CENTER *for* BIOLOGICAL DIVERSITY

FAX COVER SHEET

Date: December 12, 2016

To: Ruth Welch – Colorado State BLM

Fax #: 303-239-3799

# of Pages: 50 (including cover)

Please find attached our Protest of BLM Colorado State Office, Tres Rios Field Office February 9, 2017 Competitive Oil and Gas Lease Sale.

A compact disk with the references cited within the protest was sent to you via Federal Express.

Thank you.

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December 12, 2016

VIA FAX (303-239-3799)

Ruth Welch
State Director
Colorado State Office
Bureau of Land Management
2850 Youngfield St.
Lakewood, CO 80215

Re: Protest of BLM Colorado State Office, Tres Rios Field Office February 9, 2017 Competitive Oil and Gas Lease Sale.

Dear Director Welch:

The Center for Biological Diversity (the "Center") and Sierra Club hereby file this Protest of the Bureau of Land Management's ("BLM") planned February 2017 Oil and Gas Lease Sale and both Determinations of NEPA Adequacy, DOI-BLM-CO-S010-2017-0001-DNA and DOI-BLM-CO-S010-2016-0039-DNA, in the Tres Rios Field Offices pursuant to 43 C.F.R. § 3120.1-3. We formally protest the inclusion of each of the 17 parcels, covering 17,631.540 acres:

COC78157	COC78163	COC78169
COC78158	COC78164	COC78170
COC78159	COC78165	COC78171
COC78160	COC78166	COC78172
COC78161	COC78167	COC78173
COC78162	COC78168	

All cited references in this protest and hard copies of Exhibits A-F have been delivered to BLM's Colorado State Office via Federal Express delivery.[1]

PROTEST

[1] A corrected list of references is appended at the end of this protest (updated from the version on the CD of references). An additional reference not included in the CD is being submitted with this protest.

I. Protesting Parties: Contact Information and Interests:

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

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The Center is a non-profit environmental organization with over 48,500 members, many of whom live and recreate in Colorado. 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 their habitats in Colorado. 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 rare, endangered and threatened species like Colorado River endangered fish species (Colorado pikeminnow, razorback sucker, humpback chub, and bonytail), Gunnison's sage-grouse, and big game such as mule deer and elk. The Center's board, staff, and members use the public lands in Colorado, 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.

The Sierra Club is a national nonprofit organization of approximately 625,000 members dedicated to exploring, enjoying, and protecting the wild places of the earth; to practicing and promoting the responsible use of the earth's ecosystems and resources; to educating and enlisting humanity to protect and restore the quality of the natural and human environment; and to using all lawful means to carry out these objectives. The Rocky Mountain Chapter of the Sierra Club has approximately 17,000 members in the state of Colorado. The Sierra Club has members who live and recreate in the Tres Rios Field Office. Sierra Club members use the public lands in Colorado, including the lands and waters that would be affected by actions under the lease sale, for quiet recreation, scientific research, aesthetic pursuits, and spiritual renewal. These areas would be threatened by increased oil and gas development that could result from the proposed lease sale.

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

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

(1) the Center and Sierra Club's comments on the DNA for the proposed February 2017 lease sale, incorporated here by reference and attached as Exhibit A;

(2) Rocky Mountain Wild et al.'s comments on the DNA for the proposed February 2017 lease sale, incorporated here by reference and attached as Exhibit B;

(3) the Center's scoping comments for the proposed February 2017 lease sale, incorporated here by reference and attached as Exhibit C;

(4) the Center et al.'s June 13, 2016 comments on the proposed November 2016 lease sale (parcels for which were deferred until the February 2017 lease sale), incorporated here by reference and attached as Exhibit D;

(5) the Center's December 2015 protest of the proposed February 2016 lease sale (parcels for which were deferred until the November 2016 lease sale, which were then deferred until the February 2017 lease sale), incorporated here by reference and attached as Exhibit E.

A. BLM's Determination of NEPA Adequacy Is Erroneous

BLM's preparation of Determination of NEPA Adequacy is wholly improper and violates NEPA. The DNAs improperly tier to the Final Environmental Impact Statement for the Tres Rios Field Office and San Juan National Forest Land and Resource Management ("RMP-FEIS"), but the RMP FEIS fails to address site-specific impacts that could foreseeably result from new leasing, including impacts on wildlife, water resources, geological hazards, and air quality. Nor does it provide a complete analysis of the cumulative impacts of new oil and gas development, including greenhouse gas emissions, to properly support a DNA. Further, new information has arisen since the RMP was adopted and revised, revealing significant, reasonably foreseeable effects that BLM has never considered in any NEPA review, which we discuss in greater detail below.

NEPA requires agencies to undertake thorough, site-specific environmental analysis at the earliest possible time and prior to any "irretrievable commitment of resources" so that the action can be shaped to account for environmental values. Pennaco Energy, Inc. v. United States DOI, 377 F.3d 1147, 1160 (10th Cir. 2004). Oil and gas leasing is an irretrievable commitment of resources. S. Utah Wilderness All. v. Norton, 457 F. Supp. 2d 1253, 1256 (D. Utah 2006). Thus, NEPA establishes "action-forcing" procedures that require agencies to take a "hard look," at "all foreseeable impacts of leasing" before leasing can proceed. Center for Biological Diversity v. United States DOI, 623 F.3d 633, 642 (9th Cir. 2010); N.M. ex rel. Richardson v. BLM, 565 F.3d 683, 717 (10th Cir. 2009). Chief among these procedures is the preparation of an environmental impact statement ("EIS"). Id.

BLM, however, did not prepare an EIS; nor did BLM even bother to prepare an EA for the proposed lease sale. Instead BLM's decision to proceed with the February 2017 lease sale is based solely on the broad brush analysis contained in the RMP-FEIS regarding some general potential effects on resources throughout the planning area. As we pointed out in our previous comments, the RMP provides only a highly general overview of the range of possible impacts on a very broad scale and therefore does not contain the required analysis of environmental impacts likely to occur from oil and gas development *in the areas to be leased.* For example, the RMP's analysis does not provide any sense of how specific streams and watersheds in the proposed action area would be impacted by increased oil and gas development, including already impaired streams and watersheds. Nor does it discuss how the proposed lease sale could worsen poor air quality in those areas that already have significant well development, or significantly alter and industrialize relatively pristine or rustic landscapes and degrade prime habitat for wildlife.

Instead, BLM presupposes that it can auction off the parcels and issue the leases first, and then fulfill its NEPA obligations after the leases enter into the development stage. As we have stated in previous comments, this approach to NEPA has already been rejected by the courts. See Richardson, 565 F.3d at 688 (rejecting BLM's position that it was not required to conduct any site-specific environmental reviews until the issuance of an APD and holding that "NEPA requires BLM to conduct site-specific analysis before the leasing stage").

BLM Instruction Manual 2010-117 specifically directs BLM to conduct site-specific analysis of lease parcels in NEPA documentation.[2] See, e.g., IM 2010-117 § III(E) ("The IPDR Team will complete site-specific NEPA compliance documentation for all BLM surface and split estate lease sale parcels..."); id. ("Most parcels that the field office determines should be available for lease will require site-specific NEPA analysis."). IM 2010-117 also calls upon BLM to consider a host of factors in deciding whether to propose parcels for lease, each of which calls for site-specific analysis. For example, BLM must consider whether "[c]onstruction and use of new access roads or upgrading existing access roads to an isolated parcel would have unacceptable impacts to important resource values."[3] Other considerations include whether:

- In undeveloped areas, non-mineral resource values are greater than potential mineral development values.

- Stipulation constraints in existing or proposed leases make access to and/or development of the parcel or adjacent parcels operationally infeasible, such as an NSO parcel blocking access to parcels beyond it or consecutive and overlapping timing restrictions that do not allow sufficient time to drill or produce the lease without harm to affected wildlife resources.

- Parcel configurations would lead to unacceptable impacts to resources on the parcels or on surrounding lands and cannot be remedied by reconfiguring.

[2] Bureau of Land Management, IM 2010-117, Oil and Gas Leasing Use Planning and Lease Parcel Reviews (2010).
[3] IM 2010-117 § III(C)(4).

- The topographic, soils, and hydrologic properties of the surface will not allow successful final landform restoration and revegetation in conformance with the standards found in Chapter 6 of the Gold Book.

- Leasing would result in unacceptable impacts to specially designated areas (whether Federal or non-Federal) and would be incompatible with the purpose of the designation.

Each of these factors should be analyzed with respect to the parcels at issue, given their relative isolation and undeveloped nature (e.g., parcels COC78162, 78163, 78164, 78165, 78166, 78167, 78168, 78169, 78170, 78171, 78172), proximity to sage-grouse critical habitat or importance to sage-grouse recovery (see section A.4 and B.4 below), and special designations, including ACEC-designation (parcel COC78171), State Wildlife Area designations (e.g., parcels COC78162, 78163, 78164, 78167, 78168), Potential Conservation Area (PCA) designations by the Colorado Natural Heritage Program at Colorado State University (e.g., parcels COC78161, 78166, 78168, 7817)[4], and Colorado Parks & Wildlife Important Bald Eagle Area designations (COC78172, 78173).[5]

Moreover, IM 2010-117 directs BLM to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources."[6] Such an evaluation would necessarily require a consideration of site-specific resource uses.[7] BLM cannot proceed with new leasing without the requisite "hard look" of site-specific impacts, including consideration of all factors set forth in IM 2010-117 and consideration of alternatives that would allow BLM to meaningfully examine unresolved resource use conflicts. See S. Utah Wilderness All. v. United States DOI, 2016 U.S. Dist. LEXIS 42696, 14-15 (D. Utah Mar. 30, 2016) (failure to comply with IM 2010-117 can result in NEPA violation); see also Cotton Petroleum Corp., 870 F.2d 1515, 1527 (10th Cir. 1989) (failure to follow internal guidance document can constitute arbitrary and capricious decisionmaking).

Furthermore, even at the programmatic level, the meager analysis BLM has provided thus far is unlawfully deficient. Aside from failing to analyze site-specific impacts, the RMP-FEIS fails to thoroughly address the water depletion, greenhouse gas, and public health impacts of increased horizontal drilling and hydraulic fracturing, fail to discuss adequate mitigation, and

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[4] *See* Colorado Natural Heritage Program (CNHP), San Miguel PCA Report, available at http://www.cnhp.colostate.edu/download/documents/pca/L4_PCA-San%20Miguel%20Basin_11-29-2015.pdf; CNHP, Big Gypsum Valley PCA Report, available at http://www.cnhp.colostate.edu/download/documents/pca/L4_PCA-Big%20Gypsum%20Valley_11-29-2015.pdf; Plateau Creek PCA Report, available at http://www.cnhp.colostate.edu/download/documents/pca/L4_PCA-Plateau%20Creek_11-29-2015.pdf (noting special values of San Miguel Basin PCA, Big Gypsum Valley PCA, and Plateau Creek PCA).

[5] *See* Rocky Mountain Maps showing conflicts between species and special areas for 2/9/2017 Colorado lease sale parcels, available at https://drive.google.com/drive/folders/0B1itEUsz7CwZTWNZSE5QTGpka1U; Rocky Mountain Wild Maps showing existing oil and gas development near for 2/9/2017 Colorado lease sale parcels, available at https://drive.google.com/drive/folders/0B1itEUsz7CwZVm1KRzAyaHNxWm8?usp=sharing.

[6] *Id.* § III(E).

[7] *Id.*

sets forth toothless stipulations with open-ended exceptions. We discuss in greater detail BLM's failure to consider the following significant impacts:

1. The RMP-EIS Fails to Fully Analyze Greenhouse Gas Emissions and Social Cost of Carbon

A Determination of NEPA Adequacy is improper because the RMP-EIS fails to fully quantify greenhouse gas emissions that would result from new oil and gas development. As we explained in our previous comments, the RMP-FEIS 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.[8] Lastly, as explained in the Center's previous comments, the RMP-EIS fails to analyze the social cost of carbon, a useful tool for evaluating the cumulative climate change impacts of greenhouse gas emissions.

Development of the leases will cause, directly and indirectly, greenhouse gas emissions that could amount to millions of metric tons of carbon dioxide equivalent. NEPA requires BLM to inform the public of the "significance" of these emissions, 40 C.F.R. § 1502.16(a)-(b); for example, BLM must "evaluate the[ir] severity." Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 352 (1989). To serve NEPA's "twin aims" of informing agency decisionmakers and the public, this evaluation must be in terms that will meaningfully inform these intended audiences of the magnitude and consequences of these effects. Natural Res. Def. Council v. Nuclear Regulatory Comm'n, 685 F.2d 459, 487 n.149 (D.C. Cir. 1982) rev'd on other grounds sub nom. Balt. Gas & Elec. Co. v. Natural Res. Def. Council, 462 U.S. 87, 106-107 (1983); Columbia Basin Land Prot. Ass'n v. Schlesinger, 643 F.2d 585, 594 (9th Cir. 1981).

Here, the RMP-EIS is deficient in multiple respects. First, the RMP-EIS does not take into account the full lifecycle emissions of oil and gas extracted within the planning area. Its greenhouse gas analysis omits emissions transportation of extracted product to market or to refineries (including methane leakage), refining and other processing, and combustion of the extracted end-use product, failing to disclose the full scope of greenhouse gas emissions that could result from new leasing.

The RMP-EIS's scant treatment of the climate change effects of the proposed action runs directly counter to the CEQ's recently finalized climate change guidance. CEQ's guidance "[r]ecommends that agencies quantify a proposed agency action's projected direct and indirect GHG emissions, taking into account available data and GHG quantification tools that are suitable for the proposed agency action."[9] The CEQ climate guidance notes that "[q]uantification tools

[8] *See* RMP-FEIS at 364-65 (quantifying GHGs only from drilling rig engines, hydraulic fracturing engines, compressor engines, and well pad separators/heaters).

[9] CEQ, Final Guidance on the Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews at 4 (2016), available at https://www.whitehouse.gov/sites/whitehouse.gov/files/documents/nepa_final_ghg_guidance.pdf.

are widely available, and are already in broad use in the Federal and private sectors, by state and local governments, and globally."[10]

The agencies should quantify the potential lifetime CO2e emissions from all phases of oil and gas development. This quantification should include emissions from the associated drilling, completion, production, transportation, and ultimate consumption phases.[11] The CEQ Guidance notes that "[f]or actions such as a Federal lease sale of coal for energy production, the impacts associated with the end-use of the fossil fuel being extracted would be the reasonably foreseeable combustion of that coal."[12] This logic should hold with equal force for oil and gas leasing, and thus these combustion emissions should be quantified. Emissions from "connected actions," e.g., from development of private subsurface, and from the construction and operation of gathering and transmission infrastructure should also be quantified as part of this process.[13]

BLM's claim that such quantification is too speculative or uncertain is belied by recent efforts by other federal agencies in quantifying emissions.[14] The EAs for a recent lease sale in the Wayne National Forest, as well as one in Utah, undercut BLM's assertion here that GHGs cannot be quantified at the leasing stage.[15] See also High Country Conservation Advocates v. United States Forest Serv., 52 F. Supp. 3d 1174, 1196 (D. Colo. 2014) (decision to forgo calculating mine's reasonably foreseeable GHG emissions was arbitrary "in light of the agencies' apparent ability to perform such calculations").

Moreover, NEPA requires "reasonable forecasting," which includes the consideration of "reasonably foreseeable future actions…even if they are not specific proposals." N. Plains Res. Council, Inc. v. Surface Transp. Bd., 668 F.3d 1067, 1079 (9th Cir. 2011) (citation omitted). It is reasonably foreseeable that opening this acreage to oil and gas leasing would result in the commercial production of oil and gas. BLM has ample information to inform a greenhouse gas emissions analysis, including figures for total wells and well pads, average length of gathering lines, and total compressor stations, and other figures estimated in the Reasonably Foreseeable Development Scenario for the Tres Rio Field Office. That "the development potential of the oil

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[10] CEQ Guidance at 12 (citing CEQ's inventory of Greenhouse Gas Accounting Tools, available at https://ceq.doe.gov/current_developments/GHG-accounting-tools.html).

[11] CEQ Guidance at 14:

> "NEPA reviews for proposed resource extraction and development projects typically include the reasonably foreseeable effects of various phases in the process, such as clearing land for the project, building access roads, extraction, transport, refining, processing, using the resource, disassembly, disposal, and reclamation."

See also id. at 16 n.43 (citing DOE's life-cycle GHG emissions study for exports of liquefied natural gas, and thus implicitly endorsing the view that a life cycle analysis is the appropriate method).

[12] *Id.* at 16 n.42.

[13] *See id.* at 13.

[14] *See, e.g.*, USEPA, Draft Environmental Assessment for National Pollutant Discharge Elimination System (NPDES) General Permit for Eastern Gulf of Mexico Offshore Oil and Gas Exploration, Development, and Production, 4-33 – 4-37 (2016).

[15] U.S. Bureau of Land Management, Environmental Assessment for Oil and Gas Leasing, Wayne National Forest, Marietta Unit of the Athens Ranger District, Monroe, Noble, and Washington Counties, Ohio (October 2016); See also BLM, West Desert District, Fillmore Field Office, Environmental Assessment, August 2015 Oil and Gas Lease Sale, pp. 27-28 (Dec. 2015); U.S. Bureau of Land Management, Greenhouse Gases Estimate (West Desert District Nov 2015 Lease Sale), http://www.blm.gov/style/medialib/blm/ut/natural_resources/airQual ity.Par.38

and gas resource in the area of the leases is under considerable uncertainty" is not a rational basis for cutting off the required analysis. *See* May 2016 DNA Response no. 6. "Because speculation is . . . implicit in NEPA," agencies may not "shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as crystal ball inquiry." Id.

The RMP-FEIS also fails to provide any analysis of the impact or severity of greenhouse gas emissions. One widely used approach to evaluating the impact of GHG emissions is to estimate the costs of those emissions to society. The federal Interagency Working Group on the Social Cost of Carbon has developed estimates of the present value of the future costs of carbon dioxide, methane, and nitrous oxide emissions as a proxy for the magnitude and severity of those impacts.[16] These tools are easy to use by agencies, easy to understand by the public, and supported by years of peer-reviewed scientific and economic research. The EPA and other federal agencies have used these social cost protocols to estimate the effects of rulemakings on climate, and certain BLM field offices have used these tools in project level NEPA analysis. These protocols estimate the global financial cost of each additional ton of GHG pollution emitted to the atmosphere, taking into account factors such as diminished agricultural productivity, droughts, wildfires, increased intensity and duration of storms, ocean acidification, and sea-level rise. The Council on Environmental Quality has explicitly endorsed these tools, explaining that they were "[d]eveloped through an interagency process committed to ensuring that [these] estimates reflect the best available science and methodologies and used to assess the social benefits of reducing carbon dioxide emissions across alternatives in rulemakings, [the social cost protocols] provide[] a harmonized, interagency metric that can give decision makers and the public useful information for their NEPA review."[17]

Analysis of the social cost of greenhouse gases plays an important—and otherwise unfilled—role regardless of whether BLM engages in a broader cost benefit analysis. Because BLM cannot identify the physical consequences of the greenhouse gas emissions caused by the leases, BLM must use "generally accepted" methods to discuss those impacts. 40 C.F.R. § 1502.22(b)(4). The social cost protocols, developed by a consortium of federal agencies specifically to address the impact of federal actions, are precisely such a generally accepted method. These include tools to quantify the social costs of methane, contrary to BLM's claim.[18] Given BLM's failure to adopt any other method for discussing these impacts, BLM's failure to use the social cost protocols was arbitrary and contrary to NEPA's requirements.

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[16] *See* Interagency Working Group on the Social Cost of Carbon, United States Government, *Technical Support Document: Technical Update on the Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866* (May 2013) at 2 (hereinafter 2013 TSD); Interagency Working Group, Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide (August 2016), available at https://www.whitehouse.gov/sites/default/files/omb/inforeg/august_2016_sc_ch4_sc_n2o_addendum_final_8_26_16.pdf (last visited October 30, 2016).

[17] Council on Environmental Quality, Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews at 33 n.86 (August 1, 2016), available at https://www.whitehouse.gov/sites/whitehouse.gov/files/documents/nepa_final_ghg_guidance.pdf.

[18] *See* Exhibit C at n.223, n.224 & accompanying text.

Here, where BLM has not identified any alternative method, use of the social cost protocols is required. In 2014, the district court for the District of Colorado faulted the Forest Service for failing to calculate the social cost of carbon, refusing to accept the agency's explanation that such a calculation was not feasible. High Country Conservation Advocates v. U.S. Forest Service, 52 F.Supp.3d 1174 (D.Colo. 2014) (a decision the agency decided not to appeal, thus implicitly recognizing the importance of incorporating a social cost of carbon analysis into NEPA decisionmaking). In his decision, Judge Jackson identified the IWG's SCC protocol as a tool to "quantify a project's contribution to costs associated with global climate change." Id. at 1190.[19] To fulfill this mandate, the agency must disclose the "ecological[,] ... economic, [and] social" impacts of the proposed action. 40 C.F.R. § 1508.8(b). Simple calculations applying the SCC to GHG emissions from this project offer a straightforward comparative basis for analyzing impacts, and identifying very significant costs.[20]

Finally, any emissions from opening up new areas to leasing should be considered significant given the need to eliminate or reduce emissions from fossil fuel development already in production. A recent study by Oil Change International shows that meeting the Paris climate goals requires a managed decline in *currently operating* fossil fuel production activities.[21] Specifically:

- The potential carbon emissions from the oil, gas, and coal in the world's currently operating fields and mines would take us beyond 2°C of warming.
- The reserves in currently operating oil and gas fields alone, even with no coal, would take the world beyond 1.5°C.[22]

Based on these findings, the report recommends: "No new fossil fuel extraction or transportation infrastructure should be built, and governments should grant no new permits for them."[23]

Beginning the phase-out of public fossil fuel production by ceasing new onshore leases would have a significant effect on U.S. contributions to greenhouse gas emissions, allowing us to meet targets under the Paris Agreement. The first systematic quantitative assessment of the emissions consequences of a cessation of federal leasing (both onshore and offshore) found that:

> [U]nder such a policy, U.S. coal production would steadily decline, moving closer to a pathway consistent with a global 2°C temperature limit. Oil and gas extraction would drop as well, but more gradually, as federal lands and waters

[19] *See also Id.* at 18 (noting the EPA recommendation to "explore other means to characterize the impact of GHG emissions, including an estimate of the 'social cost of carbon' associated with potential increases in GHG emissions.") (citing Sarah E. Light, *NEPA's Footprint: Information Disclosure as a Quasi-Carbon Tax on Agencies*, 87 Tul. L. Rev. 511, 546 (Feb. 2013)).

[20] It is important to note that, although the 2010 IWG SCC protocol did not address methane impacts, the 2013 IWG Technical Update explicitly addresses methane impacts. Thus, it is appropriate to calculate a SCC outcome that takes into account the full CO_2e emissions associated with the proposed leasing.

[21] Oil Change International, The Sky's Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production, 5 (2016), available at http://priceofoil.org/content/uploads/2016/09/OCI_the_skys_limit_2016_FINAL_2.pdf.

[22] *Id.*

[23] *Id.*

represent a smaller fraction of national production, and these resources take longer to develop. Phasing out federal leases for fossil fuel extraction could reduce global CO2 emissions by 100 million tonnes per year by 2030, and by greater amounts thereafter.[24]

The looming threat of catastrophic climate disruption, and the need for swift action to reduce its worst effects, including a halt to *all* new fossil fuel production, requires the BLM to take a hard look at the climate consequences of the proposed lease sale and to find those effects significant.

2. The RMP-EIS Fails to Consider the Impacts of Oil and Gas Development on Mule Deer and Other Big Game

All of the parcels are near or overlap with mule deer and other big game habitat, including migration corridors, critical winter range, winter concentration areas, severe winter range, and summer range.[25] Reliance on the DNAs for the proposed lease sale is inappropriate, given significant new information concerning the effects of oil and gas development on mule deer and other big game that was not considered in the RMP-EIS.

