that the health and environmental risks from fracking supports its ban in New York State. In Nevada, several anti-fracking grassroots groups have emerged along with petitions to ban the practice in Nevada, which to date have garnered more than 3200 signatures.[221] However, in addition to the presence of controversy, it is already evident, as discussed above, that fracking is harmful. Clearly, the level of controversy associated with fracking and its expansion in Colorado in association with the lease sale is sufficient to trigger the need for an EIS. 40 C.F.R. § 1508.27(b)(4).

ii. The lease sale presents highly uncertain or unknown risks

An EIS must also be prepared when an action's effects are "highly uncertain or involve unique or unknown risks." 40 C.F.R. § 1508.27(b)(5). As the Ninth Circuit has held, "[p]reparation of an EIS is mandated where uncertainty may be resolved by further collection of data, or where the collection of such data may prevent speculation on potential . . . effects." *Native Ecosystems Council v. U.S. Forest Serv.*, 428 F.3d 1233, 1240 (9th Cir. 2005) (internal

[220] U.S. Environmental Protection Agency, Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources (November 2011).
[221] Petitions available at: http://petitions.moveon.org/sign/nevadas-public-health.fb28?source=c.fb&r_by=5006637
http://org.credoaction.com/petitions/nevada-s-public-health-is-at-risk-we-want-a-moratorium-on-hydraulic-fracturing
http://petitions.moveon.org/sign/prevent-fracking-in-nevada/?source=search
http://org.credoaction.com/petitions/ban-fracing-in-nevada?source=facebook-share-button&time=1374605460

citations omitted); *Blue Mtns. Biodiversity*, 161 F.3d at 1213-1214 (finding "EA's cursory and inconsistent treatment of sedimentation issues . . . raises substantial questions about . . . the unknown risks to" fish populations). As one court recently explained regarding oil and gas leasing that may facilitate fracking, "BLM erroneously discounted the uncertainty from fracking that may be resolved by further data collection. 'Preparation [of an EIS] is mandated where uncertainty may be resolved by further collection of data, or where collection of such data may prevent speculation on potential effects.'" *Center for Biological Diversity, et al. v. Bureau of Land Management, et al.*, 2013 U.S. Dist. LEXIS 52432, *42; 43 ELR 20076 (N.D. Cal. March 31, 2013) quoting *Native Ecosystems Council v. U.S. Forest Serv*., 428 F.3d 1233, 1240 (9th Cir. 2005)).

While it is clear that oil and gas activities can cause great harm, there remains much to be learned about the specific pathways through which harm may occur and the potential degree of harm that may result. Additional information is needed, for example, about possible rates of natural gas leakage, the potential for fluids to migrate through the ground in and around the parcels, and the potential for drilling to affect local faults. NEPA clearly dictates that the way to address such uncertainties is through the preparation of an EIS.

iii. The lease sale poses threats to public health and safety

As discussed in great detail above, the oil and gas activities that may occur as a result of the lease sale could cause significant impacts to public health and safety. 40 C.F.R. § 1508.27(b)(2). Fracking would pose a grave threat to the region's water resources, harm air quality, pose seismic risks, negatively affect wildlife, and fuel climate change.

As a congressional report noted, oil and gas companies have used fracking products containing at least 29 products that are known as possible carcinogens, regulated for their human health risk, or listed as hazardous air pollutants.[222] The public's exposure to these harmful pollutants alone would plainly constitute a significant impact. Operational accidents also pose a significant threat to public health. For example in August 2008, Newsweek reported that an employee of an energy-services company got caught in a fracking fluid spill and was taken to the emergency room, complaining of nausea and headaches.[223] The fracking fluid was so toxic that it ended up harming not only the worker, but also the emergency room nurse who treated him. Several days later, after she began vomiting and retaining fluid, her skin turned yellow and she was diagnosed with chemical poisoning.[224] Furthermore, and as previously discussed, information continues to emerge on the risk of earthquakes induced by wastewater injected into areas near faults. It is undeniable that these earthquakes pose risks to the residents of the area and points beyond

The use of fracking fluid, which is likely to occur as a result of the lease sale, poses a major threat to public health and safety and therefore constitutes a significant impact. BLM therefore must evaluate such impacts in an EIS.