Residential and energy development has reduced all ungulates across the West. The low-elevation valleys and mountain foothills, once important habitat for ungulates, are filled with cities and towns.[26] The same is true in Colorado, according to CPW's research, particularly on winter ranges.[27] Between 1980 and 2010, western Colorado saw a 37% increase in residential land-use in mule deer habitat, primarily on their winter range.[28] The resulting lack of high-quality winter range is limiting robust mule deer population growth in Colorado.[29]

A dearth of high-quality, long-term, and controlled studies makes it difficult to evaluate with precision the role of oil and gas development in mule deer habitat and population decline.[30] Clearly, mule deer demonstrate avoidance of roads and oil and gas infrastructure, with as-yet

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[24] Erickson, Peter and Michael Lazarus, How Would Phasing Out U.S. Federal Leases for Fossil Fuel Extraction Affect CO_2 Emissions and 2°C Goals? 1, 31-32, Stockholm Environment Institute Working Paper 2016-02 (May 2016).

[25] *See* Rocky Mountain Maps showing conflicts with game species for 2/9/2017 Colorado lease sale parcels, available at https://drive.google.com/drive/folders/0B1itEUsz7CwZLWNITUI5U0tRQTQ?usp=sharing; Rocky Mountain Wild, Colorado February 2017 Sale Notice Screen Spreadsheet (2016), available at https://drive.google.com/file/d/0B1itEUsz7CwZR09BektzaVN1c1k/view?usp=sharing.

[26] Polfus, J. L., and P. R. Krausman. 2012. Impacts of residential development on ungulates in the Rocky Mountain West. Wildlife Society Bulletin 36:647-657.

[27] Johnson, H.E., J.R. Shushinsky, A. Holland, E.J. Bergman, T. Balzer, J. Garner, and S.E. Reed. 2016. Increases in residential and energy development are associated with reductions in recruitment for a large ungulate. Global Change Biology, doi: 10.1111/gcb.13385 ("Johnson et al. 2016").

[28] Johnson et al. 2016.

[29] Bergman, E. J., P. F. Doherty, G. C. White, and A. A. Holland. 2015. Density dependence in mule deer: a review of evidence. Wildlife Biology 21:18-29; Johnson et al. 2016.

[30] Hebblewhite, Mark. 2011. Effects of Energy Development on Ungulates. Energy Development and Wildlife Conservation in Western North America 71-94. Island Press, Washington D.C.

inadequately-understood consequences for migration, energy budgets, adult and fawn survival, and population.[31]

Some of the best available long-term, controlled studies evaluate mule deer population density before and after oil and gas development in the Sublette mule deer heard near Pinedale, Wyoming.[32] The Sublette mule deer study compared mule deer density in control and development zones, and found mule deer densities declined 30% in the development area, as opposed to 10% in the control area.[33] Sawyer and Strickladn found that "the observed decline of mule deer in the treatment area was likely due to gas development, rather than drought or other environmental factors that have affected the entire Sublette Herd unit."[34]

The Sublette example is particularly important when considering energy development's effects on mule deer populations, their winter range, and their migration patterns in western Colorado. Even in its relatively early stages compared to Wyoming, the most recent spatial analysis of already-occuring effects on mule deer in western Colorado finds energy development has the second-largest effect on deer recruitment, exceeded only by residential development.[35]

Although the precise connections between energy development and population-level effects are still imperfectly understood, it is demonstrated that oil and gas development affects mule deer habitat use and migration patterns by causing site avoidance, particularly in daytime,[36] and creating "semi-permeable" barriers to migration routes.[37] CPW is currently engaged in multiple research efforts to evaluate energy development effects on migration, deer response to energy development, and fawn survival in developed and undeveloped areas.[38] Those studies have thus far documented how individual deer alter their migration speed and timing in response

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[31] Hebblewhite 2011; Sawyer, H., Kauffman, M.J., Middleton, A.D., Morrison, T.A., Nielson, R.M., and Wyckoff, T.B. 2013. A framework for understanding semi-permeable barrier effects on migratory ungulates. Journal of Applied Ecology 2013:50, doi:10.1111/1365-2664.12013; Lendrum, P.E., Anderson, C.R., Long, R.A., Jie, J.G., and Bowyer, R.T. 2012. Habitat selection by mule deer during migration: effects of landscape structure and natural-gas development. Ecosphere 3(9):82.

[32] Sawyer, H., R. Nielson, and D. Strickland. 2009. Sublette Mule Deer Study (Phase II): Final Report 2007. Western Ecosystems Technology, Inc. Cheyenne, Wyoming, USA.

[33] *Id.*

[34] *Id.*

[35] Johnson et al. 2016.

[36] Lendrum 2012.

[37] Sawyer, H., Kauffman, M.J., Middleton, A.D., Morrison, T.A., Nielson, R.M., and Wyckoff, T.B. 2013. A framework for understanding semi-permeable barrier effects on migratory ungulates. Journal of Applied Ecology 2013:50, doi:10.1111/1365-2664.12013 ("Sawyer 2013").

[38] Anderson, C. R. 2015. Population Performance of Piceance Basin Mule Deer in Response to Natural Gas Resource Extraction and Mitigation Efforts to Address Human Activity and Habitat Degradation.in C. D. o. P. a. Wildlife, editor., Colorado ("Anderson 2015"); Anderson, C.R. 2016. Piceance Mule Deer & Energy Development: Demographic influences and mitigation. Colorado Parks and Wildlife, presentation to Garfield County, Colorado. http://www.garfield-county.com/oil-gas/documents/energy-advisory-board/2016/F-D-EAB%20Chuck%20Anderson_Piceance%20deer-energy%20development_Oct%202016.pdf ("Anderson 2016"); Anderson, C.R. and Bishop, C.J. 2014. Migration Patterns of Adult Female Mule Deer in Response to Energy Development. Transactions of the 79th North American Wildlife and Natural Resources Conference 47-50; Lendrum, P.E., Anderson, C.R., Monteith, K.L., Jenks, J.A., and Bowyer, R.T. 2013. Migrating Mule Deer: Effects of Anthropogenically Altered Landscapes. PlosOne, 8:5:e64548 ("Anderson & Bishop 2014").

to development.[39] A 2015 Wildlife Research Report published by CPW found that, during an active drilling phase in the Piceance Basin, deer behavior was compromised by 25% (at nighttime) and by 50% (during day time) in critical mule deer winter range.[40]

CPW has also collected data, from 2012 through 2014, in order to evaluate mule deer fawn survival in developed and undeveloped landscapes.[41] This data has not yet been published, but CPW has disclosed preliminary data to Garfield County a strong increase in fawn predation and mortality associated with oil and gas development.[42] The preliminary data disclosed to Garfield County shows 39% predation mortality and 53% total mortality in the undeveloped study area, versus 49% predation mortality and 63% total mortality in the developed study area.

In addition, it is well-documented that human development causes direct habitat loss and fragmentation through the construction of infrastructure, and indirect habitat loss through deer avoidance of infrastructure and related activities; these consequences likely reduce the carrying capacity of the landscape.[43] A recent study shows that oil and gas development causes significant habitat loss 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.[44]

Additionally, mule deer may suffer higher mortality rates in developed landscapes because of increased vehicle collisions and accidents (i.e., entrapment in fences); moreover, increased road densities expose mule deer to more hunters, poachers and predatory domestic pets.[45]

Mule deer also need migration corridors that are protected from human development. An ongoing mule deer study by members of the Wyoming Migration Initiative has found that mule deer migration patterns are altered by human development – herds will move faster, stop less to feed, and detour around developed portions of their route.[46] Moreover, herds that can't migrate

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[39] Lendrum 2012; Lendrum, P.E., Anderson, C.R., Monteith, K.L., Jenks, J.A., and Bowyer, R.T. 2013. Migrating Mule Deer: Effects of Anthropogenically Altered Landscapes. PlosOne, 8:5:e64548.
[40] Anderson 2015.
[41] Anderson 2015.
[42] Anderson 2016.
[43] Johnson et al. 2016.
[44] 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.
[45] Johnson et al. 2016.
[46] Sawyer 2013.

in search of the most nutritious grasses just end up smaller in number, plain and simple.[47] As a result, Wyoming Game and Fish Department is working to further protect migration routes in the state, for instance, no more than four oil and gas well pads allowed in a migration corridor and no development allowed in corridors narrower than a quarter mile. Although initial CPW research suggests that existing Piceance development levels are largely influencing the timing (not the fact) of deer migration,[48] CPW acknowledges that a "threshold in development intensity" may have greater effects on migration behavior.[49]

Stipulation 3.10.2, which is proposed for many of the parcels, however, lacks any specific, objective criteria for limiting development intensity near migration corridors or other big game habitat. The wording of this stipulation is so broad and general as to provide no meaningful guidance as to how many oil and gas well pads in a migration corridor should be allowed or what density of surface disturbance is permissible:

> In order to provide for healthy ungulate populations capable of meeting state population objectives, anthropomorphic activity and improvements should be designed to maintain and continue to provide effective habitat components that support critical life functions. This includes components of size and quality on the landscape providing connectivity to seasonal habitats (wildlife travel corridors), production areas, severe winter range, and winter concentration areas, along with other habitat components necessary to support herd viability.

In contrast, the Little Snake Field Office provides for a controlled surface use stipulation requiring for parcels which overlie a medium priority habitat a stipulation requiring "a 5 percent disturbance limitation and a POD illustrating a strategy to leave large blocks of undisturbed habitat."[50]

Finally, the RMP-EIS should take into account new information indicating that sagebrush—which wintering mule deer are highly dependent on[51]—is nearly impossible to restore, such that fragmentation of sagebrush communities from oil and gas development is likely to be permanent and reclamation ineffective. Section A.4 below describes this new information in more detail. Thus, oil and gas development could have more significant effects on mule deer and other big game than previously anticipated in the RMP-EIS.

3. The RMP-EIS Fails to Consider the Direct, Indirect and Cumulative Impacts from Colorado River Withdrawals for Fracking and Other Unconventional Drilling Methods on Endangered Fish Populations and Water Supply

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[47] Edwards, M., Mule Deer Struggling To "Surf The Green Wave" Of Migration (Nov. 20, 2015) available at http://wyomingpublicmedia.org/post/mule-deer-struggling-surf-green-wave-migration.
[48] Anderson & Bishop 2014.
[49] Anderson 2016; Sawyer 2013.
[50] *See* BLM Colorado February 2017 White River, Little Snake, & Kremmling Field Offices Lease Sale EA, Attachment D, Exhibit LS-107.
[51] RMP-EIS at 100 ("Some of the highest densities of wintering mule deer on the SJNF and TRFO are found in sagebrush shrubland habitats.").

As stated in our previous comments, BLM must perform an adequate environmental review of the significant impacts that oil and gas development is likely to have on the Colorado pikeminnow, razorback sucker, bonytail, and humpback chub ("endangered fish") and the Colorado River ecosystem. Significant new information has arisen since the adoption of the RMP-EIS and 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 ("Western Colorado PBO"),[52] which is designed to address any depletions resulting from oil and gas development within the Tres Rios Field Office and other western Colorado field offices (excluding areas within the San Juan River Basin). Likewise, new information has arisen since BLM's adoption of the Programmatic Biological Opinion for Water Depletions Associated with BLM's Fluid Mineral Program and Other Actions Authorized by BLM on Public Lands within the San Juan River Basin ("San Juan PBO").[53] BLM's approval of the RMP-EIS relied on these programmatic biological opinions (collectively "PBOs"). However, as discussed further in Section B.2 below, the PBOs and the RMP-EIS did not consider several important factors that may affect the endangered fish in a manner or to an extent not previously considered.

Cumulative impacts are those impacts on the environment resulting from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency . . . or person undertakes such other actions." 40 C.F.R. § 1508.7. By all accounts, the impacts stemming from future oil and gas leasing and development of the parcels at issue are cumulative with the impacts from development of neighboring planning areas. Thomas v. Peterson, 753 F.2d 754, 759 (9th Cir. 1985) (reasoning that effects of proposed road and of timber sales that road was designed to facilitate were cumulative actions for which comprehensive analysis was required). Indeed, under NEPA, BLM has an obligation to consider the effects of neighboring lease sales and oil and gas development projects as cumulative impacts of any future development stemming from leasing in the neighboring vicinity of these parcels. 40 C.F.R. §§ 1508.7, 1508.8.

A foreseeable cumulative impact from oil and gas development occurring throughout the Colorado River Basin is water withdrawals from the Colorado River necessary for fracking and horizontal drilling techniques. Indeed, millions of gallons of water are withdrawn from the Colorado River for oil and gas extraction, potentially impacting endangered fish in the Colorado River. The loss of adequate flows in the endangered fishes' habitat within the Upper Colorado River Basin is so serious that the Fish and Wildlife Service has determined that any depletion of Upper Basin stream flows adversely affects and jeopardizes the endangered fish.[54] Any depletion should therefore also be deemed significant under NEPA.

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[52] USFWS, Programmatic Biological Opinion for Water Depletions Associated with Bureau of Land Management's Fluid Mineral Program within the Upper Colorado River Basin in Colorado (2008).

[53] USFWS, Programmatic Biological Opinion for Water Depletions Associated with BLM's Fluid Mineral Program and Other Actions Authorized by BLM on Public Lands within the San Juan River Basin in Colorado (2008).

[54] U.S. Bureau of Land Management, Ch. 3: Affected Environment, White River FEIS at 3-71 (2015) ("The FWS has determined that any federally authorized depletion from the Upper Colorado River Basin has an adverse effect on listed Colorado River fishes.") (Chapter 3); Biological Opinion for BLM Resource Management Plan (RMP), Price Field Office (PFO), 138 (Oct. 27, 2008), available at: http://www.blm.gov/style/medialib/blm/ut/price_fo/Planning/rod_approved_rmp.Par.2742.File.dat/Price%20Biological%20Opinion.pdf. ("The USFWS determined that any depletion will jeopardize their continued existence and will likely contribute to the destruction or adverse modification of their critical habitat") (citing USDI, Fish and Wildlife

BLM must analyze under NEPA the effects of the massive water demand resulting from relatively new horizontal drilling techniques in the Upper Colorado River Basin (the "Upper Basin") which would impact watersheds affected by future development of the parcels at issue here. Specifically, this analysis should address the water depletion effects of new leasing on specific water supplies and watersheds. For example, Dry Creek crosses or is near parcels COC78167, 78168, 78169, 78170, 78162, 78163, 78164, and 78165; Navajo River crosses parcel COC78173; and Plateau Creek flows past parcels COC78159, 78160, and 78161. In addition, it must address significant cumulative impacts from drilling throughout the Upper Basin on local water supplies and on the Colorado River endangered fish. Section B.2 below discusses significant water depletion effects that have not been addressed in the PBOs or RMP-EIS.

4. BLM Must Consider Site-Specific Impacts on Gunnison Sage-Grouse and Alternatives to Address "Unresolved Conflicts" Concerning Sage-Grouse Habitat

Lease parcels COC78167, COC78168, and COC78169 are adjacent to Gunnison sage-grouse critical habitat, while parcels COC78170, 78162, 78163, 78164, and 78165 are only within a few miles of this critical habitat. BLM, however, has failed to analyze or acknowledge site-specific impacts to the species that could result from its leasing decision. As noted above, IM 2010-117 requires the consideration of site-specific impacts at the leasing stage, including the consideration of "unacceptable impacts to important resource values."[55] Moreover, despite that BLM is still developing a range-wide RMP Amendment for Gunnison Sage-Grouse habitat, which could change management direction for these parcels, BLM has nonetheless proceeded to offer these parcels for sale, in violation of IM 2010-117's directive to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources" in an EIS, or even an EA.[56] The failure to study site-specific impacts to Gunnison sage-grouse and alternatives to the proposed leasing, despite specific agency direction requiring such analysis, is arbitrary and capricious, violates NEPA, and prejudices the consideration of alternative management direction for these parcels that may be adopted through the Gunnison Sage-Grouse RMP Amendment process.

The Gunnison sage-grouse was listed as a threatened species under the Endangered Species Act in November 2014. *See* U.S. Fish and Wildlife Service, Threatened Status for Gunnison Sage-Grouse, Final Rule, 79 Fed. Reg. 69,192 (Nov. 20, 2014). Approximately 88 to 93 percent of the species's historical range has been lost since Euro-American settlement, and "[t]his contraction in the birds' range indicates the vulnerability of all the populations to extirpation." Gunnison Sage-Grouse Listing Rule, 79 Fed. Reg. at 69,228. The listing rule found that "the persistence of Gunnison sage-grouse is dependent on large and contiguous sagebrush habitats, that human development and disturbance contribute to the decline of this needed

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Service, Region 6 Memorandum, dated July 8, 1997); Biological Opinion for BLM Resource Management Plan (RMP), Vernal Field Office (VFO), 113 (Oct. 23, 2008), available at: http://www.blm.gov/style/medialib/blm/ut/vernal_fo/planning/rod_approved_rmp.Par.4719.File.dat/VernalBiologicalOpinion.pdf. (same).

[55] IM 2010-117, § III(C)(4).

[56] *Id.* § III(E).

habitat, and that such impacts negatively affect the survival and persistence of Gunnison sage-grouse." *Id.* Numerous activities on BLM land and minerals contribute to loss of these sage-grouse habitats, including road-building, power lines, livestock grazing practices, invasive plants, fire, and leasable minerals (i.e. oil and gas development). Oil and gas development has numerous adverse effects on Gunnison sage-grouse habitat, behavior, and population:

> 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). The development of oil and gas resources requires surveys for economically recoverable reserves, construction of well pads and access roads, subsequent drilling and extraction, and transport of oil and gas, typically through pipelines. Ancillary facilities can include compressor stations, pumping stations, electrical generators and powerlines (Connelly *et al.* 2004, p. 7–39; BLM 2007, p. 2–110). Surveys for recoverable resources occur primarily through loud seismic exploration activities. These surveys can result in the crushing of vegetation. Well pads vary in size from 0.10 ha (0.25 ac) for coal-bed natural gas wells in areas of level topography to greater than 7 ha (17.3 ac) for deep gas wells and multi-well pads (Connelly *et al.* 2004, p. 7–39; BLM 2007, p. 2–123). Pads for compressor stations require 5–7 ha (12.4–17.3 ac) (Connelly *et al.* 2004, p. 7–39). Individually, impacts from well pads, infrastructure, and ancillary features may be small; however, the cumulative impact of such development can be significant.
>
> The amount of direct habitat loss within an area of oil and gas development is ultimately determined by well densities and the associated loss from ancillary facilities. Roads associated with oil and gas development were suggested as the primary impact to greater sage-grouse due to their persistence and continued use even after drilling and production ceased (Lyon and Anderson 2003, p. 489). Declines in male greater sage-grouse lek attendance were reported within 3 km (1.9 mi) of a well or haul road with a traffic volume exceeding one vehicle per day (Holloran 2005, p. 40). Because of reasons discussed previously, the effects of oil and gas development to Gunnison sage-grouse are expected to be similar to those observed in greater sage-grouse. Sage-grouse also may be at increased risk

> for collision with vehicles simply due to the increased traffic associated with oil and gas activities (Aldridge 1998, p. 14; BLM 2003, p. 4–222).
>
> 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.[57]

The Fish and Wildlife Service found, in considering the adequacy or inadequacy of existing regulatory mechanisms to safeguard Gunnison sage-grouse, that existing BLM RMPs, including the Tres Rios RMP in effect at the time, were inadequate as regulatory mechanisms. Existing "RMPs provide only partial protection for Gunnison sage-grouse in terms of land use allocation decisions specific to the species and its habitat and, therefore, are considered inadequate to protect the species."[58] In particular, with regard to fluid mineral development, "[t]here is currently no regulatory mechanism in effect which assures that future lease sales in occupied habitat on BLM administered lands will not occur or that operations on federal leases are conducted in a manner consistent with protection of the Gunnison sage-grouse."[59] Moreover, FWS found that"[g]iven the already small and fragmented nature of the populations where future oil and gas leases are likely to occur, additional development within occupied habitat would negatively impact those populations by contributing to further habitat decline."[60]

In part in response to this finding of inadequate regulatory mechanisms for BLM lands and minerals, the Colorado and Utah BLM have undertaken a range-wide RMP Amendment process for Gunnison Sage-Grouse habitat, encompassing the Tres Rios Field Office, with a draft RMP Amendment and EIS released in August 2016. This amendment process may result in amendments to the Tres Rios RMP: "BLM has committed to completing plan amendments throughout the range of the Gunnison Sage-grouse, in order to increase regulatory certainty that adequate conservation measures are in effect on BLM lands for this species through the Gunnison Sage-grouse Range-wide Plan Amendment. As the TRFO contains occupied and unoccupied Gunnison Sage-grouse habitat, this RMP may be amended through that effort."[61]

Despite that existing RMP stipulations and other safeguards may be inadequate to protect Gunnison sage-grouse, however, BLM has failed to analyze the site-specific impacts of new leasing on the parcels at issue. Neither the RMP-EIS nor the Forest Service's biological opinion for the RMP took into account the potential site-specific effects of oil and gas development or

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[57] Gunnison Sage-Grouse Final Listing Rule, 79 Fed. Reg. 69,192, 69,255-56 (Nov. 20, 2014).
[58] *Id.* at 69, 283.
[59] *Id.* at 69,284.
[60] *Id.* at 69,284.
[61] BLM, Record of Decision, San Juan National Forest and Tres Rios Field Office Land and Resource Management at I-10-11, available at https://www.blm.gov/style/medialib/blm/co/field_offices/san_juan_public_lands/land_use_planning/approved_lrmp.Par.21966.File.dat/Part%201%20-%20Record%20of%20Decision.pdf (2015).

made any determination as to whether stipulations adopted in the RMP would adequately protect Gunnison sage-grouse at the site-specific level. Indeed, the biological opinion noted: "Use of the NSO and/or the CSU [adopted in the RMP] does not preclude all effects to grouse, and would only apply to future leases for oil and gas development. At this programmatic level, we do not have sufficient information about where, when, or to what extent, actions may occur that may affect GUSG or its occupied critical habitat."[62] The referenced stipulations only limit development within critical habitat, although sage-grouse and their critical habitat may be adversely affected in areas outside of, but near, critical habitat. Contrary to BLM's suggestion, that development within critical habitat will be avoided is not determinative of whether a significant impact will result from new leasing. *Cf. Greater Yellowstone Coal. v. Flowers*, 359 F.3d 1257, 1275 (10th Cir. 2004) ("The fact that FWS has not designated this, or any, territory as the bald eagle's 'critical habitat' does not alone persuade us that its potential destruction should not be considered 'significant' for purposes of NEPA."); *see also id.* at 1275-76 (no jeopardy finding is neither determinative).

The biological opinion also notes the potential for impacts to unoccupied habitat, but the potential effects of new development on sage-grouse survival and recovery have never been analyzed by BLM or FWS:

> We know GUSG have used areas of mapped unoccupied habitat, and some areas are mapped incorrectly as unoccupied habitat (pers comm. Charlie Sharp March 26, 2014). We conclude that there is some low likelihood of GUSG presence within unoccupied habitats on the TRFO, and we cannot completely eliminate the potential for effects to individuals within mapped unoccupied habitat. However, we cannot effectively anticipate all possible situations where implementation of the LRMP may cause effects to GUSG, especially in these areas adjacent to occupied habitat where individual may or may not be present.
>
> Future section 7 consultation may reveal site specific or cumulative effects that we cannot foresee at this time. Since the effects of an individual action (i.e. application for a permit to drill) will not be known until an application is received by BLM, the amount, extent, and magnitude of effects associated with implementation of that action cannot be reasonably anticipated.[63]

Site-specific study, however, would allow BLM to determine whether Gunnison sage-grouse presently inhabit mapped unoccupied habitat, potential adverse effects to these species, and appropriate stipulations and other mitigation measures to reduce or avoid those effects. Delaying study of these potential impacts does not comport with NEPA's requirement to study all reasonably foreseeable effects. *See Utahns v. United States DOT*, 305 F.3d 1152, 1175 (10th Cir. 2002); *see also* 40 C.F.R. § 1501.2 (requiring agencies to "integrate the NEPA process with other planning at the earliest possible time to insure that planning and decisions reflect environmental values, to avoid delays later in the process, and to head off potential conflicts").

[62] RMP-EIS, Appendix Y at 32.
[63] *Id.* at 34.

IM 2010-117 specifically directs BLM to consider whether "[c]onstruction and use of new access roads or upgrading existing access roads to an isolated parcel would have unacceptable impacts to important resource values." IM 2010-117 § III(C)(4). Mapping provided by Rocky Mountain Wild indicates that the proposed parcels are "isolated," as only a few abandoned wells and no active wells are within the vicinity of the lease parcel and very few roads serve these areas.[64] Without site-specific analysis, however, BLM cannot determine whether "unacceptable impacts," would result to important Gunnison sage-grouse habitat values from new road constructon or road improvements. Likewise, without site-specific analysis it is impossible for BLM to determine whether whether "[p]arcel configurations would lead to unacceptable impacts to [sage-grouse habitat] resources on the parcels or on surrounding lands and cannot be remedied by reconfiguring." IM 2010-117 § III(C)(4).

Additional analysis is also required, because as explained in Exhibit B, existing leasing stipulations are inadequate to mitigate oil and gas development effects on sage-grouse, and new information reveals that oil and gas development will result in significant impacts to Gunnison sage-grouse, which have not been considered in the Tres Rios RMP-EIS.[65]

In addition, a recent scientific study confirms the established finding that sage-grouse lek attendance is negatively related to oil and gas density, regardless of sagebrush cover and precipitation.[66] Green et al. examined greater sage-grouse lek attendance, oil and gas well, and habitat and precipitation data from Wyoming over the period 1984 to 2008, and, consistent with numerous prior studies, that lek attendance declines are closely associated with the density of oil and gas development:

> Oil and gas development correlates well with sage-grouse population declines from 1984 to 2008 in Wyoming, which is supported by other findings (Doherty et al. 2010b, Harju et al. 2010, Hess and Beck 2012, Taylor et al. 2013, Gregory and Beck 2014). As with other studies, we also found support for 4-year lag effects of oil and gas development on lek attendance (Walker et al. 2007, Doherty et al. 010a, Harju et al. 2010, Gregory and Beck 2014). This result suggests that development likely affects recruitment into the breeding population rather than avoidance of wells by adult males or adult survival. Adult sage-grouse are highly philopatric to lek sites (Dalke et al. 1963, Wallestad and Schladweiler 1974, Emmons and Braun 1984, Dunn and Braun 1985, Connelly et al. 2011a), and males typically recruit to the breeding population in 2–3 years. We would expect a delayed response in lek attendance if development affects recruitment, either by reducing fecundity or avoidance of disturbance by nesting females, as adult males die and are not replaced by young males.

[64] Rocky Mountain Wild Maps showing existing oil and gas development near for 2/9/2017 Colorado lease sale parcels, available at https://drive.google.com/drive/folders/0B1itEUsz7CwZVm1KRzAyaHNxWm8?usp=sharing.
[65] Exhibit B at 5-11, 14-15.
[66] Green, Adam et al., Investigating Impacts of Oil and Gas Development on Greater Sage-Grouse, Journal of Wildlife Management (2016), DOI: 10.1002/jwmg.21179 ("Green et al. 2016").

> On average, lek attendance was stable when no oil and gas development was present within 6,400m (Fig. 4). However, attendance declined as development increased. [67]

Importantly, Green et al. confirmed that declines in sage-grouse populations may continue even within Wyoming's "core areas," where density of wells is limited to one pad per square mile. Yet the Tres Rios RMP-EIS fails to regulate the density of allowable oil and gas facilities in the planning area and the areas proposed for leasing.

Moreover, significant impacts would result from the permanent loss of sagebrush habitat, which is critical to Gunnison sage-grouse survival and recovery.[68] Recent studies show that sagebrush communities, such as those found within the areas to be leased, are nearly impossible to restore. Drilling sites have not been restored to pre-drilling conditions even after having 20 or 50 years to recover.[69] A recent study postdating the RMP-EIS found that 50 years or more would be required to recover sagebrush on disturbed sites, and that restoring heterogeneous soil conditions with patchy nutrient conditions, was necessary for recovery of large sagebrush and ecosystem resiliency.[70] There is no evidence, however, that any measures required by the Tres Rios RMP-EIS ensure attainment of these conditions. *See* IM 2010-117 (directing site-specific analysis of whether "[t]he topographic, soils, and hydrologic properties of the surface will not allow successful final landform restoration and revegetation in conformance with the standards found in Chapter 6 of the Gold Book, as revised").

BLM's response to comments suggests that additional measures would be considered at the Application for Permit to Drill (APD) stage,[71] but waiting until then to consider additional protective measures may be too little too late. As FWS has previously noted, BLM's authority to move drilling or other facilities to avoid sensitive resources under 43 C.F.R. § 3101.1(c) at the APD stage is too limited and "would have little to no conservation benefit to Gunnison sage-grouse because sage-grouse respond to nonrenewable energy development at much further distances" than the maximum distances at which facilities can be re-sited under 43 C.F.R. § 3101.1(c).[72] Moreover, a project-by-project analysis could sweep under the rug potential cumulative effects of new leasing and development within the several parcels at issue here—these parcels (COC78162, 78163, 78164, 78165, 78167, 78168, 78169, and 78170) are all very near or contiguous to each other and cover a total area of over 6,600 acres.

BLM's decision to offer proposed lease parcels before the range-wide Gunnsion sage-grouse amendment process is completed, and without the preparation of an EA or EIS, also

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[67] Green et al. 2016 at 9.
[68] 79 Fed Reg. at 69,208, 69,216.
[69] Lester, Liza, Sagebrush Ecosystem Recovery Hobbled By Loss Of Soil Complexity At Development Sites, Ecological Society of America (Jan. 26, 2015), available at http://www.esa.org/esa/sagebrush-ecosystem-recovery-hobbled-by-loss-of-soil-complexity-at-development-sites/.
[70] *Id.*; Minnick, Tamara J., Plant–soil feedbacks and the partial recovery of soil spatial patterns on abandoned well pads in a sagebrush shrubland. Ecological Applications, 25(1), 2015, pp. 3–10, available at http://onlinelibrary.wiley.com/doi/10.1890/13-1698.1/full.
[71] DNA DOI-BLM-CO-S010-2016-0039-DNA, Attachment E at Comment 1.
[72] 79 Fed. Reg. at 69,284.

violates IM 2010-117's directive that BLM "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." IM 2010-117 § III(E). Those conflicts are still being resolved in the range-wide Gunnison sage-grouse amendment process. New leasing before the resolution of these conflicts prejudices the consideration of additional management prescriptions needed to "increase regulatory certainty that adequate conservation measures are in effect on BLM lands" for Gunnsion sage-grouse--measures BLM had promised it would consider in its Record of Decision for the 2015 Tres Rios RMP revision.[73] As Fish and Wildlife Service and Colorado Parks and Wildlife noted in their comments on the proposed lease sale, additional Gunnison Sage-grouse protections may be identified in the plan amendment process that are not currently contained with the Tres Rios RMP, and therefore, not currently applied to any parcels currently under consideration for leasing.[74] Exhibit B describes various proposed measures that could eventually apply to the parcels at issue, but only if leasing is delayed until the amendment process is completed.[75] Moreover, as those agencies also point out, oil and gas development may result in increased noise, truck traffic, new access roads, and other associated human disturbance for parcels near critical habitat, which existing regulatory mechanisms are inadequate to avoid or mitigate.[76] The imposition of new measures resulting from the Gunnison sage-grouse amendment process, however, would likely be foreclosed once the parcels are leased if those measures are inconsistent with any lease stipulations.

In sum, BLM must analyze in an EIS, or at minimum, an EA: (1) site-specific impacts of its leasing proposal on Gunnison sage-grouse and its habitat, and (2) alternative uses and management prescriptions for those lease parcel areas that are adjacent to or near Gunnison sage-grouse critical habitat to address unresolved conflicts, in compliance with IM 2010-117.

5. The RMP-FEIS Does Not Describe Effective Mitigation

As described in Exhibit A, the Determination of NEPA Adequacy is also flawed because numerous stipulations set forth in the RMP-FEISs and applied to the proposed lease parcels are inadequate or vague, or contain broad and general exceptions without any objective criteria for how they should be applied.[77] Significant impacts could result from the application of these extremely general stipulations. The EISs fail to acknowledge these effects, and their conclusions that stipulations would avoid or reduce significant impacts are unsupported.

In addition, setbacks for water resources are inadequate, despite that many parcels are crossed by streams.[78] BLM's response to comments regarding this issue ignores the need for larger setbacks to protect streams that may be critical to vegetation and wildlife, even though they may not be municipal water supplies or "major rivers."[79] For example, Dry Creek passes

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[73] *Id.*
[74] *See* DNA DOI-BLM-CO-S010-2016-0039-DNA, Attachment E at Comments 5 & 8.
[75] Exhibit B at 14-15.
[76] *See id.*
[77] Exhibit A at 16-17.
[78] Exhibit A at 16-17.
[79] *See* DNA DOI-BLM-CO-S010-2017-0001-DNA, Attachment E, Response 9.a.iv. DNA DOI-BLM-CO-S010-2016-0039-DNA does not respond to this issue at all.

through or near parcels near critical habitat for Gunnison sage-grouse. Any spills or leaks that reach this creek could adversely affect this imperiled species.

B. BLM and Fish and Wildlife Service's Must Consult Over the Impacts of the Proposed Oil and Gas Leasing on Threatened and Endangered Species Pursuant to ESA Section 7

BLM cannot proceed with leasing the parcels at issue until it has consulted with Fish and Wildlife Service regarding the impacts of oil and gas leasing development on the Gunnison sage-grouse and the four Colorado River endangered fish. Lease parcels COC78167, COC78168, and COC78169 are adjacent to Gunnison sage grouse critical habitat, while parcels COC78170, 78162, 78163, 78164, and 78165 are only within a few miles of this critical habitat. Leasing is reasonably certain to lead to oil and gas development on these parcels, which would adversely affect Gunnison sage grouse and their critical habitat, such that Section 7 consultation over these effects is required.

Likewise, because all of the parcels proposed for lease are within the Upper Colorado River Basin, leasing is reasonably certain to result in water depletion and water contamination impacts on the endangered fish, compelling consultation under Section 7. Moreover, to the extent BLM relies on existing programmatic consultations for the Fluid Mineral Program to comply with its Section 7 duties--i.e., the Western Colorado and San Juan PBOs--such reliance is misplaced in light of new information revealing that water depletions from oil and gas development may affect listed species and their critical habitat in a manner or to an extent that was not considered in the PBOs.

1. Background on ESA Section 7

Congress enacted the ESA to provide "a program for the conservation of . . . endangered species and threatened species." 16 U.S.C. § 1531(b). Section 2(c) of the ESA establishes that it is "the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act." 16 U.S.C. § 1531(c)(1). The ESA defines "conservation" to mean "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this [Act] are no longer necessary." 16 U.S.C. § 1532(3). Section 7(a)(1) of the ESA explicitly directs that all federal agencies "utilize their authorities in furtherance of the [aforesaid] purposes" of the ESA. 16 U.S.C. § 1536(a)(1).

Section 7 of the ESA requires BLM, in consultation with the Fish and Wildlife Service ("FWS"), to insure that any action authorized, funded, or carried out by the agency is not likely to (1) jeopardize the continued existence of any threatened or endangered species, or (2) result in the destruction or adverse modification of the critical habitat of such species. 16 U.S.C. § 1536(a)(2). For each proposed federal action, BLM must request from FWS whether any listed or proposed species may be present in the area of the agency action. 16 U.S.C. § 1536(c)(1); 50 C.F.R. § 402.12. If listed or proposed species may be present in such area, BLM must prepare a

"biological assessment" to determine whether the listed species may be affected by the proposed action. Id.

If BLM determines that its proposed action may affect any listed species or critical habitat, the agency must engage in formal consultation with FWS. 50 C.F.R. § 402.14. To complete formal consultation, FWS must provide BLM with a "biological opinion" explaining how the proposed action will affect the listed species or habitat. 16 U.S.C. § 1536(b); 50 C.F.R. § 402.14. If FWS concludes that the proposed action will jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of critical habitat, the biological opinion must outline "reasonable and prudent alternatives." 16 U.S.C. § 1536(b)(3)(A).

BLM's oil and gas leasing proposal is an agency action under the ESA. Action is broadly defined under the ESA to include all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies, including the granting of leases, and actions that will directly or indirectly cause modifications to the land, water, or air. 50 C.F.R. § 402.02

Agencies are required to reinitiate ESA consultation if (1) the amount or extent of taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the action is modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action. 50 C.F.R. § 402.16.

2. *BLM and FWS Must Reinitate Consultation over the Programmatic Biological Opinion Governing Fluid Mineral Development Water Depletions*

Leasing of the parcels at issue would foreseeably entail significant water depletions within the Upper Colorado River Basin, increased surface disturbance, and toxic spills from hydraulic fracturing and horizontal drilling, all of which can adversely affect endangered fish that inhabit areas within and downstream of the lease areas. All of the parcels except parcel COC78173 fall within the Upper Basin and outside the San Juan River Basin and therefore fall under the Western Colorado PBO. While the Western 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 cannot rely on that consultation for its Section 7 compliance for the reasons discussed below. To the extent that approval of the lease sale would rely on the Western Colorado 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.

The Western Colorado PBO does not take into account the enormous water depletion effects of horizontal drilling and other unconventional well development techniques. The PBO is also unreliable in numerous other respects due to significant new information revealing that the Fluid Mineral Program may have effects on the endangered fish in a manner or to an extent not previously considered. This includes new information about (a) the potential for increased oil and gas development and horizontal drilling within emerging shale plays, including the Mancos

shale play in the Piceance Basin, and the Gothic Shale Gas Play in southwest Colorado's Paradox Basin; (b) climate change effects on Upper Colorado River Basin stream flows; (c) long-term drought and increased water demand which have drastically reduced water supplies; (d) mercury and selenium pollution effects on the endangered fish; (e) declining humpback chub and Colorado pikeminnow populations and failure to meet these populations' recovery targets; (f) the Recovery Program's failure to meet recommended stream flows necessary for recovery of the endangered fish; and (f) BLM's failure to adequately monitor and track actual water use and depletions in the Upper Colorado River Basin, which could result in higher water use and greater depletions in the RMP and leasing area than anticipated in the Western Colorado PBO.

a. New Drilling, Fracking, and Horizontal Drilling Will Require Greater Water Depletions Than Previously Anticipated.

While the 2008 Western Colorado PBO is designed to address any depletions resulting from oil and gas development within western Colorado field offices, it 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 Basin. 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, Uncompahgre, White River, Gunnison and Colorado River Valley Field Offices.[80]

New Information Reveals the Increased Potential for Horizontal Drilling and Fracking in the Paradox Basin and their Greater Water Depletion Effects

BLM's Programmatic Biological Assessment (PBA) which informed the Western Colorado 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.[81]

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 [Gothic Shale Gas Play] 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. [Gothic Shale Gas Play] 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

[80] BLM Instruction Memorandum CO-2011-022 (April 11, 2011) ("All of the estimates in the PBO were based on using conventional vertical drilling technology.").
[81] BLM, Programmatic Biological Assessment for BLM's Fluid Minerals Program in Western Colorado re: Water Depletions and effects on the Four Endangered Big River Fishes: Colorado Pikeminnow, humpback chub, bonytail, and razorback sucker, 8 (Nov. 3, 2008).

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.[82]

These increased per well water depletions are attributable to the increased water demand of new oil and gas development techniques such as multi-stage fracking and horizontal drilling that were not previously taken into account in the Western Colorado PBO.[83] Accordingly, 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 7,555 and 8,840 acre-feet, or approximately 503 acre-feet to 589 acre-feet per year.[84] This annual depletion rate is approximately ten times the amount of depletions that the PBA projected would occur in the Dolores River Basin (54 acre-feet per year). Moreover, depletions could be much higher as the RMP-EIS did not estimate stream depletions resulting from removal of interconnected groundwater, which operators would likely pump out to facilitate gas extraction.[85]

However, despite that projected depletions for oil and gas development in the Tres Rios planning area far exceed the Western Colorado PBO's depletion limit for the Dolores River sub-basin, BLM and FWS did not consider this increased water use in their consultation over the Tres Rios RMP, but simply "tiered to" and relied on the Western Colorado PBO.[86] In the absence of a valid consultation over Fluid Mineral Program water depletions in the Tres Rios planning area and Dolores River sub-basin, BLM and FWS must reinitiate consultation on the Western Colorado PBO, or separately consult over these water depletion effects.

The Western Colorado PBO Fails to Consider Increased Horizontal Drilling Within the Piceance Basin

Water use within other areas of the Upper Colorado River Basin have also been grossly underestimated in the Western Colorado PBO, because it fails to take into account increased horizontal drilling that could be used to develop the Mancos/Mowry and Niobrara shale plays. These increased water depletion impacts throughout the entire Upper Basin could alter the Service's analysis of the Fluid Mineral Program's depletion 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.

For example, in the White River planning area, the Western Colorado PBO projects that new vertical wells would consume 2.62 acre-feet per well, while in the Grand Junction planning area, vertical wells would require require 0.77 acre-feet of water per well. But BLM water depletion logs indicate that between FY2011 and FY2015, the average depletion for horizontal

[82] Tres Rios RMP-EIS at 244.
[83] *See* Tres Rios RMP-EIS at 19, 491-92.
[84] *Id.* at 245.
[85] *Id.*
[86] Tres Rios RMP-EIS, Appendix Y, Conference Opinion at 3.

wells in BLM's western Colorado field offices was 26.45 acre-feet of water per well in the field offices covered by the PBO.[87] Indeed, in FY2015 horizontal drilling in the Grand Junction Field Office resulted in a violation of the Western Colorado PBO's Incidental Take Statement (ITS) water depletion limit in the Colorado River sub-basin—under the ITS, water depletions are a surrogate for take. In FY2015, an operator drilled eight horizontal wells in the Grand Junction Field Office, which consumed a total of 620.87 acre-feet of water.[88] The total amount of water depleted in the Colorado River sub-basin by all horizontal and vertical wells was 691.09 acre-feet of water, which exceeds the 379 acre-feet annual projection for this sub-basin by 1.8 times.[89]

This drastic increase in the use of water-intensive horizontal drilling techniques was not considered in the Western Colorado PBO, nor in BLM's consultations over the recent White River, Kremmling, Little Snake, and Grand Junction RMP amendments or revisions, which only relied on the Western Colorado PBO regarding the RMPs' water depletion effects.

Moreover, recently, on June 8, 2016, the U.S. Geological Survey published a report re-assessing the total technically recoverable reserves in the Mancos shale play in the Piceance Basin, including the Niobrara strata of the play.[90] According to the report, the Mancos shale play's total technically recoverable natural gas reserves are over 40 times greater than the USGS's 2003 estimate and is the second-largest in the U.S., behind the Marcellus shale.[91] Specifically, 66.3 trillion cubic feet of natural gas, 74 million barrels of oil and 45 million barrels of natural gas liquids are potentially recoverable.[92] While tight gas in the younger, shallower Mancos shale intervals is produced primarily from vertical and directional wells in which the reservoirs have been hydraulically fractured, the tight gas and continuous oil and gas in the older and deeper intervals of the Mancos shale are produced mostly from horizontal wells that have been hydraulically fractured.[93] These reserves underlie large areas of the Grand Junction, White River, Royal Gorge, Colorado River Valley, Uncompahgre, and Gunnison Field Offices, all of which fall under the Western Colorado PBO.[94]

Increasing interest in the Mancos Shale Play should therefore be expected given its enormous production potential. Water depletions throughout the entire Upper Colorado River Basin could therefore exceed projected water use estimates in the Western Colorado PBO. Indeed, since the 2003 USGS assessment, more than 2,000 wells have already been drilled and completed in one or more intervals of the study area.[95] A review of BLM oil and gas projects in

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[87] *See* Water Depletion Logs which are completed, pursuant to requirements within the PBO, on an annual basis by the BLM to estimate water depletion resulting from fluid minerals development on BLM lands in western Colorado.
[88] *Id.*
[89] *Id.*
[90] Assessment of Continuous (Unconventional) Oil and Gas Resources in the Late Cretaceous Mancos Shale of the Piceance Basin, Uinta-Piceance Province, Colorado and Utah (2016) ("USGS 2016"), available at http://pubs.usgs.gov/fs/2016/3030/fs20163030.pdf.
[91] *See id.*
[92] *Id.*
[93] *Id.*
[94] Center for Biological Diversity, Map of Mancos Shale relative to BLM Field Offices (2016).
[95] *Id.*

western Colorado indicates that operators are planning a number of projects involving horizontal drilling, which would most likely target the Mancos shale.[96]

Accordingly, Mancos shale drilling projects could increase within the Upper Basin, but the Western Colorado PBO does not take into account this expansion in new development potential. Because the RMPs for the Piceance Basin field offices overlapping the Mancos shale play do not limit total new wells that may be drilled, the greater amount and availability of technically recoverable oil and gas reserves could result in the development of many more new wells in the Upper Basin than assumed in the RMPs and the Western Colorado PBO. For example, the RFDs for the Colorado River Valley and White River RMPs did not take into account Mancos shale drilling (other than exploratory wells) and thus such drilling is not considered in the PBO.[97] Further, a substantial portion of new wells would be horizontal wells, as the lower strata of the Mancos formation would likely be accessed via horizontal drilling, but again, the Western Colorado PBO does not take into account the extraordinarily higher water use of horizontal wells. Water depletions throughout the entire Upper Colorado River Basin could therefore exceed projected water use estimates in the Western Colorado PBO, both at the basin-wide and sub-basin levels.

BLM and FWS must reinitiate consultation over the increased water depletion effects of horizontal drilling and increased oil and gas development potential of the Gothic and Mancos shale plays.

b. Climate Change Is Reducing Stream Flows in the Upper Colorado River Basin.

The Western Colorado PBO does not analyze or even mention climate change and its potential to reduce stream flows in the Upper Basin, which could amplify the effects of water depletions on the endangered fish and reduce the effectiveness of the Endangered Fish Recovery Program (e.g., by reducing the availability of water to supplement natural flows in dry years). The best available scientific data indicate that climate change is resulting in higher temperatures in the Colorado River Basin, reduced snowpack, diminished runoff, and more frequent and intense droughts, which have already reduced and will continue to reduce stream flows in the Basin. As shown in the Center's attached literature review (Exhibit F), ample studies document these effects and predict continuing flow declines.[98]

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[96] *See* Center for Biological Diversity, Spreadsheet of Horizontal Well Projects in Colorado (listing horizontal well projects listed in BLM's NEPA register and projected water use) (Exhibit G).

[97] *See* White River RMP FEIS at K-358 ("Development of the Mancos and Niobrara outside the Rangely Field in Rio Blanco County in the WRFO are not [] currently well defined and are exploratory in nature. This development is in the initial stages of the exploration phase to determine of the maturity of the reservoir and the potential viability of the Niobrara within the WRFO."); *see also* Colorado River Valley RMP FEIS at 4-576 ("To date, use of horizontal drilling in relation to the deep marine shales [i.e., Niobrara, Mancos, and Eagle Basin formations] has been limited and is considered experimental. As a result, the development intensity, timing, and location of development of the deep marine shales was considered too speculative for quantitative impact analysis in connection with this planning process.").

[98] Wolf, Shaye Ph.D. Impacts of Climate Change on the Colorado River Basin, Center for Biological Diversity (March 10, 2016) (Exhibit F).