[222] Waxman, Henry et al., United States House of Representatives, Committee on Energy and Commerce, Minority Staff, Chemicals Used in Hydraulic Fracturing (Apr. 2011) ("Waxman 2011")
[223] Wiserman at 138-39.
[224] *Id.*

iv. The Lease Sale Action Will Adversely Affect Candidate and Agency Sensitive Species and Their Habitat

An EIS may also be required when an action "may adversely affect an endangered or threatened species or its habitat." 40 C.F.R. § 1508.27(b)(9). Although a finding that a project has "some negative effects does not mandate a finding of significant impact," an agency must nonetheless fully and closely evaluate the effects on listed species and issue an EIS if those impacts are significant. *Klamath-Siskiyou Wildlands Ctr. v. U.S. Forest Serv.*, 373 F. Supp. 2d 1069, 1081 (E.D. Cal. 2004) (finding agency's conclusion that action "may affect, is likely to adversely affect" species due to "disturbance and disruption of breeding" and "degradation" of habitat is "[a]t a minimum, . . . an important factor supporting the need for an EIS").

Impacts to BLM sensitive and other rare species threatened by the proposed lease have been highlighted in section "V" subsection "G" of these comments.

XI. BLM Must Ensure That the Federal Land Policy and Management Act and the Mineral Leasing Act Are Not Violated

The Mineral Leasing Act ("MLA") requires BLM to demand lessees take all reasonable measures to prevent the waste of natural gas. The MLA states:

> All leases of lands containing oil or gas, made or issued under the provisions of this chapter, shall be subject to the condition that the lessee will, in conducting his explorations and mining operations, use all reasonable precautions to prevent waste of oil or gas developed in the land, or the entrance of water through wells drilled by him to the oil sands or oil-bearing strata, to the destruction or injury of the oil deposits.

30 U.S.C. § 225; *see also id.* § 187 (stating that for the assignment or subletting of leases that "[e]ach lease shall contain . . . a provision . . . for the prevention of undue waste"). This statutory mandate is unambiguous and must be enforced. *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 184 n.29 (1978) (stating that "[w]hen confronted with a statute which is plain and unambiguous on its face," "it is not necessary to look beyond the words of the statute."). As already discussed in previous sections, oil and gas operations emit significant amounts of natural gases, including methane and carbon dioxide, which can be easily prevented. [225]

Pursuant to the Federal Land Policy and Management Act ("FLPMA"), BLM must "take any action necessary to prevent unnecessary or undue degradation of the [public] lands." 43 U.S.C. § 1732(b). Written in the disjunctive, BLM must prevent degradation that is "unnecessary" and degradation that is "undue." *Mineral Policy Ctr. v. Norton*, 292 F.Supp.2d 30, 41-43 (D. D.C. 2003). The protective mandate applies to BLM's planning and management decisions. *See Utah Shared Access Alliance v. Carpenter*, 463 F.3d 1125, 1136 (10th Cir. 2006)

[225] *See* U.S. 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 20(2010)

(finding that BLM's authority to prevent degradation is not limited to the RMP planning process). Greenhouse gas pollution for example causes "undue" degradation. Even if the activity causing the degradation may be "necessary," where greenhouse gas pollution is avoidable, it is still "unnecessary" degradation. 43 U.S.C. § 1732(b).

In addition to being harmful to human health and the environment, the emissions from oil and gas operations are also an undue and unnecessary waste and degredation of public lands. Consequently, BLM's proposed gas and oil lease sale violates FLPMA. *See* 43 U.S.C. § 1732(b).

Conclusion

Unconventional oil and gas development not only fuel the climate crisis but entail significant public health risks and harms to the environment. Accordingly, BLM should end all new leasing on BLM lands. Should BLM proceed with the lease sale it must thoroughly analyze the alternatives of no new leasing (or no action), and no fracking or other unconventional well stimulation methods in an EIS. Thank you for your consideration of these comments. The Center looks forward to reviewing a legally adequate EIS for this proposed oil and gas leasing action.

Sincerely,

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Center for Biological Diversity