In the Colorado River basin, temperatures have increased roughly by 2° F, and "additional decades of warming are 'locked in' regardless of any behavioral changes that may or may not be implemented by the world's governments"—roughly an additional 5° F of warming can be expected in the basin by 2050.[99] Recently, researchers for the first time used historical data to show temperature-driven stream flow declines in the Upper Basin. As described in the Center's attached literature review (Exhibit F):

> An empirical study of the influence of precipitation, temperature, and soil moisture on upper Colorado River basin streamflow over the past century found that warmer temperatures have already resulted in flows less than expected based on precipitation levels (Woodhouse et al. 2016). Consistent with past research, the study found that cool season precipitation explains most of the variability in annual streamflow. However, temperature was highly influential in determining streamflow under certain conditions. The study concluded that "[s]ince 1988, a marked increase in the frequency of warm years with lower flows than expected, given precipitation, suggests continued warming temperatures will be an increasingly important influence in reducing future UCRB water supplies." The researchers warned that "streamflow forecasts run the risk of overprediction if warming spring and early summer temperatures are not adequately considered."[100]

According to the study's press release it is the "first to examine the instrumental historical record to see if a temperature effect [on stream flows] could be detected."[101] The study's lead author highlighted its significance: "If we have a warmer spring, we can anticipate that the flows will be less relative to the amount of snowpack[.]....What we're seeing is not just the future – it's actually now. That's not something I say lightly."[102]

In addition to reducing the overall amount of water in the Upper Colorado River Basin, these climate change effects would worsen effects from toxic spills by increasing the concentration of pollutants and toxic contaminants. Climate change is also likely to exacerbate mercury and selenium pollution effects on the Colorado pikeminnow. Mercury deposited into soil from coal burning and selenium will increasingly run off into streams with increased heavy rainfall events.[103] More frequent and severe wildfire events will result in increased charring of soil, releasing mercury and selenium that can wash off into streams.[104] Warmer water conditions will hasten the conversion of mercury into toxic methylmercury.[105]

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[99] Colorado River Research Group, Climate Change and the Colorado River: What We Already Know (Oct. 2016), available at http://www.coloradoriverresearchgroup.org/uploads/4/2/3/6/42362959/crrg_climate_change.pdf.
[100] *Id.* at 2.
[101] American Geophysical Union, Colorado River Flows Reduced by Warmer Spring Temperatures (March 9, 2016), available at http://news.agu.org/press-release/colorado-river-flows-reduced-by-warmer-spring-temperatures/.
[102] *Id.*
[103] National Wildlife Federation, Swimming Upstream: Freshwater Fish in a Warming World, 19 (2013), available at http://www.nwf.org/~/media/PDFs/Global-Warming/Reports/NWF-Swimming%20Upstream-082813-B.ashx.
[104] *Id.*
[105] *Id.*

BLM and the Service must reinitiate consultation on the Fluid Mineral Program in light of new evidence that climate change and warming temperatures are reducing Colorado River stream flows and may affect the endangered fish and its critical habitat in a manner and to an extent not previously considered.

c. Persistent Drought Conditions and Increasing Water Demand Have Reduced Water Supply

Compounding this threat to the endangered fish are persistent drought conditions that have diminished natural flows in the Colorado River Basin and reduced water storage that is needed to supplement Upper Basin flows. The period from 2000 to 2015 was the lowest 16-year period for natural flow in the last century, and one of the lowest 16-year periods for natural flow in the past 1,200 years, according to paleorecords.[106] As a result, water storage in the Colorado River system reservoirs have declined "from nearly full to about half of capacity," and led to local shortages in the Upper Colorado's sub-basins.[107]

Further, population growth will increase water demand for agriculture and municipal uses, making it increasingly difficult to ensure sufficient water availability for the endangered fish, which rely on the release of stored water, especially in dry years.[108] An ever widening gap between water supply and water demand is weakening the Colorado River water supply system's reliability and ability to buffer the system in dry years.[109] According to the U.S. Geological Survey, "increased water demand and declining water availability make the restoration of endangered fish habitat extremely challenging."[110] This growing gap between supply and demand in the Upper Colorado River Basin must be taken into account in a reinitiated consultation.

d. Mercury and Selenium Are Adversely Impacting the Endangered Fish

New scientific information regarding (a) mercury and selenium effects on fish reproduction and population viability, (b) mercury and selenium concentrations in Upper Colorado and White River fish, (c) the potential role of oil and gas development in mercury contamination levels in the White River, (d) the potential for development of the Mancos shale play to increase selenium pollution, and (e) the relationship between climate change and mercury and selenium toxicity constitutes new information revealing that the Fluid Mineral Program may have effects on the endangered fish to an extent that was not considered in the Western Colorado PBO, and requires reinitiation of consultation over the Fluid Mineral Program.[111]

Mercury contamination is harming Colorado pikeminnow populations

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[106] Bureau of Reclamation, Managing Water in the West: SECURE Water Act Section 9503(c) Report to Congress, Chapter 3, Colorado River Basin at 3-64 (2016) (Chapter 3)
[107] *Id.*
[108] *See id.* at 3-7, 3-8.
[109] *Id.* at 3-10, 3-12.
[110] USGS, Effects of Climate Change and Land Use on Water Resources in the Upper Colorado River Basin, 5 (2010), available at https://pubs.usgs.gov/fs/2010/3123/pdf/FS10-3123.pdf.
[111] 50 C.F.R. § 402.16(b).

The Western Colorado PBO's discussion of the environmental baseline for, and threats to, the Colorado pikeminnow and razorback sucker contains no discussion whatsoever of environmental and tissue mercury contamination or the resulting toxicity and reproductive impairment to the endangered fish. Significant new research since the 2008 PBO has demonstrated that elevated levels of mercury in Colorado pikeminnow muscle tissue, including within the Upper Colorado River Basin, are at concentrations likely to cause reproductive and behavioral impairment to the fish.[112]

Mercury is a potent neurotoxin shown to cause numerous reproductive and endocrine impairments in fish in laboratory experiments, including effects on production of sex hormones, gonadal development, egg production, spawning behavior, and spawning success.[113] Concentrations of mercury in Colorado pikeminnow in the Upper Basin are documented to be well in excess of the thresholds for reproductive impairment and population-level impacts.[114] 2008-2009 muscle tissue averages were 0.60 mg/Kg Hg for Colorado pikeminnow in the Upper Colorado basin and 0.95 mg/Kg Hg for Colorado pikeminnow in the White River – well above the 0.2 mg/kg threshold of concern.[115]

Mercury deposition and accumulation in critical habitat is attributable to a number of local and global factors, including air emissions from coal-fired power plants both in the immediate region and around the world.[116] In addition, because of discrepancies in mercury concentrations between pikeminnow in the Yampa and White Rivers, research suggests that "[i]t is possible that there is some localized sources of mercury contamination into the White River drainage connected with oil and gas exploration and development."[117]

Once mercury is deposited on land or water, it is converted into a biologically available form, methylmercury (MeHg) by bacteria. Methylmercury "bioaccumulates in food chains, and particularly in aquatic food chains, meaning that organisms exposed to MeHg in their food can build up concentrations that are many times higher than ambient concentrations in the environment."[118] Once it accumulates, mercury is a potent neurotoxin, affecting fish in many ways, including brain lesions, reduced gonadal secretions, reproductive timing failures, reduced

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[112] USFWS, Upper Colorado River Endangered Fish Recovery Program, Colorado pikeminnow (*Ptychochellus lucius*), 5-Year Review: Summary and Evaluation 21 (2011) ("[T]he recovery goal revision needs to consider the impacts of mercury. . . the majority (64 %) of Colorado pikeminnow may be experiencing some reproductive impairment through mercury exposure.") ("Colorado Pikeminnow 5-year Review"); USFWS, Biological Opinion for the Four Corners Power Plant and Navajo Mine Energy Project at 76 & Table 3 (April 8, 2015) ("Four Corners Biological Opinion")

[113] USFWS, Draft 2014-2015 Assessment of Sufficient Progress Under the Upper Colorado River Endangered Fish Recovery Program in the Upper Colorado River Basin, and of Implementation of Action Items in the December 20, 1999, 15-Mile Reach Programmatic Biological Opinion and December 4, 2009, Gunnison River Basin Programmatic Biological Opinion, 10 (Oct. 7, 2015) ("Sufficient Progress Assessment")

[114] *See* Barb Osmundson and Joel Lusk, Field assessment of mercury exposure to Colorado pikeminnow within designated critical habitat (May 5, 2011) ("Osmundson & Lusk 2011")

[115] *See* Four Corners Biological Opinion at 76 & Table 3; *see generally* Beckvar, N., T.M. Dillon, and L.B. Reads, Approaches for linking whole-body fish tissue residues of mercury or DDT to biological effects threshold, Environmental Toxicology and Chemistry 24:2094-2105 (2005)

[116] *See* Four Corners Biological Opinion at 73-74; Osmundson & Lusk 2011 at 9-10.

[117] *Id.* at 29.

[118] Four Corners Biological Opinion at 73.

ability to feed, suppressed reproductive hormones, reduced egg production, reduced reproductive success, and transfer of mercury into developing eggs.[119] Although the precise effects vary with relative concentrations, mercury and selenium may have synergistic toxic effects at certain ratios.[120]

The Service has acknowledged that its recovery planning for the Colorado pikeminnow needs updating to reflect this new information regarding mercury:

> In addition, the recovery goal revision needs to consider the impacts of mercury. Beckvar et al. (2005) associated studies involving survival, growth, reproduction, and behavior and recommended that 0.2 mg/kg in whole fish be viewed as protective, while adverse biological effects are more likely at higher concentrations. Based on this threshold, the majority (64 %) of Colorado pikeminnow may be experiencing some reproductive impairment through mercury exposure. Management strategies for controlling anthropogenic mercury emissions are necessary as atmospheric pollution can indirectly affect this endangered species, its critical habitat, and its recovery by ambient air exposure, deposition into aquatic habitat and bioaccumulation in diet and in fish tissues.[121]

Moreover, the Service's 2015 Sufficient Progress Assessment for the Recovery Program acknowledges that population viability studies show that mercury- and selenium-related reproductive impairment is likely to influence population levels in the San Juan Basin,[122] but no comparable analysis has yet been done for the higher levels of contamination present in Upper Colorado River Basin fish.

The significant difference in mercury concentrations in fish found in the neighboring Yampa and White Rivers also offers significant new information potentially relevant to the effect of BLM-authorized oil and gas development. Osmundson and Lusk found very high (average 0.95 mg/Kg WW) mercury concentrations in Colorado pikeminnow and in the White River, and lower (0.49 mg/Kg) concentrations in the neighboring Yampa.[123] Based on this discrepancy, they noted:

> The Yampa and White rivers are relatively close geographically in northwestern Colorado. Because of this proximity, it is interesting that the Yampa River had the lowest mercury concentrations in Colorado pikeminnow while the White River had the highest mercury concentrations. If most of the mercury was from aerial wet and dry deposition, the two drainages should be similar. This difference may indicate a localized source/s of mercury contamination into the White River

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[119] *See* Lusk, Joel D., USFWS, Mercury (Hg) and Selenium (Se) in Colorado Pikeminnow and in Razorback Sucker from the San Juan River, 17 (2010), available at https://www.fws.gov/southwest/sjrip/pdf/DOC_Evaluation_Hg_Se_SJR_pikeminnow%20or_razorback_SJRIP_BC_2010.pdf.

[120] Four Corners Biological Opinion at 103.

[121] Colorado Pikeminnow 5-year Review at 21; *see also* Significant Progress Assessment at 10-11.

[122] Sufficient Progress Assessment at 10-11.

[123] Osmundson & Lusk 2011 at 21 & Table 2.

drainage. There are currently >2,600 gas and oil wells in Rio Blanco county. It is possible that there is some localized sources of mercury contamination into the White River drainage connected with oil and gas exploration and development.[124]

Although site-specific information for the Upper Basin planning areas appears scarce, there is scientific as well as circumstantial evidence that oil and gas operations can contribute to mercury contamination.[125] The Western Colorado PBO does not consider the effect of oil and gas development within the White River watershed on the threat to Colorado pikeminnow and razorback sucker from mercury toxicity.

Nor does the PBO give any consideration to the multiple ways in which climate change will exacerbate mercury and selenium contamination and toxicity. Climate change can foreseeably be predicted to increase heavy rainfall events and ensuing runoff, increase pollutant concentrations due to reduced flows during low-flow periods, and contribute to increased methylmercury conversion due to higher temperatures.

Selenium pollution is harming the endangered fish

Selenium harms the endangered fish and other aquatic species through bioaccumulation in the food chain. Concentrations of 3µg/g in the food chain have been found to cause gill and organ damage in certain fish and may lead to death.[126] These bioaccumulative effects resulting in direct toxicity to juvenile and adults are known as "Type 1" effects. Moreover, selenium bioaccumulation can result in maternal transfer of selenium to fish egg yolks and lead to developmental abnormalities, known as "Type 2 effects."[127] Waterborne concentrations of selenium in the 1-5 µg/L range can bioaccumulate and lead to Type 1 and/or Type 2 effects.[128]

Recent studies reveal significant exposures of the endangered fish to selenium. In one study analyzing selenium concentrations of 26 fish specimens collected from designated critical habitat in the Gunnison River, one Colorado pikeminnow specimen exhibited concentrations in muscle plugs that exceeded the 8 micrograms per gram dry weight toxicity guideline for selenium in fish muscle tissue.[129] Several species, including the razorback sucker and Colorado pikeminnow, exhibited selenium exposures in excess of the critical concentration at which Type 1 health effects begin to occur.[130]

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[124] *Id.* at 29 (citations omitted).
[125] *See* U.S. EPA, National Risk Management Research Laboratory, Mercury in Petroleum and Natural Gas: Estimation of Emissions from Production, Processing, and Combustion, EPA/600/SR-01/066 (Oct. 2001); Visvanathan, C., Treatment and Disposal of Mercury Contaminated Waste from Oil and Gas Exploration Facilities (1993) available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.549.9515&rep=rep1&type=pdf
[126] Lemly, A.D., Appalachian Center for the Economy & the Environment and Sierra Club, Aquatic hazard of selenium pollution from mountaintop removal coal mining, 3 (2009) ("Lemly 2009").
[127] Lemly 2009 at 3 ; Hamilton, S.J., Review of residue-based selenium toxicity thresholds for freshwater fish, Ecotox. Environ. Saf. 56: 201-210 (2003).
[128] *See id.*
[129] May, Thomas W. and Michael J. Walther, USGS, Determination of selenium in fish from designated critical habitat in the Gunnison River, Colorado, March through October, 2012, Open-File Report 2013-1104, 2 (2013)
[130] *Id.*

In the Lower Gunnison River Basin, 2014 data indicated a range of dissolved selenium (chronic values) from 0.97 µg/L to 16.7 µg/L along the Uncompahgre River. Out of 18 sites in the lower Gunnison that were considered, the Colorado water-quality standard for chronic dissolved selenium of 4.6 µg/L was exceeded at two sites.[131] In regards to acute values, the range measured was from 1.1 µg/L for a portion of the Uncompahgre River to 125 µg/L along a portion of Loutzenhizer Arroyo, with 125 µg/L being well in excess of any criteria for instantaneous selenium measurements.[132] In another 2015 study, mean concentrations of selenium in various fish species in the lower Colorado River Basin exceeded the risk for maternal transfer to eggs, while selenium concentrations in various species of macroinvertebrate prey exceeded the risk value for larval fishes.[133] Average selenium concentrations in the studied fish species were found to be 2- to 4-fold higher than the risk threshold for piscivorous (fish-eating) wildlife, with samples exceeding this threshold in 81-100% of cases depending on the species. The risk value for larval fishes, who either absorb selenium via maternal transfer to eggs or through invertebrate diet, was exceeded in 56-100% of cases depending on the adult species (with risk posed to larvae due to maternal transfer), and 86-100% of cases among invertebrates (with risk posed to larval fishes through diet). Thus, the transfer of selenium toxicity from invertebrates to fish to piscivores is readily observable.[134]

Natural erosion and runoff, as well as selenium leaching into irrigation runoff, are the primary sources of this toxic pollutant. The weathering of Cretaceous marine shales can produce high selenium soils, which are present in many areas of the western U.S.[135] Most notable of these Cretaceous shales is the Mancos Shale, which is found in Colorado, Utah, Wyoming, New Mexico, and Arizona. Irrigation of selenium-rich soils for crop production in arid and semi-arid regions can mobilize selenium and move it off-site in surface water runoff or via leaching into groundwater.

e. Population Numbers of the Endangered Fish Are Declining

Colorado pikeminnow populations are in decline throughout the Green River and Colorado River Basin, indicating that the Recovery Plan for the endangered fish has not been effective and that the impacts of water depletions could be more severe than previously anticipated.

According to Fish and Wildlife Service, the latest 2014 Colorado River sub-basin population number of 501 is "cause for great concern," and catch of sub-adults and adults in 2013 and 2014 "were near lowest observed in the history of the project."[136] 2015 catch numbers

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[131] Henneberg, M.F., 2014 annual summary of the lower Gunnison River Basin Selenium Management Program water-quality monitoring, Colorado: U.S. Geological Survey Open-File Report 2016–1129, 25 p. (2016), http://dx.doi.org/10.3133/ofr20161129.

[132] *Id.*

[133] Walters, David M., et al. Mercury and selenium accumulation in the Colorado River food web, Grand Canyon, USA. Environmental Toxicology and Chemistry, 34(10):2385-2394, 2390 (2015).

[134] *Id.*

[135] Lemly, A.D., Guidelines for evaluating selenium data from aquatic monitoring and assessment studies. Environ. Monitor. Assess. 28(1):83-100 (1993)

[136] Sufficient Progress Assessment at 23, 36.

are within the same range, which suggests that the population estimate for 2015 will be similar to the 2014 estimate.[137] Preliminary data show that the Green River sub-population is "in decline throughout the entire Green River Subbasin" and has fallen under 2,000, below the minimum viable population of 2,600 adults.[138] The Yampa River portion of the sub-basin population also "remains low and may be in further decline."[139] Recent studies show that Colorado pikeminnow declines in the Yampa River are linked to "persistent high densities of nonnative predators (e.g., smallmouth bass and northern pike)," and that northern pike are outnumbering Colorado pikeminnow by three to one.[140]

Humpback chub numbers are also low. Fish and Wildlife Service is "concerned that wild populations of humpback chub in Black Rocks and Westwater Canyon of the Colorado River (near the Colorado-Utah state line) have not recovered from declines detected in the late 1990's. The reason for those population declines is uncertain."[141] After this steep reduction, the Black Rocks/Westwater population continued to decline.[142] In 2008, the population "dropped below the population size downlist criterion (MVP = 2,100 adults) for the first time."[143] In 2011 and 2012, the core population estimates were 1,846 and 1,718, respectively.[144]

The Desolation/Gray Canyons population in the Green River has also not met the population-size downlist criterion, and was observed to be "trending downward" based on 2006-2007 population estimates.[145] This trend has been attributed to "increased nonnative fish abundance and habitat changes associated with dry weather and low river flows."[146] The 2014 estimate is 1,863 adults, substantially below the 2,100-adults recovery criterion.[147] Further, the proportion of captured individuals in 2015 that were first-year adults was 7.9%, continuing "a significantly declining trend in this metric since the 2001–2003 sampling period."[148] This "significant decline" in the percentage of captured individuals that were first-year adults "may be an indication that the future stability of the population is uncertain."[149]

Finally, the two smaller Yampa Canyon and Cataract Canyon populations do not indicate "self-sustaining" populations. "[I]t is not known if pure humpback chubs occur in Yampa

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[137] *See* USFWS, Monitoring the Colorado Pikeminnow Population in the Mainstem Colorado River via Periodic Population Estimates, 3 (Nov. 2015), available at http://www.coloradoriverrecovery.org/documents-publications/work-plan-documents/arpts/2015/rsch/127.pdf (showing similar capture rates of pikeminnow in 2014 and 2015).
[138] Sufficient Progress Assessment at 7.
[139] *Id.*
[140] *Id.* at 8.
[141] *Id.* at 36.
[142] *Id.* at 13.
[143] *Id.*
[144] *Id.* at 13-14.
[145] *Id.* at 12.
[146] *Id.* at 23.
[147] *Id.* at 12.
[148] USFWS, Colorado River Recovery Program, FY 2015 Annual Project Report, Project No. 129, Humpback chub population estimates for Desolation/Gray Canyons, Green River Utah, p. 4 (Nov. 13, 2015), available at http://www.coloradoriverrecovery.org/documents-publications/work-plan-documents/arpts/2015/rsch/129.pdf.
[149] *Id.*

Canyon."[150] The Cataract Canyon population is "small," decreasing by over half, from 150 wild adults in 2003 to 66 in 2005 such that population estimates are no longer possible.[151]

These declining population numbers are new baseline conditions, such that the endangered fish could be more vulnerable to water depletion and other oil and gas development effects than previously assumed. These downward trends also strongly suggest that the Endangered Fish Recovery Program is not achieving recovery targets nor adequately offsetting water depletion effects as intended.

f. The Recovery Program Is Failing to Meet Recommended Flows

A consistent pattern of failing to meet recommended flows in the Colorado River's 15-Mile Reach requires BLM and the Service to reinitiate consultation over the Fluid Mineral Program.

The Recovery Program establishes minimum recommended flows within various segments of the Upper Colorado River Basin that should be maintained to ensure recovery of the endangered fish.[152] The Western Colorado PBO's effects analysis assumes that, at the very least, the minimum recommended flow of 810 cubic feet per second (cfs) for dry years will be maintained within the 15-Mile Reach of the Colorado River within Colorado's Grand Valley in the Grand Junction Field Office.[153] The 15-Mile Reach extends from the confluence of the Gunnison River in Grand Junction to Palisade, Colorado, fifteen miles upstream.[154] According to the Service, when flows drop below 810 cfs, "habitat becomes compromised to the point that adult pikeminnow likely vacate the 15-Mile Reach to points downstream where flows increase either due to tributary input from the Gunnison River or irrigation return flow."[155] The 15-Mile Reach is one of the most important habitats to the Colorado pikeminnow and razorback sucker,[156] providing important spawning grounds for both species and year-round habitat for the Colorado pikeminnow.[157]

In its discussion of the environmental baseline, the Western Colorado PBO notes various recommended flows for the Colorado River sub-basins, including minimum flows for wet years, wet-average years, dry-average years, and dry years.[158] The PBO notes that in some recent years,

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[150] Sufficient Progress Assessment at 11.
[151] *Id.* at 14.
[152] *See id.* at 41; USFWS, Final Programmatic Biological Opinion for Bureau of Reclamation's Operations and Depletions, Other Depletions, and Funding and Implementation of Recovery Program Actions in the Upper Colorado River above the Confluence with the Gunnison River, 54 (Dec. 1999) ("Colorado River PBO"), available at http://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/15mile/FinalPBO.pdf.
[153] PBO at 42, 48.
[154] PBO at 4.
[155] *See* Sufficient Progress Assessment at 34-35; Osmundson, Douglas B. & Patrick Nelson, USFWS, Relationships Between Flow and Rare Fish Habitat in the '15 Mile Reach' of the Upper Colorado River Final Report, 6 (1995), available at http://www.coloradoriverrecovery.org/documents-publications/technical-reports/isf/OsmundsonNelson1995.pdf ("Osmundson 1995").
[156] PBO at 36, 42; Colorado River PBO at 25, 32, 45; Osmundson 1995 at 6.
[157] PBO at 36; Colorado River PBO at 31-32.
[158] PBO at 41-44.

recommended flows have not been met in the 15-Mile Reach.[159] However, the PBO's effects analysis assumes that the lowest recommended flow for dry years (810 cfs) will be maintained; this minimum flow is the baseline by which the PBO determined the Fluid Mineral Program's depletion effects on the Colorado pikeminnow.[160]

The Endangered Fish Recovery Program's latest Sufficient Progress Assessment indicates that recommended flows for dry years in the 15-Mile Reach of the Colorado River were not met in 2012 and 2013.[161] Flows also fell short of recommended levels in 2015, despite it being a dry-average precipitation year. In April, May, August and October 2015, the 15-Mile Reach missed the recommended minimum average flows for those months for dry-average precipitation years.[162] This average year shortfall (following a "wet-average" year) strongly suggests that minimum recommended flows for later dry years will almost certainly not be met when water will be scarcer, and as declining stream flows overall due to climate change weaken the Recovery Program's ability to supplement natural flows in dry years.[163] Indeed, in the period since the Western Colorado PBO was adopted, between 2009 and 2015, the Recovery Program has failed to meet mean monthly recommended flows in the 15-Mile Reach in over half of all months.[164] This new information strongly suggests that critical habitat within the 15-Mile Reach is likely to be unsuitable for the Colorado pikeminnow and razorback sucker in dry years, and that flow depletions from oil and gas development will only exacerbate these unsuitable conditions and reduce these species' chances of recovery.

The Recovery Program's continuing pattern of failing to meet recommended flows is new information revealing that the Fluid Mineral Program may have effects on the endangered fish to an extent that was not considered in the Western Colorado PBO or any of the RMPs that rely on the PBO in this leasing decision.

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Finally, for many of the same reasons noted above, BLM cannot rely on the San Juan PBO for its Section 7 compliance regarding water depletion effects on the endangered fish in connection with leasing of parcel COC78173. The San Juan PBO fails to take into account the increased water depletion effects of horizontal drilling and other new oil and gas extraction

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[159] *See id.* at 42-44 (e.g., "Since the publication of the spring flow recommendations in 1991, peak 1-day average flows through the 15-mile reach have been below 12,900 cfs approximately one-third of the years through 2006 and these targets have not been met."); *Id.* at 42 ("Mean monthly flows have…dropped below 810 cfs [the minimum flow for drought years] for at least one of the summer-time months during 7 of the last 17 years (1991-2007).").

[160] *Id.* at 48.

[161] *See* Sufficient Progress Assessment at 34 (noting average monthly flows significantly below 810 cfs in 15-mile reach in 2012 and 2013); *id.* at 31 (recognizing need to reduce the amount of time flows drop below 810 cfs in the 15-Mile Reach).

[162] *Compare* Colorado River PBO at 40-41 (recommended mean monthly stream flows for 15-Mile Reach) *with* U.S. Geological Survey, Surface Water Monthly Statistics (1991 - 2016) & Email from Tom Chart, FWS, Director, Upper Colorado River Endangered Fish Recovery Program to Wendy Park (July 15, 2016) (chart indicating dry, average, and wet precipitation years).

[163] *See* n. 415 above & accompanying text (noting ability to buffer Colorado River system will become more difficult as streamflows decrease).

[164] *See* Center for Biological Diversity's comparison of USGS monthly mean flow data to recommended flow (spreadsheet showing 15-Mile Reach flows and months with shortfall) (Exhibit G).

techniques. As noted above, the Tres Rios RMP-EIS projected increased deployment of these techniques in the Gothic Shale Gas Play and the Paradox Basin, and estimated that approximately 50 acre-feet per year of water depletions would occur in the San Juan River Basin, compared to 40 acre-feet projected in the 2008 San Juan PBO. This figure does not take into account stream depletions that would result from the removal of interconnected ground water to enhance the extraction of gas, so annual depletions could be much higher.[165] BLM and FWS's consultation over the Tres Rios RMP, however, improperly relied on the San Juan PBO which did not take into account this increased water use.

In addition, the San Juan PBO fails to fully take into account new information concerning climate change effects and increasing water scarcity and drought severity within the Upper Basin. It wholly fails to acknowledge mercury contamination within the Upper Basin and its effects on the endangered fish. New information concerning selenium contamination and effects on the endangered fish has arisen. Further, it fails to consider new information concerning endangered fish population declines in the Upper Basin, and the Recovery Program's failure to maintain flows upstream, which are necessary for the recovery of the Colorado River sub-basin population. BLM must reinitiate consultation on the San Juan River PBO, in light of all of these new circumstances.

3. *Allowing New Leasing While BLM Evaluates New Information Concerning the Endangered Fish Violates BLM's Consultation Duties and Risks Violation of ESA Section 7(d)*

Recently, in BLM's response to the Center and Sierra Club's protest of the Colorado State Office's Grand Junction Field Office December 8, 2016 lease sale, BLM stated its intent to prepare a new programmatic biological assessment on the Fluid Mineral Program, while at the same time allowing the December lease sale to go forward. BLM, however, cannot have it both ways relying on the PBO to support new leasing, while also revising its analysis. Under these circumstances, proceeding with new leasing violates BLM's obligations to consult before its proposed action and insure against jeopardy.

As an initial matter, BLM's protest response asserts that the "2008 PBO is still suitable to support the decision to lease parcels in the Upper Colorado River Basin area," on the flawed basis that the PBO's overall basin-wide depletion threshold had not been exceeded.[166] This ignores the fact that the PBO's Colorado River sub-basin depletion threshold was exceeded in FY2015, in violation of the PBO. BLM's implicit position that the PBO does not establish sub-basin depletion limits (in contrast to its prior suggestion)[167] is contrary to common sense and the PBO. Depletions in a particular sub-basin may significantly affect local endangered fish

[165] Tres Rios RMP-EIS at 245.
[166] BLM, Protest Decision on December 2016 Oil and Gas Competitive Lease Sale, 13 (Dec. 7, 2016) ("December Protest Decision").
[167] *See* BLM, Protest Decision on Center for Biological Diversity's Protest of May 12, 2016 Competitive Oil & Gas Lease Sale (May 12, 2016) ("Moreover, consistent with the 2008 PBO, average annual depletions, regardless of the drilling technology employed, would not be allowed to exceed 369 acre-feet [i.e., Little Snake Field Office's projected water depletion] without further BLM and Fish and Wildlife Service analysis and reinitiated Section 7 consultation.").

populations; otherwise, there would be no reason for the PBO to analyze the effects of depletions at the sub-basin level, or to require BLM to track and report depletions to FWS by sub-basin, as it does.

More troublingly, BLM's assertion that the 2008 PBO still validly supports its leasing decisionn does not square with BLM's recognition, in the same decision, of "the need to consider new information and re-evaluate changing conditions on the Upper Colorado River" and to "prepar[e] an updated Programmatic Biological Assessment (PBA)."[168] The PBA, BLM notes, "may consider information about new drilling techniques and re-examine the extent and location of fluid mineral reserves by river basin. The PBA will also evaluate how climate change and contaminants (specifically selenium and mercury) are affected by water depletions associated with BLM's fluid mineral program."[169] As the foregoing section shows, all of these factors are important considerations on the long-term viability of the endangered fish, which must be considered *before* any new depletions are allowed. And given FWS's finding that any water depletion is likely to jeopardize the endangered fish, BLM cannot dismiss the effects of any depletions resulting from its leasing decision. New depletions could result in significant adverse effects on the fish before BLM and FWS have had a chance to evaluate their potential effects in light of these significant new circumstances. In addition, BLM has never consulted over the depletion and spill effects of new leasing in the particular areas at issue. Leasing of the parcels here could have localized effects on endangered fish downstream which have not been considered in any prior consultation, given the much higher water depletion effects and increased surface water contamination risks that could result from increased fracking, horizontal drilling, and wastewater and frack fluid transport and storage in the leasing areas.

In the absence of a valid Section 7 consultation covering the Fluid Mineral Program and BLM's leasing decision, BLM is in violation of its Section 7 duties to both consult over the lease sale's depletion effects on the endangered fish and to insure against jeopardy to the species, before auctioning new leases. 16 U.S.C. § 1536(b). Waiting until the APD stage to consult violates BLM's duty to initiate consultation "at the earliest possible time," when meaningful consultation is possible now. *See* 50 C.F.R. § 402.14(a) ("Each Federal agency shall review its actions at the earliest possible time to determine whether any action may affect listed species or critical habitat."); *The Wilderness Society v. Wisely*, 524 F. Supp. 2d 1285, 1302 (D. Colo. 2007) (requiring Section 7 consultation before BLM's decision to resume oil and gas leasing where it was "possible… to engage in meaningful conference"); *Colorado Envtl. Coal. v. Office of Legacy Mgmt.*, 819 F. Supp. 2d 1193, 1223 (D. Colo. 2011) (requiring same for uranium leasing decision).

Indeed, the law is clear that, in the context of oil and gas leasing, "agency action" under the ESA includes not just the legal transaction of lease issuance, but also all resulting post-leasing activities from exploration, through production, to abandonment:

> we hold that agency action in this case entails not only leasing but leasing and all post-leasing activities through production and abandonment. Thus, section 7 of

[168] December Protest Decision at 13.
[169] *Id.*

> the ESA on its face requires the FWS in this case to consider all phases of the agency action, which includes postleasing activities, in its biological opinion. Therefore the FWS was required to prepare, at the leasing stage, a comprehensive biological opinion assessing whether or not the agency action was likely to jeopardize the continued existence of protected species, based on "the best scientific and commercial data available." 16 U.S.C. § 1536(a)(2).

Conner v. Burford, 848 F.2d 1441, 1453 (9th Cir. 1988).

The Ninth Circuit's decision in *Conner v. Burford* is similarly clear that the consultation requirement is not obviated by uncertainty about the precise location and extent of future drilling: "Although we recognize that the precise location and extent of future oil and gas activities were unknown at the time, extensive information about the behavior and habitat of the species in the areas covered by the leases was available."[170] Similarly, the inclusion of a general Threatened and Endangered Species stipulation in the standard lease terms cannot substitute for the ESA Section 7 obligation to prepare a comprehensive biological opinion at the initial leasing stage:

> Appellants ask us, in essence, to carve out a judicial exception to ESA's clear mandate that a comprehensive biological opinion -- in this case one addressing the effects of leasing and all post-leasing activities -- be completed before initiation of the agency action. They would have us read into the ESA language to the effect that a federal agency may be excused from this requirement if, in its judgment, there is insufficient information available to complete a comprehensive opinion and it take upon itself incremental step consultation such as that embodied in the T & E stipulations. We reject this invitation to amend the ESA. That it is the role of Congress, not the courts.

Id. at 1455.

The BLM's refusal to consult at the lease stage, and proposal to defer consultation to the APD stage, is precisely the sort of incremental step consultation decisively rejected as inconsistent with the ESA in *Conner v. Burford.*[171]

BLM should cancel the lease sale and halt all new leasing until an adequate consultation on the Fluid Mineral Program and proposed lease sale has been completed.

4. *BLM and FWS Must Consult Over the Leasing Action's Effects on Gunnison Sage-Grouse*

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[170] *Id.* at 1453.

[171] Further, there is no assurance that BLM would even consult under Section 7 at the APD or site-specific stage. Instruction Memorandum 2010-023 allows projects to go forward without Section 7 consultation if (1) the project or well operator has signed a Recovery Agreement under terms set forth by the PBO, if the project or APD is located in the Yampa or Colorado river sub-basins; or (2) if the project is located in the White, Dolores, or Gunnison river sub-basins. Accordingly, BLM typically does not perform Section 7 consultation for water depletions at the APD stage.

As detailed more fully in Exhibit E, unoccupied habitat may be essential to recover the Gunnison sage-grouse, yet neither the DNA for the proposed lease sale nor the Tres Rios RMP FEIS to which it tiers contains any analysis of whether parcel COC78158 is suitable and/or necessary for recovery of viable Gunnison sage-grouse populations, or whether this parcel must include conditions to minimize disturbance to neighboring sage-grouse populations.[172] The same can also be said for parcels COC78167, 78168, 78169, 78170, 78162, 78163, 78164, and 78165, which are all adjacent to or near critical habitat, as well as parcels 78159, 78160, 78161, 78166, 78171, and 78172, which are all within historical 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. BLM must address how leasing within unoccupied areas may affect recovery of Gunnison sage-grouse under NEPA and ESA Section 7.

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We strongly urge BLM to cancel the proposed lease sale, or prepare a legally adequate EIS for this proposed oil and gas leasing action and consult under Section 7 of the ESA prior to allowing the proposed action to move forward. Thank you for your consideration of these comments.

Sincerely,

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Center for Biological Diversity

Katie Schaefer
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Sierra Club

[172] *See* Exhibit E at 33-35.

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Exhibits

Exhibit A: Center for Biological Diversity and Sierra Club's comments on the Determination of NEPA Adequacy for the proposed Colorado February 2017 lease sale

Exhibit B: Rocky Mountain Wild et al.'s comments on the Determination of NEPA Adequacy for the proposed Colorado February 2017 lease sale

Exhibit C: Center for Biological Diversity's scoping comments for the proposed Colorado February 2017 lease sale

Exhibit D: Center for Biological Diversity June 13, 2016 comments on the proposed Colorado November 2016 lease sale

Exhibit E: Center for Biological Diversity December 2015 protest of the proposed Colorado February 2016 lease sale

Exhibit F: Wolf, Shaye Ph.D. Impacts of Climate Change on the Colorado River Basin, Center for Biological Diversity (March 10, 2016)

CENTER for BIOLOGICAL DIVERSITY Because life is good.

December 9, 2016

VIA FEDERAL EXPRESS DELIVERY

Ruth Welch, State Director
BLM
Colorado State Office
2850 Youngfield Street
Lakewood, CO 80215-7093

Re: References and Exhibits for Center for Biological Diversity and Sierra Club's Protest of BLM Colorado State Office's February 9, 2017 Lease Sale—Tres Rios Field Office

Dear Director Welch:

Enclosed are references and exhibits for the above-referenced matter:

(1) Hard copies of Exhibits A - F of our protest of the Colorado State Office's February 9, 2017 Lease Sale, which are incorporated by reference and part of the protest; and
(2) a CD of all references cited in our protest letter.

The protest will be delivered to your office via fax on Monday, December 12.

If you have any questions concerning this matter, please do not hesitate to reach me at 510-844-7138 or wpark@biologicaldiversity.org. Thank you.

Sincerely,

Wendy Park
Senior Attorney
Center for Biological Diversity

EXHIBIT A

CENTER for BIOLOGICAL DIVERSITY Because life is good

September 8, 2016

Ryan Joyner
Bureau of Land Management
Tres Rios Field Office
29211 Highway 184
Dolores, CO 81323
rjoyner@blm.gov

Re: February 2017 Tres Rios Field Office, Colorado Lease Auction--Center for Biological Diversity and Sierra Club Comments on Determination of NEPA Adequacy

Dear Mr. Joyner:

Center for Biological Diversity and Sierra Club write to submit comments on BLM's proposed Determination of NEPA Adequacy (DNA) for its planned February 2017 oil and gas lease auction of 15,865.100 acres in the Tres Rios Field Office in Montezuma, Dolores, San Miguel, and Archuleta Counties. As detailed in our June 8, 2016 scoping comment, attached here and incorporated by reference, BLM must prepare an Environmental Impact Statement (EIS) that addresses numerous issues posed by the lease auction, including the site-specific impacts of hydraulic fracturing (or "fracking") on seismic hazards, air and water quality, public health, and sensitive wildlife, including the threatened Gunnison sage grouse and the Colorado River endangered fish. BLM, however, has proceeded without the preparation of an EIS, or even an Environmental Assessment (EA), instead relying on its 2013 Tres Rios Field Office, San Juan National Forest Land and Resource Management Plan Final Environmental Impact Statement (RMP-FEIS), despite it lacking any analysis of the site-specific impacts of oil and gas development in the areas proposed for leasing. Sole reliance on the RMP-FEIS to fulfill BLM's public disclosure duties under NEPA is wholly inappropriate. The RMP-FEIS also falls short in many other respects that make reliance on this document inadequate.

The following comments supplement our June 8 letter, and specifically address BLM's failure to analyze or consider (1) site-specific impacts of leasing in violation of NEPA and Instruction Memorandum 2010-117's (IM 2010-117) directive to analyze site-specific impacts at the lease sale stage, (2) alternatives to the proposed leasing of ACEC-nominated areas, despite IM 2010-117's directive to consider alternatives where "unresolved" land-use conflicts exist, (3) greenhouse gas emissions and climate change impacts of new leasing, and (4) the significant impacts of inadequate and ineffective leasing stipulations set forth in the Tres Rios RMP-FEIS. In addition, for the reasons discussed in section I(B)-(C) below, our scoping comment, and

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Rocky Mountain Wild's September 8, 2016 comments on the DNA (RMW Comment), BLM must consult under Section 7 of the Endangered Species Act (ESA) regarding the proposed lease action's effects on the endangered fish and Gunnison sage grouse. We also join in RMW's Comment on the proposed lease sale, which are attached here and incorporated by reference.

I. BLM Has Failed to Take the Required Hard Look at the Site-Specific Environmental Consequences of Leasing

Case law and NEPA itself makes clear that the agencies are required to perform and disclose an analysis of environmental impacts *prior* to the irretrievable commitment of resources. *N.M. ex rel. Richardson v. BLM*, 565 F.3d 683, 716 (10th Cir. 2009) (NEPA and CEQ regulations provide that assessment of a given environmental impact must occur as soon as that impact is "reasonably foreseeable," citing 40 C.F.R. § 1502.22, and must take place before an "irretrievable commitment of resources" occurs, citing 42 U.S.C. § 4332(2)(C)(v)); *see also Pennaco Energy, Inc. v. United States DOI*, 377 F.3d 1147, 1160 (10th Cir. 2004) (agencies required to satisfy NEPA before committing themselves irretrievably to a given course of action, so that the action can be shaped to account for environmental values.)

BLM's asserts in the DNA that the Tres Rios RMP-EIS satisfies NEPA for a site-specific lease sale. This assertion is unsupportable, because selling these parcels, even with NSO stipulations, will have readily foreseeable site-specific impacts on water, air, wildlife, neighboring lands, and climate – foreseeable site-specific impacts that were never considered in the RMP-EIS.

A. It is Unlawful to Proceed with the Lease Sale without Undertaking a Site-Specific Environmental Assessment.

The agencies' failure to analyze site-specific environmental impacts before leasing may be related to the agencies' past claims, in numerous other lease sales, that they are not required to undertake any site-specific environmental reviews until the issuance of an APD. To support this claim, the agencies have commonly and improperly cited to *Park County Resource Council, Inc. v. U.S. Department of Agriculture*, 817 F.2d 609 (10th Cir. 1987), which was discussed at length by the Tenth Circuit in the more recent decision of *N.M. ex rel. Richardson*, 565 F.3d 683 ("The parties dispute whether our precedents create a hard rule that no site-specific EIS is ever required until the permitting stage, or a flexible test requiring a site-specific analysis as soon as practicable. If the latter, they dispute whether a site-specific EIS was practicable, and thus required, before issuance of the [] lease."). There the oil industry similarly argued that under *Park County*, BLM may routinely wait until the APD stage to conduct site-specific analysis. *N.M. ex rel. Richardson*, 565 F.3d at 717. The Tenth Circuit disagreed with that interpretation, and compared the *Park County* case to *Pennaco Energy, Inc. v. United States DOI*, 377 F.3d 1147, 1152 (10th Cir. 2004), in which the Tenth Circuit affirmed the Interior Board of Land Appeals' ("IBLA") decision that the time for considering potential environmental impacts under NEPA, is when BLM proposes to lease public lands for oil and gas purposes. *See Wyoming Outdoor Council, et al.*, 156 IBLA 347 (2002).

In *Richardson*, the Tenth Circuit explained, "[t]aken together, these cases [*Park County* and *Pennaco*] establish that there is no bright line rule that site-specific analysis may wait until the APD stage. Instead, the inquiry is necessarily contextual. Looking to the standards set out by regulation and by statute, assessment of all 'reasonably foreseeable' impacts must occur at the earliest practicable point, and must take place *before an 'irretrievable commitment of resources'* is made." *N.M. ex rel. Richardson,* 565 F.3d at 717-18 (emphasis added) (citing 42 U.S.C. § 4332(2)(C)(v)). Although the agencies attempt to characterize leasing as mere administrative paperwork that cannot result in any impacts to the environment, NEPA and governing Tenth Circuit decisions have made clear that the test depends upon existing environmental circumstances, not upon "the formalities of agency procedures," and as such requires a "fact-specific inquiry." *Id.* at 717. The "operative inquiry," therefore, is two-fold. First, we must ask whether the lease constitutes an "irretrievable commitment of resources"—the Tenth Circuit has concluded that issuing an oil and gas lease without an NSO stipulation constitutes such a commitment. *Id.* at 717 (citing to *Pennaco Energy,* 377 F.3d at 1160 and *Sierra Club v. Peterson*, 717 F.2d 1409, 1412-1414 (D.C. Cir. 1983)). Second, we must ask whether all "foreseeable impacts of leasing" have been taken into account before leasing can proceed. *Id.* Here, given the utter lack of any site-specific review of the parcels, BLM has entirely failed to disclose reasonably foreseeable impacts of leasing.

Oil and gas development and hydraulic fracturing are a reasonably foreseeable consequence of leasing the proposed parcels, and therefore an analysis of site-specific impacts from new oil and gas development is required. Indeed, BLM Instruction Manual 2010-117 specifically directs BLM to conduct site-specific analysis of lease parcels in NEPA documentation.[1] *See, e.g.*, IM 2010-117 § III(E) ("The IPDR Team will complete site-specific NEPA compliance documentation for all BLM surface and split estate lease sale parcels..."); *id.* ("Most parcels that the field office determines should be available for lease will require site-specific NEPA analysis."). IM 2010-117 also calls upon BLM to consider a host of factors in deciding whether to propose parcels for lease, each of which call for site-specific analysis. For example, BLM must consider whether "[c]onstruction and use of new access roads or upgrading existing access roads to an isolated parcel would have unacceptable impacts to important resource values." IM 2010-117 § III(C)(4). Another consideration is whether "[p]arcel configurations would lead to unacceptable impacts to resources on the parcels or on surrounding lands and cannot be remedied by reconfiguring." *Id.* Moreover, IM 2010-117 directs BLM to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." *Id.* § III(E). Such an evaluation would necessarily require a consideration of site-specific resource uses. *Id.* § III(E).

In sum, BLM must perform the requisite "hard look" of site-specific impacts to support its decision to lease, including consideration of all factors set forth in IM 2010-117 and consideration of alternatives that would allow BLM to meaningfully examine unresolved resource use conflicts. *See S. Utah Wilderness All. v. United States DOI*, 2016 U.S. Dist. LEXIS 42696, 14-15 (D. Utah Mar. 30, 2016) (failure to comply with IM 2010-117 can result in NEPA violation); *see also Cotton Petroleum Corp. v. U.S. Dept. of Interior, Bureau of Indian Affairs*, 870 F.2d 1515, 1527 (10th Cir. 1989) (failure to follow internal guidance document can

[1] Bureau of Land Management, IM 2010-117, Oil and Gas Leasing Use Planning and Lease Parcel Reviews (2010).

constitute arbitrary and capricious decisionmaking). RMW's Comment, incorporated here by reference, details site-specific resource issues, which BLM must analyze in an EIS.

B. The Agencies Failed to Take the Requisite Hard Look at Environmental Impacts

NEPA establishes action-forcing procedures that require agencies to take a "hard look" at environmental consequences of the proposed action. *Pennaco Energy, Inc.*, 377 F.3d at 1150; *see also N.M. ex rel. Richardson*, 565 F.3d at 714 (holding that BLM acted arbitrarily by concluding environmental impacts would be minimal because the "hard look" requirement was not satisfied.). In the matter at hand, BLM failed to take any look, let alone the requisite "hard look," at the potential impacts of oil and gas development on the lease parcels. Instead, BLM's proposed lease sale is based solely on the analysis contained in the RMP-FEIS which states:

> This FEIS is a programmatic document. It discusses environmental effects on a broad scale and does not predict what would happen when such broad-based standards and guidelines are implemented on individual, site-specific projects. *Nor does it convey the long-term environmental consequences of any site-specific project*. The actual consequences (impacts) would depend on the extent of each project, *the environmental conditions at the site (which can vary widely across the public lands)*, and the mitigation measures and their effectiveness.

RMP-FEIS at 47 (emphasis added).

Any and all such significant environmental consequences of site-specific projects such as this one must be reviewed and disclosed. The RMP-FEIS indeed provides only a highly general overview of the range of possible impacts on a very broad scale – the analysis area covers nearly 2.5 million acres,[2] which is too general to meaningfully address the foreseeable impacts to the parcels at issue. Throughout the remainder of the RMP-FEIS, the document acknowledges that the RMP-FEIS is meant to be used as "a starting point." It is not designed to replace or in any way satisfy the site-specific analysis necessary to provide proper NEPA review:

> The analysis presented in this FEIS would be used to "tier" to future analyses. NEPA defines tiering as the coverage of general matters in broader EISs with subsequent narrower statements or environmental analyses that incorporate by reference the general discussions, allowing discussions to then concentrate solely on the issues specific to the statement subsequently prepared. Tiering is appropriate when it helps the lead agency to focus on new issues and exclude from consideration issues already decided. Thus, the broader analysis and conclusions analyzed in this document *can then be used as a starting point for future site-specific project planning in the planning area*. Each future project's environmental effects analysis document would incorporate, by reference, the information found in the FEIS, without the need to repeat the broader analysis process.

RMP-FEIS at 61 (emphasis added).

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[2] Final Environmental Impact Statement for BLM Tres Rios Field Office and San Juan National Forest Land and Resource Management Plan (Sept. 2013) ("RMP-FEIS") at i.

The RMP-FEIS therefore does not contain any of the required analysis of environmental impacts likely to occur from oil and gas development *in the areas to be leased*, which are highly sensitive and valuable areas as discussed in RMW's Comment.

C. BLM Failed to Follow its Own DNA Criteria

BLM's standard Determination of NEPA Adequacy Worksheet includes a section titled "NEPA Adequacy Criteria" that asks several guidance questions, such as:

> Is the existing analysis valid in light of any new information or circumstances (such as, rangeland health standard assessment, recent endangered species listings, updated lists of BLM-sensitive species)? Can you reasonably conclude that new information and new circumstances would not substantially change the analysis of the new proposed action?
>
> Are the direct, indirect, and cumulative effects that would result from implementation of the new proposed action similar (both quantitatively and qualitatively) to those analyzed in the existing NEPA document?

BLM's DNA, which tiers to the 2013 RMP-FEIS, fails to address "new information and new circumstances," as well as significant differences between the foreseeable impacts of a site-specific lease proposal and the planning-area-wide RMP, that would substantially change the analysis of the lease sale. The RMP-FEIS fails to consider in any detail the potential impacts of hydraulically fracturing the leased parcels. It also lacks adequate analysis of wildlife impacts, seismic activity, health impacts, or many of the other known impacts of hydraulic fracturing. RMW's Comment, submitted herewith, details the ways in which BLM failed to analyze foreseeable threats to the areas at issue. We supplement this letter with the following additional relevant studies and data:

i. The DNA Does Not Consider New Information showing Foreseeable Impacts on Endangered Fish

As stated in our June 8 scoping comment letter, BLM must perform an adequate environmental review of the significant impacts that oil and gas development is likely to have on the Colorado pikeminnow, razorback sucker, bonytail, and humpback chub ("endangered fish") and the Colorado River ecosystem. *See* CBD Scoping Comment pp. 46-47. Significant new information has arisen since the adoption of the RMP-FEIS and 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" (Western Colorado PBO), which is designed to address any depletions resulting from oil and gas development within the Tres Rios Field Office and other western Colorado field offices (excluding areas within the San Juan River Basin). Likewise, new information has arisen since BLM's adoption of the "Programmatic Biological Opinion for Water Depletions Associated with BLM's Fluid Mineral Program and Other Actions Authorized by BLM on Public Lands within the San Juan River Basin" (San Juan PBO). BLM's approval of the RMP-FEIS relied on these programmatic

biological opinions (collectively "PBOs").[3] As discussed further below, however, the PBOs did not consider several important factors that may affect the endangered fish in a manner or to an extent not previously considered.

Horizontal Drilling

As discussed in our June 8 letter, the PBOs 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.[4] Nor did they 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.[5] To the extent that approval of the lease sale would rely on the PBOs, such reliance is arbitrary. An EIS must examine the impacts that increased horizontal drilling and associated water depletions would have on the endangered fish.

Climate Change

Ample new evidence indicates that climate change is reducing stream flows within the Upper Colorado River Basin, factors which neither the RMP-FEIS nor the PBOs took into account. There is no mention of climate change in the Western Colorado PBO. The San Juan PBO only mentions the potential for a change in timing of spring stream flows to shift spawning times, and makes the most general of observations that reduced runoff "would not be positive" for the endangered fish.[6] Such cursory analysis of the effects of climate change on endangered fish survival and recovery is completely inadequate.

The best available scientific data indicate that climate change is resulting in higher temperatures in the Colorado River Basin, reduced snowpack, reduced runoff, and increased drought, *which have already reduced* and will continue to reduce stream flows in the Basin.[7] In March 2016, scientists published the first empirical study demonstrating a link between warmer spring temperatures and reduced runoff in the Basin, verifying predictive models.[8] The Center's attached literature review (Exhibit A) provides more specific detail regarding these climate change effects on Colorado River stream flows. BLM must take into account these climate change effects on the endangered fish and other aquatic resources, in connection with its evaluation of the water depletion effects of increased oil and gas development.

Compounding this threat to the endangered fish are persistent drought conditions that have diminished natural flows in the Colorado River Basin and reduced water storage that is

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[3] Parcel 7786 is in the Lower San Juan Basin, while parcel 7787 is in the Upper San Juan Basin. The other 22 parcels are in the Upper Colorado-Dolores River Basin.
[4] *See* Scoping Comment at 46-47.
[5] BLM Instruction Memorandum CO-2011-022 (April 11, 2011) ("All of the estimates in the PBO were based on using conventional vertical drilling technology."); *see also* Center for Biological Diversity et al. Comment on EA for November 2016 Grand Junction, Royal Gorge, and Tres Rios Field Offices Lease Sale (June 2016).
[6] San Juan PBO at 27-28.
[7] Wolf, Shaye Ph.D. Impacts of Climate Change on the Colorado River Basin, Center for Biological Diversity (March 10, 2016) ("Wolf 2016") (Exhibit A); *see also* studies cited therein.
[8] *See id.* at 2.

needed to supplement Upper Colorado River Basin flows. The period from 2000 to 2015 was the lowest 16-year period for natural flow in the last century, and one of the lowest 16-year periods for natural flow in the past 1,200 years, according to paleorecords.[9] As a result, water storage in the Colorado River system reservoirs have declined "from nearly full to about half of capacity," and led to local shortages in the Upper Colorado's sub-basins.[10]

Further, population growth will increase water demand for agriculture and municipal uses, making it increasingly difficult to ensure sufficient water availability for the endangered fish, which rely on the release of stored water, especially in dry years.[11] An ever widening gap between water supply and water demand is weakening the Colorado River water supply system's reliability and ability to buffer the system in dry years.[12]

Already-strapped Western water supplies are expected to become harder to manage over the next century due to climate change, according to a study released recently by federal water managers. The Bureau of Reclamation's report looks at how climate change will affect water supplies in the West and finds that warming weather will increase the likelihood of shortages, particularly for farmers.[13] More "extreme variations" in climate will make it difficult for Reclamation to meet competing demands for water. Building on a 2011 report that analyzed eight river basins, the new version analyzes nine: the Klamath, Truckee, Sacramento, San Joaquin, Lower Colorado, Rio Grande, Colorado, Columbia and Missouri. The rivers supply Reclamation with 10 trillion gallons of water per year for cities, as well as water for 10 million acres of irrigated farmland that supply more than half of U.S. vegetable production and more than a quarter of fruit and nut production.[14]

Reclamation notes that the basins have already warmed by about 2 degrees Fahrenheit since 1895, which is only slightly more than the nationwide average of 1.3 to 1.9 F.[15] The report finds that more of the West's precipitation will fall as rain rather than snow, and predicts reductions in runoff entering rivers in the South. All areas are expected to see big changes in the timing of snowmelt, which will shift peak river flows earlier and earlier.[16]

Runoff and demand for irrigation will rise. In addition to runoff changes, increased temperatures are expected to increase the demand for irrigation water and for Reclamation's hydroelectricity, as well as for water dedicated to maintaining habitat for fish and other river species.[17] Collectively, the impacts of climate change to water resources give rise to difficult questions about how best to operate Reclamation facilities to address growing demands for water and hydropower now and how to upgrade and maintain infrastructure to optimize operations in

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[9] U.S. Bureau of Reclamation, Managing Water in the West: SECURE Water Act Section 9503(c) Report to Congress, 3-64 (2016) ("Bureau of Reclamation 2016).
[10] *Id.*
[11] *See id.* at 3-7 , 3-8.
[12] *Id.* at 3-10, 3-12.
[13] *Id.* at 10-13.
[14] Kahn, Debra, Climate change bodes ill for Western supplies, E&E Reporter: The Politics and Business of Climate Change (March 2016), available at http://www.eenews.net/climatewire/2016/03/23/stories/1060034478.
[15] *Id.*
[16] *Id.*
[17] *Id.*

the future.[18] These growing demands will make it increasingly more difficult to maintain recommended baseline flows required for endangered fish recovery. The PBOs' effects analysis assumes that these baseline flows will be maintained, but such assumptions are highly questionable given these changing circumstances. Indeed, BLM is not meeting minimum recommended baseline flows of 810 cfs in the 15-Mile Reach in the Grand Junction Field Office--one of the most important habitats for recovery of the Colorado pikeminnow and razorback sucker.[19]

Endangered Fish Population Declines

Colorado pikeminnow populations are in decline throughout the Green River and Colorado River Basin, indicating that the Recovery Plan for the endangered fish has not been effective and that the impacts of water depletions may be more severe than previously anticipated.

According to the Fish and Wildlife Service, the latest 2014 Colorado River sub-basin population number of 501 is "cause for great concern," and catch of sub-adults and adults in 2013 and 2014 "were near lowest observed in the history of the project."[20] 2015 catch numbers are within the same range, which suggests that the population estimate for 2015 will be similar to the 2014 estimate.[21] Preliminary data show that the Green River sub-population is "in decline throughout the entire Green River Subbasin" and has fallen under 2,000, below the minimum viable population of 2,600 adults.[22] The Yampa River portion of the sub-basin population also "remains low and may be in further decline."[23] Recent studies show that Colorado pikeminnow declines in the Yampa River are linked to "persistent high densities of nonnative predators (e.g., smallmouth bass and northern pike [])," and that northern pike are outnumbering Colorado pikeminnow by three to one.[24] The weakening of the Yampa River portion of the sub-basin population makes it even more critical to ensure that habitat for the Green River portion of the Green River sub-basin population is not degraded and remains a stronghold for the species.

Humpback chub numbers are also low. Fish and Wildlife Service is "concerned that wild populations of humpback chub in Black Rocks and Westwater Canyon of the Colorado River (near the Colorado-Utah state line) have not recovered from declines detected in the late 1990's. The reason for those population declines is uncertain."[25] After this steep reduction, the Black

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[18] Bureau of Reclamation at 1-10.
[19] USFWS, (Signed) Draft 2014-2015 Assessment of Sufficient Progress Under the Upper Colorado River Endangered Fish Recovery Program in the Upper Colorado River Basin, and of Implementation of Action Items in the December 20, 1999, 15-Mile Reach Programmatic Biological Opinion and December 4, 2009, Gunnison River Basin Programmatic Biological Opinion, 31, 34 (Oct. 7, 2015) ("Sufficient Progress Memo").
[20] *Id.* at 23, 36.
[21] *See* USFWS, Monitoring the Colorado Pikeminnow Population in the Mainstem Colorado River via Periodic Population Estimates, p. 3 (Nov. 2015), available at http://www.coloradoriverrecovery.org/documents-publications/work-plan-documents/arpts/2015/rsch/127.pdf (showing similar capture rates of pikeminnow in 2014 and 2015).
[22] Sufficient Progress Memo at 7.
[23] *Id.*
[24] *Id.* at 8.
[25] *Id.* at 36.

Rocks/Westwater population continued to decline.[26] In 2008, the population "dropped below the population size downlist criterion (MVP = 2,100 adults) for the first time."[27] In 2011 and 2012, the core population estimates were 1,846 and 1,718, respectively.[28]

The Desolation/Gray Canyons population—which inhabits the Green River directly downstream of the project area—has also not met the population-size downlist criterion, and was observed to be "trending downward" based on 2006-2007 population estimates.[29] This trend has been attributed to "increased nonnative fish abundance and habitat changes associated with dry weather and low river flows."[30] The project's water depletions within the Green River sub-basin, in connection with climate change effects and shrinking water supply, could exacerbate these declines. The 2014 estimate is 1,863 adults, substantially below the 2,100-adults recovery criterion.[31]

These declining numbers not only show that the endangered fish may be more sensitive to water depletion and other oil and gas development effects than previously assumed, but they strongly suggest that the Endangered Fish Recovery Program is not achieving recovery targets nor adequately offsetting water depletion effects as intended.

ii. Site-Specific Water Depletion Effects Are Ignored

The RMP-FEIS attempts to defer all site-specific analysis of the effects of oil and gas operations' water demands. The time for that site-specific analysis is now, before the BLM irretrievably conveys to a lessee the right to extract oil and gas. The RMP-FEIS states:

> Water used for well drilling, completion, and operation on the federal mineral estate is assumed to come from off-site. Due to the lack of specific project proposals, the effects on groundwater resources on federal lands are unknown. However, water used for these operations on state and private lands would likely come from ground or surface water sources within the planning area. The withdrawal of groundwater resources from the planning area 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 (CWCB 2010).

RMP-FEIS at 279. Now that particular areas are proposed for lease, BLM is in a position to evaluate the potential development, and ensuing water demands, of these particular leases. Given a site-specific leasing proposal, BLM can no longer defer analysis of the water demands of oil and gas development as "unknown."

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[26] *Id.* at 13.
[27] *Id.*
[28] *Id.* at 13-14.
[29] *Id.* at 12.
[30] *Id.* at 23.
[31] *Id.* at 12.

II. BLM Must Consider Alternatives to Address "Unresolved Conflicts Concerning Alternative Uses of Available Resources"

As detailed in RMW's attached comments, several parcels fall within areas that have been nominated for Areas of Critical Environmental Concern (ACEC). By failing to prepare an EIS, or even an EA, however, BLM has failed to consider alternatives that would avoid or reduce unresolved conflicts over the use of these parcels' resources. IM 2010-117 directs BLM to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." *Id.* § III(E). The failure to study alternatives, despite specific agency direction that such study is required when unresolved resource conflicts exist, is arbitrary and capricious, violates NEPA, and undermines FLPMA's intent to protect proposed ACECs.

BLM's apparent determination in Appendix U of the RMP-FEIS that existing RMP standards and lease stipulations are sufficient to protect proposed ACECs, *before* the ACEC review process is complete, prejudices the determination of whether ACEC-designation is warranted. ACECs, by definition, are areas where "special management" is required, and under FLPMA, such designation and protection must be given "priority." 43 U.S.C. §§ 1702(a), 1711(a); *see also* BLM Manual 1613, §§ 1613.02, 1613.13. But Appendix U suggests that BLM has pre-determined the outcome by finding that no special management is warranted while ACEC-designation is considered. Allowing leasing and oil and gas development before the ACEC-designation process is complete circumvents FLPMA's mandate to prioritize ACEC-designation and protection, and BLM Manual 1613's extensive process for such designation, while defeating the purpose of ACEC-designation.

BLM must study alternative uses of those lease parcel areas that are currently being reviewed for ACEC-designation in an EIS, or at minimum, in an EA.

III. BLM Cannot Tier to the RMP, Because It Fails to Analyze the Greenhouse Gas Emissions Impacts of Oil and Gas Leasing

BLM fails to quantify potential greenhouse gas emissions from developing the lease parcels, improperly tiering to the RMP-FEIS. The RMP-FEIS falls far short in preparing a complete life-cycle analysis of the lease sale's potential GHG emissions, and therefore fails to provide any meaningful sense of the lease sale's potential direct, indirect, and cumulative greenhouse gas impacts. The FEIS 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* RMP-FEIS at 364-65 (quantifying GHGs only from drilling rig engines, hydraulic fracturing engines, compressor engines, and well pad separators/heaters). Further, the RMP-FEIS does not provide an analysis of the "social costs of carbon," despite quantifying potential economic benefits of oil and gas development in the Tres Rios planning area.[32]

[32] *See, e.g.*, RMP-FEIS at 603-606.

Meaningful consideration of greenhouse gas emissions (GHGs) is clearly within the scope of required NEPA review. *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008). As the Ninth Circuit has held, in the context of fuel economy standard rules:

> The impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct. Any given rule setting a CAFE standard might have an "individually minor" effect on the environment, but these rules are "collectively significant actions taking place over a period of time" *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1216 (9th Cir. 2008)(quoting 40 C.F.R. § 1508.7).

The courts have ruled that federal agencies consider indirect GHG emissions resulting from agency policy, regulatory, and leasing decisions. For example, agencies cannot ignore the indirect air quality and climate change impact of decisions that would open up access to coal reserves. *See Mid States Coal. For Progress v. Surface Transp. Bd.*, 345 F.3d 520, 532, 550 (8th Cir. 2003); *High Country Conservation Advocates v. U.S. Forest Serv.*, 52 F.Supp. 3d 1174, 1197-98 (D.Colo. 2014).

BLM's failure to fully quantify the potential emissions from the proposed auction violates NEPA. The final CEQ *Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA review* is dispositive on the issue of federal agency review of greenhouse gas emissions as foreseeable direct and indirect effects of the proposed action. 81 Fed. Reg. 51,866 (Aug. 5, 2016). The CEQ guidance provides clear direction for BLM to conduct a lifecycle greenhouse gas analysis because the modeling and tools to conduct this type of analysis are readily available to the agency:

> If the direct and indirect GHG emissions can be quantified based on available information, including reasonable projections and assumptions, agencies should consider and disclose the reasonably foreseeable direct and indirect emissions when analyzing the direct and indirect effects of the proposed action. Agencies should disclose the information and any assumptions used in the analysis and explain any uncertainties. To compare a project's estimated direct and indirect emissions with GHG emissions from the no-action alternative, agencies should draw on existing, timely, objective, and authoritative analyses, such as those by the Energy Information Administration, the Federal Energy Management Program, or Office of Fossil Energy of the Department of Energy. In the absence of such analyses, agencies should use other available information. 81 Fed. Reg. 51,866 at 16 (Aug. 5, 2016)(citations omitted).

CEQ's guidance even provides an example of where a lifecycle analysis is appropriate in a leasing context at footnote 42:

> The indirect effects of such an action that are reasonably foreseeable at the time would vary with the circumstances of the proposed action. For actions such as a Federal lease sale of coal for energy production, the impacts associated with the end-use of the fossil fuel being extracted would be the reasonably foreseeable combustion of that coal. *Id.*

Numerous greenhouse gas calculation tools exist to develop lifecycle analyses, particularly for fossil fuel extraction, operations, transport and end-user emissions.[33] Indeed, the Department of Energy has historically utilized these types of lifecycle emissions analyses in NEPA review of oil and gas infrastructure projects.[34] Other federal agencies have begun to employ upstream, downstream and lifecycle greenhouse gas emissions analyses for NEPA review of energy-related projects.[35] Courts have upheld the viability and usefulness of lifecycle analyses, and adoption of this trend is clearly reflected in the CEQ Guidance on Climate Change. 81 Fed. Reg. 51, 866 at 11 (Aug. 5, 2016) ("This guidance recommends that agencies quantify a proposed agency action's projected direct and indirect GHG emissions. Agencies should be guided by the principle that the extent of the analysis should be commensurate with the quantity

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[33] *See* Council on Environmental Quality, Revised draft guidance for greenhouse gas emissions and climate change impacts (2014), https://ceq.doe.gov/current_developments/GHG-accounting-tools.html.

[34] U.S. Department of Energy National Energy Technology Laboratory, Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States, DOE/NETL-2014/1649 (May 29, 2014) *available at* http://energy.gov/sites/prod/files/2014/05/f16/Life%20Cycle%20GHG%20Perspective%20Report.pdf. *See also,* U.S. Department of Energy National Renewable Energy Laboratory, Life Cycle Greenhouse Gas Emissions from Electricity Generation Fact Sheet, Pub No. NREL/FS-6A20-57817 (2013) *available at* http://www.nrel.gov/docs/fy13osti/57187.pdf; U.S. Department of Energy National Energy Technology Laboratory Role of Alternative Energy Sources: Natural Gas Technology Assessment, Pub No. DOE/NETL- 2012/1539 (NETL, 2012) *available at* https://www.netl.doe.gov/File%20Library/Research/Energy%20Analysis/Life%20Cycle%20Analysis/LCA-2012-1539.pdf; U.S. Department of Energy National Energy Technology Laboratory, Life Cycle Greenhouse Gas Inventory of Natural Gas Extraction, Delivery and Electricity Production, Pub No. DOE/NETL-2011/1522 (NETL, 2011) *available at* http://www.fossil.energy.gov/programs/gasregulation/authorizations/2013_applications/sierra_club_13-69_venture/exhibits_44_45.pdf; U.S. Department of Energy National Energy Technology Laboratory, Life Cycle Analysis: Natural Gas Combined Cycle (NGCC) Power Plant, Pub No DOE/NETL-403-110509 (Sep 10, 2012) (NETL, 2010) *available at* https://www.netl.doe.gov/energy-analyses/temp/FY13_LifeCycleAnalysisNaturalGasCombinedCycle(NGCC)PowerPlantFinal_060113.pdf.

[35] U.S. Bureau of Land Management, Final Supplemental Environmental Impact Statement for the Leasing and Underground Mining of the Greens Hollow Federal Coal Leas Tract, UTU-84102, 287 (Feb 2015) (BLM expressly acknowledged that "the burning of the coal is an indirect impact that is a reasonable progression of the mining activity" and quantified emissions from combustion without any disclaimer about other sources of coal. *Id* at 286. In that same EIS, BLM also acknowledged that truck traffic to haul coal would be extended as a result of the proposed lease approval, and this would generate additional emissions.) *See also*, U.S. Forest Service, Record of Decision and Final Environmental Impact Statement, Oil and Gas Leasing Analysis, Fishlake National Forest, 169 (Aug 2013) (Table 3.12-7: shows GHG emissions from transportation, offsite refining and end use; and total direct and indirect emissions. *See also id.*, Appendix E/SIR-2 (more detailed calculations of direct and indirect emissions.)) U.S. Army Corps of Engineers, Final Environmental Impact Statement: Alaska Stand Alone Gas Pipeline, Volume 2 Sec. 5.20-70–71 (Oct. 2012) The Corps, in a 2012 EIS for an intrastate natural gas pipeline in Alaska, estimated downstream emissions from combustion of the natural gas that would be transported, and also discussed the potential for natural gas to displace other, dirtier fuel sources such as coal and oil.) U.S. Department of State, Final Supplemental Environmental Impact Statement for the Keystone XL Project, § 4.14.3, Appendix U (Jan. 2014)(The Department of State, as lead agency on the Keystone XL Pipeline Review conducted a relatively comprehensive life-cycle greenhouse gas analysis for the proposed pipeline, alternatives, and baseline scenarios that could occur if the pipeline was not constructed.) U.S. Environmental Protection Agency Region X, Letter from Dennis McLerran, Regional Administrator, to Randel Perry, U.S. Army Corps of Engineers Seattle District, re Gateway Pacific Projects (Jan 22, 2013) *available* at http://www.eisgatewaypacificwa.gov/sites/default/files/content/files/EPA_Reg10_McLerran.pdf#overlay-context=resources/project-library. (EPA submitted comments on the scope of impacts that should be evaluated in the coal terminal EIS that the Corps is preparing, in which it urged the Corps to conduct a lifecycle emissions analysis of GHG emissions from the coal that would be transported via the terminal.)

of projected GHG emissions and take into account available data and GHG quantification tools that are suitable for and commensurate with the proposed agency action").[36]

It is reasonably foreseeable, as opposed to speculative, that this lease sale will induce oil and natural gas production, transmission and ultimate end-user climate change impacts. The very purpose of oil and gas leasing is the production, and subsequent combustion, of hydrocarbon fossil fuels. The effects of this induced production necessitate review in an EIS. *See, e.g., N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1081-82 (9th Cir. 2011) (finding that NEPA review must consider induced coal production at mines, which was a reasonably foreseeable effect of a project to expand a railway line that would carry coal, especially where company proposing the railway line anticipated induced coal production in justifying its proposal); *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549-50 (8th Cir. 2003) (environmental effects of increased coal consumption due to construction of a new rail line to reach coal mines was reasonably foreseeable and required evaluation under NEPA). The development of an area for lease and subsequent oil and gas production would certainly result in combustion of the extracted product. As courts have held in similar contexts, combustion emissions resulting from opening up a new area to development are "reasonably foreseeable," and therefore a "proximate cause" of the leasing. See *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549 (8th Cir. 2003) (holding that agency violated NEPA when it failed to disclose and analyze the future coal combustion impacts associated with the agency's approval of a railroad line that allowed access to coal deposits); *High Country Conserv'n Advocates v. United States Forest Serv.*, 52 F. Supp. 3d 1174, 1197 (D. Colo. 2014) (same with respect to GHG emissions resulting from approval of coal mining exploration project); *cf. S. Fork Band Council of W. Shoshone v. United States Dep't of the Interior*, 588 F.3d 718, 725 (in reviewing authorization of gold mining project, "[t]he air quality impacts associated with transport and off-site processing of the five million tons of refractory ore are prime examples of indirect effects that NEPA requires be considered.").

In both *Mid States Coalition* and *High Country*, the courts rejected the government's rationale that increased emissions from combustion of coal was not reasonably foreseeable because the same amount of coal would be burned without opening up the areas at issue to new coal mining. Both courts found this argument "illogical at best" and noted that "increased availability of inexpensive coal will at the very least make coal a more attractive option to future entrants into the utilities market when compared with other potential fuel sources, such as nuclear power, solar power, or natural gas." See *High Country*, 52 F. Supp. 3d at 1197 (quoting *Mid States Coalition*, 345 F.3d at 549). On similar grounds, the development of new wells over

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[36] *High Country Conservation Advocates v. United States Forest Serv.*, 52 F. Supp. 3d 1174 (D. Colo. 2014) (Court held that the agencies' failure to quantify the effect of greenhouse gas (GHG) emissions from the mining lease modifications was arbitrary in violation of NEPA because the social cost of carbon protocol tool existed for such analysis under 40 C.F.R. § 1502.23 but the agencies did not provide reasons in the final EIS for not using the tool; and that the agencies' decision to forgo calculating the foreseeable GHG emissions was arbitrary in light of their ability to perform such calculations and their decision to include a detailed economic analysis of the benefits.) See also, *Dine Citizens Against Ruining Our Env't v. United States Office of Surface Mining Reclamation & Enf't*, 82 F. Supp. 3d 1201, 1213-1218 (D. Colo. 2015) (Court held that the agency failed to adequately consider the reasonably foreseeable combustion-related downstream effects of the proposed action. Also held that that combustion emissions associated with a mine that fed a single power plant were reasonably foreseeable because the agency knew where the coal would be consumed).

the proposed areas for lease will increase the supply of [oil and natural gas]. At some point this additional supply will impact the demand for [oil and gas] relative to other fuel sources, and [these minerals] that otherwise would have been left in the ground will be burned. This reasonably foreseeable effect must be analyzed, even if the precise extent of the effect is less certain." *Id. See also WildEarth Guardians v. United States Office of Surface Mining, Reclamation & Enf't*, 104 F. Supp. 3d 1208, 1229-30 (D. Colo. 2015) (coal combustion was indirect effect of agency's approval of mining plan modifications that "increased the area of federal land on which mining has occurred" and "led to an increase in the amount of federal coal available for combustion.").[37]

To the extent that BLM would respond similarly to these issues as it did to our protest of the Colorado May 2016 lease sale, BLM's response lacks merit. First, BLM's May 2016 response suggests that quantifying greenhouse gas emissions at this stage is not possible because of "uncertainties in the amount and type of future development on the lease." But NEPA requires "reasonable forecasting," which includes the consideration of "reasonably foreseeable future actions…even if they are not specific proposals." *N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1079 (9th Cir. 2011) (citation omitted). Full development of the areas for lease is entirely foreseeable in light of the Reasonably Foreseeable Development Scenario for the Tres Rios Field Office, including the identification of areas of "high potential" oil and gas development, and existing development patterns.[38] That BLM cannot accurately calculate the total emissions expected from full development is not a rational basis for cutting off its analysis. "Because speculation is . . . implicit in NEPA," agencies may not "shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as crystal ball inquiry." *Id.* Indeed, the EA for a recent lease sale in Utah undercuts BLM's assertion here that GHGs cannot be quantified at the leasing stage.[39] *See High Country Conservation Advocates v.*

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[37] *See also*, Council on Environmental Quality, Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews, 81 Fed. Reg. 51,866 at 14 (Aug. 5, 2016) (For example, NEPA reviews for proposed resource extraction and development projects typically include the reasonably foreseeable effects of various phases in the process, such as clearing land for the project, building access roads, extraction, transport, refining, processing, using the resource, disassembly, disposal, and reclamation. Depending on the relationship between any of the phases, as well as the authority under which they may be carried out, agencies should use the analytical scope that best informs their decision making.)

[38] *See* BLM, Tres Rios RMP-FEIS, Reasonably Foreseeable Development Scenario (2006), available at http://www.blm.gov/style/medialib/blm/co/field_offices/san_juan_public_lands/land_use_planning/approved_lrmp.Par.74032.File.dat/SAN_JUAN_RFD_Dec2006.pdf; RFD Appendix F, available at http://www.blm.gov/style/medialib/blm/co/field_offices/san_juan_public_lands/land_use_planning/approved_lrmp.Par.63391.File.dat/SAN_JUAN_RFD_Appendix%20F.xlsx; BLM, Addendum to the Oil and Gas Potential and Reasonably Foreseeable Development Scenario in the San Juan National Forest and BLM Public Lands, 31 (2009), available at http://www.blm.gov/style/medialib/blm/co/field_offices/san_juan_public_lands/land_use_planning/proposed_lrmp.Par.89898.File.dat/ReasonableForeseeableDevelopmentScenario.pdf (map identifying high potential areas); https://drive.google.com/drive/folders/0B1itEUsz7CwZTnhkNTlVUGpENEE (maps showing areas of existing oil and gas development and leasing, submitted with RMW Comment).

[39] U.S. Bureau of Land Management, Environmental Assessment for West Desert District, Fillmore Field Office, August 2015 Oil and Gas Lease Sale, pp. 57-58 (2015), available at https://eplanning.blm.gov/epl-front-office/projects/nepa/55342/72905/80038/Fillmore_FO_Final_EA_4-19.pdf; U.S. Bureau of Land Management, Greenhouse Gases Estimate (West Desert District Nov 2015 Lease Sale), http://www.blm.gov/style/medialib/blm/ut/natural_resources/airQuality.Par.38

United States Forest Serv., 52 F. Supp. 3d 1174, 1196 (D. Colo. 2014) (decision to forgo calculating mine's reasonably foreseeable GHG emissions was arbitrary "in light of the agencies' apparent ability to perform such calculations").

Further, such faulty logic circumvents consideration of the cumulative emissions that would result from developing the multiple lease parcels at issue here. Based on this flawed reasoning, the only time the cumulative impacts of oil and gas development projects could be analyzed is when the last oil and gas well in a given area is proposed—a result that contravenes NEPA's intent, to study and analyze potential significant and cumulative environmental effects of a proposed action before they occur.

It is simply not credible to assert in 2016 that BLM has no way of estimating a range of possible production levels for leases within established industry plays and currently producing geological formations. Although there are certainly geological, technological, and economic uncertainties that could affect the production from the leases in question, these uncertainties do not relieve BLM of the obligation to analyze and disclose, at the very least, a range of possible production scenarios and their resulting emissions. In its recent NEPA guidance, CEQ directs agencies, at a minimum, to "use projected GHG emissions as a proxy for assessing potential climate change effects when preparing a NEPA analysis for a proposed agency action." 81 Fed. Reg. 51,866, 51,866 (Aug. 5, 2016). BLM has failed to meet even this low bar in its climate analysis.

Even if it were true that potential emissions cannot reasonably be estimated, it is possible for BLM to identify significant sources of greenhouse gas emissions, which would enable the identification of specific measures to reduce emissions and an understanding of the extent to which certain emissions are avoidable. The extreme urgency of the climate crisis requires BLM to pursue all means available to limit the climate change effects of its actions. Any emissions source, no matter how small, is potentially significant, such that BLM should fully explore mitigation and avoidance options for all sources.

In addition, by delaying quantification or consideration of greenhouse gas emissions until after a lease is issued, BLM may prejudice the consideration of alternatives or leasing stipulations that would avoid or reduce greenhouse gas emissions to an extent not otherwise available after leasing. BLM has long (but incorrectly) maintained that leasing stipulations can only be imposed with the issuance of the lease. Thereafter, purportedly, its authority to condition drilling is limited to "reasonable measures" or "conditions of approval" that may not be "[in]consistent with lease rights granted." 43 C.F.R. § 3101.1-2. Cost-prohibitive measures could therefore potentially be barred. Further, measures to "minimize" impacts may be imposed, but those may not necessarily avoid impacts altogether. *Id.* Waiting until the drilling stage could also be too little too late, as various other actions may occur between leasing and drilling, such as the execution of unit agreements, or construction of roads or pipelines, all of which may narrow mitigation options available at the drilling stage. *See William P. Maycock et al.*, 177 I.B.L.A. 1, 20-21 (Dec. Int. 2008) (holding that unit agreements limit drilling-stage alternatives).

Nor does tiering to the RMP-FEIS excuse BLM from conducting this analysis at the leasing stage. The RMP-FEIS's disclosure of GHG emissions within the planning area is

woefully incomplete. It makes no attempt to fully identify the various sources of greenhouse gas pollution that could result from new leasing, much less quantify all potential emissions. As noted above, the RMP-FEIS's analysis is narrowly constricted to engine, heater, and separator emissions from production activities. But as our scoping comment details, numerous other sources, including pipelines, are a large contributor of GHGs.[40]

Contrary to BLM's claim in its May 2016 response, we can find no estimate of GHG emissions for a typical well in the Tres Rio planning area in the RMP-FEIS. The suggestion that the public must sift and comb through the RMP-FEIS to cobble together this estimate, as BLM staff has suggested is necessary here, is plainly unreasonable under NEPA. Information must be presented in such a manner that it is readily locatable and understandable. *See Or. Nat. Desert Ass'n v. BLM*, 531 F.3d 1114, 1142 n.24 (9th Cir. 2008) ("An EIS, to fulfill its role as an 'action-forcing device[]'… conducive to public analysis and agency reflection, must 'be written in plain language . . . so that decisionmakers and the public can readily understand [it].'" [alterations and quotation marks in original]);[41] *see also Earth Island Inst. v. U.S. Forest Serv.*, 442 F.3d, 1147, 1160 (9th Cir. 2006) (characterizing 40 C.F.R. § 1502.8 as requiring that NEPA documents be organized so as to be "readily understandable"). The only place where greenhouse gas emissions are expressly quantified in the RMP-FEIS is on pp. 364-65 and p. 372, which present total emissions from all future development and do not provide a typical per-well estimate.

In short, BLM's failure to quantify reasonably foreseeable GHG emissions that could result from new leasing within the Tres Rios planning area—including emissions from construction, operating fossil-fuel powered equipment during production, reclamation, transportation, processing and refining, and combustion of the extracted product—is unlawful and unsupported by evidence or reasoned analysis.

IV. Reliance on the RMP-EIS is inappropriate, because it fails to consider other significant environmental impacts

The RMP-EIS is also inadequate in various other respects. Not only does it fail to analyze impacts at the parcel-specific level, but it fails to acknowledge potentially significant impacts that could result from the application of weak and inadequate leasing stipulations to the parcels at issue here.

First, 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."[42] NSOs to protect streams and other water bodies are inadequate, in

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[40] *See* CBD Scoping Comment at 28-31. In addition, a recent study of fugitive emissions in the Four Corners region should be considered in BLM's evaluation of greenhouse gas emissions. The study identified more than 250 sources of methane plumes from fossil fuel harvesting, processing, and distributing infrastructures in this region, including leakages of up to 5,000 kilograms per hour. *See* Frankenberg, C., et al., Airborne Methane Remote Measurements Reveal Heavy-Tail Flux Distribution in Four Corners Region (2016), available at http://www.eenews.net/assets/2016/08/16/document_ew_01.pdf.

[41] "Clarity is at a premium in NEPA because the statute…is a democratic decisionmaking tool, designed to 'foster excellent action' by 'help[ing] public officials make decisions that are based on [an] understanding of environmental consequences.' 40 C.F.R. § 1500.1(c)." *Id.*

[42] U.S. Bureau of Land Management, Grand Junction Field Office, Resource Management Plan Final Environmental

that they require setbacks of only 325 feet for streams and other perennial water bodies and 50 feet for ephemeral streams. RMP-FEIS at 247, H-12. For lakes and reservoirs, a setback of only 0.25 mile (1320 feet) is required. RMP-FEIS at 247. These setbacks are also inadequate to protect endangered fish found downstream of the parcels in the tributaries or mainstems of the Dolores and San Juan Rivers, as well as Colorado River cutthroat trout habitat found around parcels 7787 and 7789.[43]

In addition, stipulations to protect water resources and other sensitive resources are subject to exceptions, waivers, and modifications without any specific criteria for how these exceptions would be applied. *See, e.g.,* DNA, Attachment D, Exhibit 1.3.1 ("Exceptions, modifications, and waivers would be considered for BLM leases."). Thus, there is no reason to believe that BLM would objectively apply protective measures to areas where they are needed, and no assurance that impacts to sensitive plant species would be mitigated. The same goes for numerous other stipulations attached to the lease parcels. *See generally* DNA, 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.

Conclusion

Thank you for your consideration of these comments. We look forward to reviewing a legally adequate EIS for this proposed oil and gas leasing action.

Sincerely,

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[43] *See* RMW ABI Screen for February 2017 lease sale, available at https://drive.google.com/file/d/0B1itEUsz7CwZMUZ6bXdsM00xZXc/view (submitted with RMW Comment).

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EXHIBIT B

September 8, 2016

Delivered via email (rjoyner@blm.gov) and U.S. mail to:

BLM Tres Rios Field Office
Attn: February 2017 Lease Sale
29211 Highway 184,
Dolores, Colorado 81323

To Whom It May Concern:

Please accept and fully consider these comments on the nominated parcels for BLM Colorado's February 2017 oil and gas lease sale, submitted on behalf of Rocky Mountain Wild, San Juan Citizen's Alliance, Sheep Mountain Alliance, Conservation Colorado, The Wilderness Society, and Defenders of Wildlife. Our organizations are deeply invested in sound stewardship of public lands and wildlife in the Tres Rios Field Office, and we appreciate this opportunity to comment on oil and gas parcels proposed for leasing.

I. Summary of parcels that should be deferred from the February 2017 oil and gas lease sale.

We request that BLM defer the parcels below from the February 2017 oil and gas lease sale for the reasons outlined in these comments. Maps of the overlap between the oil and gas lease parcels and values described below are provided in Attachment 1. We will provide relevant GIS shapefiles to BLM upon request.[1] A detailed summary of the acreage of overlap with the relevant values is also provided in Attachment 2.

A. Parcels in and adjacent to occupied critical Gunnison sage-grouse habitat

Oil and gas leasing and subsequent development on parcels 7795, 7797, 7798, 7799, 7801, 7802, and 7805 will have significant negative impacts on the San Miguel Basin population of Gunnison sage-grouse and these parcels should be deferred from the lease sale. Parcel 7795 includes 4 acres of occupied critical Gunnison sage-grouse habitat[2], and roughly 86 acres within 4 miles of a Gunnison sage-grouse lek. Parcels 7795, 7797 and 7798 are directly adjacent to occupied critical Gunnison sage-grouse habitat. All seven of the parcels listed above are in a location where some potential access roads bisect 0.6 mile buffers around leks, and where all potential access roads bisect occupied critical habitat and areas within 1.9 miles of leks.

B. Parcels in potential Areas of Critical Environmental Concern

Parcels 7378, 7787, 7795 and 7797 should be deferred from the lease sale. These parcels fall within potential Areas of Critical Environmental Concern (ACECs) being considered for designation through the ongoing Tres Rios ACEC RMP Amendment and associated Environmental Assessment (DOI-BLM-CO-S010-2016-0018-EA).[3] Leasing these parcels will have significant negative impacts on relevant and

[1] A limited number of the relevant GIS shapefiles are subject to user agreements that prohibit data distribution.
[2] https://www.fws.gov/mountain-prairie/species/birds/gunnisonsagegrouse/GuSGCriticalHabitat_11202014.pdf
[3] http://www.blm.gov/co/st/en/BLM_Information/nepa/TRFO_NEPA/acecs.print.html

important values within these potential ACECs and may preclude alternatives being considered in the Tres Rios ACEC RMP Amendment, including ACEC designation and special management needed to protect relevant and important values within ACECs.

C. Parcels in the designated Gypsum Valley Area of Critical Environmental Concern and habitat for the globally imperiled Gypsum Valley cateye

Parcel 7792 should be deferred from the lease sale. This parcel is in the designated Gypsum Valley Area of Critical Environmental Concern and contains known occurrences of the globally imperiled Gypsum Valley cateye.[4] Leasing this parcel will have significant negative impacts on this designated ACEC and on the globally critically imperiled Gypsum Valley cateye.

D. Parcels in the Dry Creek Basin and Jim Olterman/Lone Cone State Wildlife Areas

The BLM should defer parcels within State Wildlife Areas. Parcel 7790 overlaps with the Jim Olterman/Lone Cone State Wildlife Area. Parcels 7795, 7797, 7801, 7802, 7805 overlap with the Dry Creek Basin State Wildlife Area. Leasing these parcels will result in significant negative impacts on these State Wildlife Areas and the wildlife and other resources these areas were designated to protect.

II. BLM should complete Environmental Assessments for all oil and gas lease sales in compliance with IM 2010-117, with specific exceptions only for areas with comprehensive Master Leasing Plans in place.

BLM reformed its onshore oil and gas leasing program in 2010 with the intention of ensuring leasing of federal mineral resources is conducted in a more environmentally responsible and transparent manner. BLM's new process for oil and gas leasing is set forth in Instruction Memorandum 2010-117.[5] That process has three primary goals: (1) "create more certainty and predictability" in the leasing process; (2) "protect multiple-use values"; and (3) "provide for consideration of natural and cultural resources as well as meaningful public involvement." To achieve those goals, the reforms instituted a new lease parcel review and issuance process that provides for increased public participation and more thorough site-specific analysis.

A critical component of the new leasing process is that BLM typically prepares Environmental Assessments (EAs) to analyze potential parcels for lease:

> Most parcels that the field office determines should be available for lease will require site-specific NEPA analysis. This analysis will typically take the form of an EA, which would be tiered, as appropriate, to the RMP/EIS or a MLP/EA or EIS, if one has been completed for any of the parcels.

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[4] Colorado Natural Heritage Program, Colorado State University. 2014 (November 25th). Colorado Natural Heritage Program Element Occurrence Polygons for rare and imperiled species, subspecies, and unique natural communities in Colorado (SENSITIVE DATA!). The Colorado Natural Heritage Program, Colorado State University, Ft. Collins, CO, USA.

[5] http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2010/IM_2010-117.html

IM 2010-117 at III(E). The guidance also requires BLM to provide a 30-day public review and comment period for the EA and unsigned Finding of No Significant Impact (FONSI) before forwarding the leasing recommendation to the State Director. *Ibid.* BLM notes that the "process outlined in this IM—which includes site-specific parcel analysis and increased public participation—will help identify, address, and resolve most issues before the lease sale." *Id* at III(H), emphasis added.

Indeed, the leasing reforms have proven successful, reducing protests on lease parcels. Until last year, when certain members of the public began protesting every oil and gas lease offered by the BLM, due to broad, climate-based concerns, protests were steadily declining – from 43% of leases protested in 2009 to only 18% in 2014. Inexplicably, after establishing a track record of more successful leasing under the reforms, BLM Colorado is now preparing Determinations of NEPA Adequacy (DNAs) for some parcels rather than EAs.

It appears BLM Colorado is preparing DNAs rather than EAs in field offices with recently revised resource management plans (RMPs).[6] The BLM has prepared a DNA for the Tres Rios Field Office February 2017 Oil and Gas lease sale, which includes the parcels at issue here.[7] The Tres Rios Field Office completed an RMP revision in 2015. Preparing DNAs rather than EAs in field offices with recently revised RMPs is an inappropriate interpretation of IM 2010-117, and does not comply with the intent or spirit of the agency's leasing reforms. RMPs do not provide the site-specific analysis envisioned by the leasing reforms, even if they have been recently revised. RMPs make broad brush decisions, and the intention of the reforms is to take a closer look at specific parcels and resources prior to leasing them. As BLM Colorado's FAQ on oil and gas leasing states: "An EA augments the decisions made in an RMP with current on-the-ground information."[8] Site-specific information and analysis is critically important to reviewing lease parcels regardless of the age of the governing RMP.[9] We note that BLM Wyoming is still preparing EAs for all of its lease sales, even in areas with recently-completed RMPs.

This argument is reinforced by the agency's own comparison of oil and gas decisions made in RMPs to those made in Master Leasing Plans (MLPs). According to BLM, MLPs are a "stepped-down leasing analysis" that evaluates "in greater detail than the RMP the impacts of leasing and likely development" and identifies "key issues such as protection of air quality, watersheds, wilderness, wildlife, and nearby land uses" and "leasing and higher-level development mitigation measures to protect the environment.[10] These types of analyses are not incorporated into RMPs and must be considered at the leasing stage, which is best accomplished through preparation of an EA.

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[6] For the November 2016 lease sale, BLM prepared DNAs for the Tres Rios, Grand Junction and Colorado River Valley Field Offices, which all completed RMP revisions in 2015. BLM also completed a DNA for the Tres Rios Field Office for the May 2016 oil and gas lease sale.

[7] http://www.blm.gov/style/medialib/blm/co/programs/oil_and_gas/Lease_Sale/2017/february.Par.58526.File.dat/TRFO-DNA-Comment-Period.pdf

[8] http://www.blm.gov/co/st/en/BLM_Programs/oilandgas/Frequently_Asked_Questions_Leasing.html

[9] http://www.blm.gov/style/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/leasing_reform.Par.54947.File.dat/Leasing_Reform_05-11-2011.pdf (emphases in original).

[10] http://www.blm.gov/style/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/leasing_reform.Par.54947.File.dat/Leasing_Reform_05-11-2011.pdf (emphases in original).

Where BLM has a robust MLP in place that was developed and is being implemented in compliance with IM 2010-117 and Chapter V of BLM's Handbook on Planning for Fluid Mineral Resources, a DNA may be appropriate for evaluating parcels for oil and gas lease sales rather than an EA. IM 2010-117 states that a DNA may be prepared for a proposed leasing action if the action is "adequately analyzed in an existing NEPA document, such as that prepared during the MLP process, and is in conformance with the approved RMP." *Id* at III(E), emphasis added. This provision clearly states BLM's intention that a DNA could be used where an MLP has been completed, but not simply where the action is in conformance with the approved RMP. BLM Colorado should apply the adoption of an MLP as a threshold for allowing proposed leasing actions to rely on a DNA rather than an EA. The parcels at issue here are not within an area where an MLP has been completed, and the proposed leasing action requires an EA.

BLM must complete EAs for oil and gas lease sales, in compliance with IM 2010-117 which directs that most parcels that the field office determines should be available for lease will require site-specific NEPA analysis – typically an EA. BLM Colorado should set as a threshold for preparing a DNA rather than an EA that a robust MLP is in place that was developed and is being implemented in compliance with IM 2010-117 and Chapter V of BLM's Handbook on Planning for Fluid Mineral Resources. In areas where a robust MLP is not in place, BLM should complete EAs for all oil and gas lease sales. There is no MLP in place for the parcels at issue here, and BLM should complete an EA prior to leasing these parcels. The parcels should be deferred until an EA has been completed.

III. An EIS may be required prior to leasing the parcels at issue here.

Leasing and subsequent development of the parcels at issue here may result in significant negative impacts and an Environmental Impact Statement (EIS) may be needed to meet the legal requirements of the National Environmental Policy Act (see discussion of potential impacts in section IV below).

Under NEPA, each federal agency must circulate for public review an environmental impact statement ("EIS") for all "major Federal actions significantly affecting the quality of the human environment."[11] Agencies must conduct this analysis before there is "an irretrievable commitment of resources."[12] Federal agencies may first prepare an EA that includes "sufficient evidence and analysis" to determine whether impacts are significant enough to warrant an EIS.[13] If an agency determines that an EIS is unnecessary, it must issue a "finding of no significant impact" (FONSI) that provides a convincing statement of reasons why the action "will not have a significant effect on the human environment."[14]

NEPA regulations dictate that impacts are assessed based on their "context" and "intensity."[15] The "intensity" factors include: impacts to threatened species, public health and safety, and areas with

[11] 42 U.S.C. § 4332(2)(C); 40 C.F.R. § 1501.4
[12] New Mexico, 565 F.3d at 718
[13] 40 C.F.R. §§ 1508.3, 1501.4(c), (e), 1508.9(a)
[14] Id. §§ 1508.9, 1508.13; Middle Rio Grande Conservancy Dist. v. Norton, 294 F.3d 1220, 1224 (10th Cir. 2002) (EIS required when possibility of significant impacts exists); Ocean Advocates v. Army Corps of Eng'rs, 402 F.3d 846, 864 (9th Cir. 2005) (EIS required if there are "substantial questions" that project "*may* cause significant degradation") (emphasis in original)
[15] 40 C.F.R.§ 1508.27(a)-(b)

"unique characteristics" like Refuges, beneficial effects, controversial actions and their impacts, actions with uncertain or unknown risks, and actions that threaten violations of Federal or State law.[16] Agencies must analyze and disclose all "direct," "indirect," and "cumulative" impacts of its actions as well as impacts of "connected actions."[17]

The proposed leasing will have significant negative impacts on threatened (Gunnison sage-grouse) and sensitive (rare plants) species, and areas with "unique" characteristics, including designated and proposed Areas of Critical Environmental Concern and State Wildlife Areas. In addition, leasing of the parcels is highly controversial and may impact the outcome of two ongoing RMP Amendment processes in that are subject to a significant level of public interest and controversy (see section V below).

Leasing the parcels at issue here may constitute a major Federal action significantly affecting the quality of the human environment, and an EIS may be required (see discussion of potential impacts in section IV below).

IV. BLM's Determination of NEPA Adequacy prepared for the February 2017 lease sale is inadequate to analyze and provide for public review of the proposed lease sale parcels.

A. The BLM's Determination of NEPA Adequacy is inadequate to analyze the impacts of leasing on Gunnison sage-grouse.

There are legitimate questions as to the reasonably foreseeable impacts of leasing parcels 7795, 7797, 7798, 7799, 7801, 7802, 7805 on Gunnison sage-grouse, which is listed as a threatened species under the Endangered Species Act. The Determination of NEPA Adequacy (DNA) for these parcels is inadequate, and further consideration is needed before a decision is made to lease these parcels. These parcels should be deferred to allow for additional review of appropriate protections for Gunnison sage-grouse from oil and gas development, and should not be leased without an Environmental Impact Statement.

a. Stipulations have not been attached to these lease parcels in conformance with the BLM Tres Rios Field Office, San Juan National Forest Land and Resource Management Plan Final Environmental Impact Statement.

The BLM's DNA for the lease parcels in the February 2017 sale states that, "All lands considered in this action are open to leasing under the RMP/FEIS, and stipulations have been attached in conformance with the RMP/FEIS." (DNA pp. 4-5).[18] However, stipulations have not been attached to these parcels in conformance with the BLM Tres Rios Field Office, San Juan National Forest Land and Resource Management Plan Final Environmental Impact Statement (Tres Rios RMP/FEIS) (September 2013).[19]

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[16] 40 C.F.R. § 1508.27(b)
[17] Id. § 1508.7, 1808.8(a) & (b), 1508.25(a) & (c).
[18] Id. at 7
[19] http://www.blm.gov/co/st/en/fo/sjplc/land_use_planning.html

Appendix H of the Tres Rios RMP/FEIS (pages H20-H-22)[20] describes several stipulations that apply to leases that may impact Gunnison sage-grouse, and that should be applied to the parcels at issue here to protect Gunnison sage-grouse. Contrary to BLM's assertion in the DNA, stipulations have not been attached to these parcels in conformance with the Tres Rios RMP/EIS, and the DNA is therefore inadequate.

Parcel 7795 overlaps with 4 acres of occupied critical Gunnison sage-grouse habitat.[21] However, this parcel does not include stipulations that should be applied to occupied habitat in order for leasing to be consistent with the Tres Rios RMP/EIS, and in order to avoid significant negative impacts to Gunnison sage-grouse. The portion of the parcel within occupied Gunnison sage-grouse habitat should be subject to the No Surface Occupancy stipulation in mapped occupied Gunnison sage-grouse habitat, for the purpose of protecting priority habitat such as leks and nesting habitat for Gunnison sage-grouse (Tres Rios RMP/FEIS, Appendix H, pg. H-21, 3.4.2).[22,23] In addition, the parcel should include the Gunnison sage-grouse Lease Notice, notifying the operator that the lease may contain Gunnison sage-grouse habitat (Tres Rios RMP/FEIS, Appendix H, pg. H-21-H-22, 3.4.1).[24]

Parcels 7795, 7797, 7798, 7799, 7801, 7802, 7805 are in a location where some potential access roads bisect 0.6 mile buffers around leks, and where all potential access roads bisect occupied critical habitat and areas within 1.9 miles of leks (Attachment 3). All of these parcels should be subject to the Controlled Surface Use stipulation that limits noise levels at the perimeter of a lek between 6 p.m. to 9 a.m. during active lek season, and limits vehicular traffic from 6 p.m. to 9 a.m. within 1.9 miles of a lek from March 15th-May 15th annually, for the purpose of protecting priority habitat for Gunnison sage-grouse in order to prevent abandonment of display grounds and to maintain reproductive success, recruitment, and survival (Tres Rios RMP/FEIS, Appendix H, pg. H-21-H-22, 3.4.4).[25]

Leasing these parcels without the above stipulations does not conform to the Tres Rios RMP/FEIS. Further, leasing the parcels without the above stipulations would result in significant negative impacts not analyzed in the Tres Rios RMP/FEIS. Finally, the BLM is developing improved oil and gas lease stipulations to protect Gunnison sage-grouse (see further discussion in Sections IV, A, b and V, B below), and the applicable lease stipulations in the Tres Rios RMP/FEIS (described above), are insufficient and would not mitigate impacts on Gunnison sage-grouse to insignificance even if BLM applied them to the lease parcels in conformance with the Tres Rios RMP/FEIS. Therefore, the DNA for these parcels is inadequate, and an EIS is required.

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[20] http://www.blm.gov/style/medialib/blm/co/field_offices/san_juan_public_lands/land_use_planning/approved_lrmp.Par.5798.File.dat/App_H%20Oil%20and%20Gas%20Leasing%20Stipulations.pdf

[21] Id. at 2

[22] I.d. at 20

[23] The RMP appears to give BLM discretion regarding application of the No Surface Occupancy stipulation, stating that No Surface Occupancy is "allowed" and "may be applied" in mapped occupied habitat for Gunnison sage-grouse; and that exception, modifications and waivers would be considered (Tres Rios RMP/FEIS, Appendix H, pg. H-21, 3.4.2). However, leasing without this stipulation will result in significant negative impacts to Gunnison sage-grouse and thus require an Environmental Impact Statement.

[24] Id at 20

[25] Id at 20

b. The analysis in the Tres Rios RMP/FEIS is not adequate in light of new information and circumstances.

The analysis in the Tres Rios RMP/FEIS is not adequate in light of new information and circumstances that would substantially change the analysis of the impacts. In November of 2014, The U.S. Fish and Wildlife Service listed the Gunnison sage-grouse as a threatened species under the Endangered Species Act, and designated critical habitat. Subsequently, the Bureau of Land Management initiated a process to amend all of the Resource Management Plans within the range of the Gunnison sage-grouse, including the Tres Rios RMP/FEIS, through a Gunnison Sage-Grouse Rangewide Plan Amendment. The BLM recently issued the draft Gunnison Sage-Grouse Rangewide Plan Amendment and Environmental Impact Statement (draft GRPA).[26] In the draft GRPA, BLM states: "The BLM manages approximately 40 percent of GUSG habitat across twelve counties in southwestern Colorado and southeastern Utah. The inadequacy of regulatory mechanisms in land use plans was identified as a major threat in the FWS listing decision. In response to the listing decision, the United States (U.S.) Department of the Interior, Bureau of Land Management (BLM) has prepared this Draft Resource Management Plan (RMP) Amendment to analyze the addition of GUSG conservation measures to their existing RMPs." (draft GRPA p. i)[27]

In describing the need for the GRPA, the BLM states, "ESA Section 7(a)(1) requires the BLM to use its authorities to further the purposes of the ESA by implementing programs for the conservation of federally listed species and the ecosystems upon which they depend. The BLM conducted plan evaluations in accordance with its planning regulations, which require that RMPs "shall be revised as necessary based on ..., new data, new or revised policy ..." (43 CFR 1610.5-6). These evaluations concluded that a plan amendment is necessary to address the changed circumstances and new information resulting from the 2014 FWS listing of the GUSG as "threatened" under the Endangered Species Act." (draft GRPA pp. 1-3).[28]

Among a variety of other conservation measures for Gunnison sage-grouse, the draft GRPA is considering additional lease stipulations and other conservation measures to protect Gunnison sage-grouse from oil and gas development that may apply to the parcels at issue here, and that were not considered in the Tres Rios RMP/FEIS (see further discussion under Section IV,B below).

Further, the GRPA is considering not only the changed circumstances and new information resulting from the 2014 listing of the GUSG as "threatened" under the Endangered Species Act, it is also considering significant new information relevant to: 1) determining conservation measures necessary to conserve Gunnison sage-grouse, and 2) analyzing reasonably foreseeable impacts of oil and gas leasing on Gunnison sage-grouse. The draft GRPA considers more than 75 scientific papers

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[26] https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=39681&dctmId=0b0003e88073b43a

[27] Id. at 26

[28] Id. at 26

relevant to determining conservation measures necessary to conserve Gunnison sage-grouse, including at least 15 scientific papers relevant to determining the reasonably foreseeable impacts of oil and gas development, and to developing lease stipulations necessary to avoid, minimize and mitigate such impacts (GRPA Chapter 8 pp. 8-1 through 8-29)[29], which were not considered in the Tres Rios RMP/FEIS (Tres Rios RMP/FEIS, Chapter 5, pp. 2-191 through 2-197).[30,31]

In light of the significant new information and circumstances outlined above, the analysis in the Tres Rios RMP/FEIS is not adequate, and the BLM's DNA is inadequate to analyze the impacts of leasing on Gunnison sage-grouse. An EIS is required to analyze the impacts of leasing on Gunnison sage-grouse.

c. Leasing of these parcels will have significant negative impacts on Gunnison sage-grouse that have not been analyzed in the Tres Rios RMP/FEIS and an EIS is necessary.

Leasing of parcels 7795, 7797, 7798, 7799, 7801, 7802, and 7805 will have significant negative impacts on Gunnison sage-grouse that have not been analyzed in the Tres Rios RMP/FEIS and must be deferred pending adequate NEPA analysis. Leasing and development on the parcels is likely to have significant negative impacts that must be disclosed in an EIS.

i. The San Miguel Basin population is critically important to recovery of the species and at risk of extirpation.

The Gunnison sage-grouse occupies less than 10% of its historic range, with a total estimated population of fewer than 5,000 birds scattered across southwestern Colorado and Utah in seven populations.[32] In order to achieve recovery of the Gunnison sage-grouse, the U.S. Fish and Wildlife Service finds that it is essential to maintain AND increase the number of birds and the area of occupied habitat outside of the Gunnison Basin.[33]

Only the largest of the seven populations, in the Gunnison Basin, is relatively stable and of sufficient size to persist in the absence of threats.[34] The Gunnison Basin population contains more than 80% of all remaining individuals of the species.[35] All six of the remaining populations, including the San Miguel Basin population, which are referred to as 'the satellite populations', are so small and isolated that they are at extreme risk of extirpation even in the absence of further threats.[36] These small, isolated populations are at risk of extirpation due to demographic and environmental

[29] Id at 26
[30] Id. at 19
[31] Many of these scientific papers were available during the time period when the Tres Rios RMP/FEIS were being prepared, but were not considered adequately in the Tres Rios RMP/FEIS. Some of these scientific papers were published after the Tres Rios RMP/FEIS was finalized.
[32] https://www.fws.gov/mountain-prairie/species/birds/gunnisonsagegrouse/GUSGFinalListingRule_11202014.pdf
[33] Id. at 32
[34] Id. at 32
[35] Id at 32
[36] Id at 32

stochasticity (random demographic and environmental events).[37] In addition, the San Miguel Basin population has an effective population size (number of individuals that contribute genes to the next generation) that is below the level at which inbreeding depression has been observed to occur, and given that all of the other satellite populations are smaller than San Miguel Basin, they may also be subject to inbreeding depression.[38] Inbreeding depression further increases the risk of extirpation. In addition to being at risk due to small size and isolation, these populations also face a variety of threats that further exacerbate the risk of extirpation. For example, during four years form 2007-2010, Colorado Parks and Wildlife (CPW) research suggested that there was little to no recruitment of young into the San Miguel Basin population as a consequence of low chick survival due to predation. Recruitment improved slightly in subsequent years, but appeared to be low again in 2014. This illustrates the fact that this population is at risk of extirpation even in the absence of additional loss of habitat and other negative impacts that will result from additional energy development in and adjacent to occupied critical habitat.

Given that all of the satellite populations are at high risk of extirpation even in the absence of additional threats, it is essential to comprehensively address threats to all of the satellite populations in order to maximize the odds of success in the effort to achieve recovery through increasing the number of birds and area of occupied habitat outside of the Gunnison Basin.

Therefore, it is essential that BLM avoid authorizing any activities, including oil and gas leasing, which may have significant negative impacts on this extremely vulnerable and critically important San Miguel Basin Gunnison sage-grouse population, particularly without adequate analysis of reasonably foreseeable impacts. Leasing parcels 7795, 7797, 7798, 7799, 7801, 7802, 7805, will result in significant negative impacts on the San Miguel Basin Gunnison sage-grouse population. BLM must defer these parcels pending completion of an EIS.

ii. Oil and gas leasing of the proposed parcels is likely to have significant negative indirect and cumulative impacts on Gunnison sage-grouse

There is a substantial body of research on the impacts of oil and gas development on greater sage-grouse, which is relevant to determining the reasonably foreseeable impacts of oil and gas development on Gunnison sage-grouse. Greater sage-grouse are a closely related species, and impacts of oil and gas development on Gunnison sage-grouse are likely to be similar to impacts on greater sage-grouse, though negative impacts may be more pronounced for Gunnison sage-grouse due to their small population size and isolation, other factors limiting reproduction and survival, and the limited amount of remaining Gunnison sage-grouse habitat. We hereby incorporate by reference the BLM Report on National Greater Sage-Grouse Conservation Measures (NTT Report) [39], and all of the references cited in

[37] Id. at 32
[38] Stiver et al. 2008 in Id. at 32
[39] http://www.blm.gov/style/medialib/blm/co/programs/wildlife.Par.73607.File.dat/GrSG%20Tech%20Team%20Report.pdf

the NTT Report. In addition, we hereby incorporate by reference all of the references cited in the draft Gunnison Sage-Grouse RMP Amendment.[40] We also incorporate by reference the Colorado Parks and Wildlife Gunnison Sage-Grouse Rangewide Conservation Plan and all of the references cited in the plan.[41] The scientific research on the impacts of oil and gas development on sage-grouse cited in the above reports and plans indicates that oil and gas development can have significant negative impacts on sage-grouse populations. The primary risks to sage-grouse from energy development are: 1) direct disturbance, displacement or mortality of grouse, 2) direct loss of habitat or loss of effective habitat through fragmentation and reduced patch size and quality, and 3) cumulative landscape level impacts.[42]

Parcel 7795 includes 4 acres of occupied critical Gunnison sage-grouse habitat. Leasing and subsequent development of parcel 7795 may result in direct loss of occupied critical habitat, or loss of effective habitat through fragmentation and reduced patch size and quality.[43] Given the precarious status of the San Miguel Basin Population and the fact that recovery will require increasing the number of birds and area of occupied habitat, leasing any amount of occupied critical habitat is likely to have significant negative impacts on Gunnison sage-grouse.

Oil and gas leasing and subsequent development on parcels 7795, 7797, 7798, 7799, 7801, 7802, and 7805 are in a location where some potential access roads bisect 0.6 mile buffers around leks, and where all potential access roads bisect occupied critical habitat and areas within 1.9 miles of leks. Oil and gas traffic on these access roads may cause direct disturbance, displacement and mortality of grouse. Noise from oil and gas drilling and traffic on roads near leks has been shown to result in declines in lek attendance and disruption of lekking behavior.[44] Increasing traffic on roads within either 0.6 or 1.9 miles of leks is likely to have significant negative impacts on Gunnison sage-grouse. One of the potential access routes is road U-29, which has been identified as a road that is currently having significant negative impacts on Gunnison sage-grouse due to oil and gas and other traffic that use a portion of the road in close proximity to leks. Colorado Parks and Wildlife and the San Miguel Basin working group have recommended seasonal closure or re-routing of this road, and San Miguel County and BLM are currently discussing the possibility of seasonal closures or re-routing of this road. Leasing these parcels may create additional need for this road and impede these discussions.

Oil and gas leasing and subsequent development on parcels 7795, 7797, 7798, 7799, 7801, 7802, and 7805 will result in increased infrastructure in an area between occupied critical habitat for the Dry Creek Basin and Miramonte subpopulations of the Gunnison sage-grouse population. Roads, wells, pipelines, compressor stations and other infrastructure can reduce connectivity between populations.[45] Placing oil and gas infrastructure in this location will likely reduce connectivity between these two subpopulations. Grouse may also suffer increased mortality when moving between populations due to collisions with oil

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[40] Id. at 26
[41] http://cpw.state.co.us/learn/Pages/GunnisonSagegrouseConservationPlan.aspx
[42] Id. at 39
[43] Id. at 39, 40, 41
[44] Id. at 39, 40, 41
[45] Id. at 39, 40, 41

and gas infrastructure and vehicles. This will exacerbate the existing problems with small population size and isolation that are already putting these populations at risk of extinction.

Oil and gas on lease parcels 7795, 7797 and 7798, which are directly adjacent to occupied critical Gunnison sage-grouse habitat, may result in significant negative impacts on Gunnison sage-grouse in occupied critical habitat, even if all development occurs outside of occupied critical habitat. In addition to the impacts due to traffic on roads used to access the parcels described above and reduction in connectivity between patches of occupied habitat, oil and gas development can result in functional loss of occupied habitat due to behavioral avoidance of tall structures such as oil and gas rigs and avoidance of noise associated with oil and gas activity, increased predation due to creation of perches for predators adjacent to occupied habitat, and other negative impacts.[46]

The Tres Rios RMP/FEIS does not discuss any of these potentially significant negative impacts of leasing these parcels on Gunnison sage-grouse, and the parcels do not include lease stipulations to address these potential negative impacts. Therefore, the BLM's DNA is inadequate, and an EIS is required prior to leasing these parcels for oil and gas development.

B. The BLM's Determination of NEPA Adequacy is inadequate to analyze the impacts of leasing on potential Areas of Critical Environmental Concern

i. Stipulations have not been attached to these lease parcels in conformance with the BLM Tres Rios Field Office, San Juan National Forest Land and Resource Management Plan Final Environmental Impact Statement.

The BLM's DNA for the lease parcels in the February 2017 sale states that, "All lands considered in this action are open to leasing under the RMP/FEIS, and stipulations have been attached in conformance with the RMP/FEIS." (DNA pgs. 4-5). However, stipulations have not been attached to the lease parcels described below in conformance with the BLM Tres Rios Field Office, San Juan National Forest Land and Resource Management Plan Final Environmental Impact Statement (Tres Rios RMP/FEIS) (September 2013).

Parcel 7378 has significant overlap with 2 potential Areas of Critical Environmental Concern, Spring Creek and Disappointment Valley, which are currently being considered for designation through the Tres Rios ACEC RMP Amendment (see further discussion in section V, C below).[47] Disappointment Valley meets the relevance and importance criteria because it contains two globally imperiled and BLM sensitive rare plant species (Appendix U, p. U9).[48] Spring Creek meets the relevance and importance criteria because it contains one globally imperiled rare and BLM sensitive plant species and two additional rare plant species (Appendix U, p. U25).[49] BLM lists two Controlled Surface Use (CSU) stipulations to protect sensitive plants (including Gypsum Valley cat-eye) and Gypsum soils, that it states

[46] Id. at 39, 40, 41
[47] Id. at 3
[48] Id. at 19
[49] Id. at 19

will be applied to protect the relevant and important values in these two ACECs (Tres Rios RMP/FEIS, Appendix U pp. U9-U10, and p. U25).[50] However, neither of these lease stipulations have been applied to parcel 7378, despite the presence of a known occurrence of the globally imperiled Gypsum Valley cateye within the parcel boundaries.[51]

Contrary to BLM's assertion in the DNA, stipulations have not been attached to these parcels in conformance with the Tres Rios RMP/EIS, and the DNA is therefore inadequate.

C. The BLM's Determination of NEPA Adequacy is inadequate to analyze the impacts of leasing on the Designated Gypsum Valley Area of Critical Environmental Concern and occurrences of the globally imperiled Gypsum Valley cateye

Parcel 7792 should be deferred from the lease sale. This parcel is in the designated Gypsum Valley Area of Critical Environmental Concern and contains known occurrences of the globally imperiled Gypsum Valley cateye.[52] The designated Gypsum Valley Area of Critical Environmental Concern is a unique and sensitive place. Leasing this parcel will have significant negative impacts on this designated ACEC and on the globally critically imperiled Gypsum Valley cateye.

The BLM's DNA for the lease parcels in the February 2017 sale states that, "All lands considered in this action are open to leasing under the RMP/FEIS, and stipulations have been attached in conformance with the RMP/FEIS." (DNA pgs. 4-5). However, stipulations have not been attached to lease parcel 7792 in conformance with the BLM Tres Rios Field Office, San Juan National Forest Land and Resource Management Plan Final Environmental Impact Statement (Tres Rios RMP/FEIS) (September 2013) to protect known occurrences of the Gypsum Valley cateye.

An EIS is required prior to authorizing oil and gas leasing in the designated Gypsum Valley Area of Critical Environmental Concern.

D. The BLM's Determination of NEPA Adequacy in inadequate to analyze the impacts of leasing on the Jim Olterman/Lone Cone State Wildlife Area and the Dry Creek Basin State Wildlife Area.

The BLM should defer parcels within State Wildlife Areas. Parcel 7790 overlaps with the Jim Olterman/Lone Cone State Wildlife Area. Parcels 7795, 7797, 7801, 7802, 7805 overlap with the Dry Creek Basin State Wildlife Area. Leasing these parcels will result in significant negative impacts on these State Wildlife Areas and the wildlife and other resources these areas were designated to protect. An adequate analysis of impacts of leasing these parcels within State Wildlife areas requires full consideration of all of the information on resource values and potential impacts of oil and gas leasing within these State Wildlife Areas, provided to BLM by Colorado Parks and Wildlife. In order to adequately mitigate impacts to insignificance, BLM must apply all lease stipulations and other protective measures recommended by Colorado Parks and Wildlife to the leases that overlap with these two State

[50] Id. at 19
[51] Id. at 4
[52] Id. at 4

Wildlife Areas. These leases should be deferred pending full consideration of all information provided to BLM by Colorado Parks and Wildlife relevant to determining impacts of leasing on State Wildlife Areas and the resources within State Wildlife Areas, and until BLM has applied the lease stipulations and other protective measures recommended by Colorado Parks and Wildlife to the lease parcels, or completed an Environmental Impact Statement that disclosed the significant negative impacts that will result from leasing these parcels without the lease stipulations and other protective measures recommended by Colorado Parks and Wildlife. Please consider all of the information in Colorado Parks and Wildlife's Scoping Comments on the BLM February 2017 Lease Sale (Attachment 3), and in any subsequent comments submitted to BLM by Colorado Parks and Wildlife on the proposed lease sale.

V. BLM must defer parcels in areas being considered for closure to oil and gas leasing and/or new lease stipulations, through ongoing Resource Management Plan Amendment Processes, until the RMP Amendments are finalized

A. NEPA requires that BLM avoid taking actions that will limit the choice of alternatives and prejudice the ultimate decision in ongoing RMP revision processes.

The National Environmental Policy Act, which provides that: (a) Until an agency issues a record of decision as provided in Sec. 1505.2 (except as provided in paragraph (c) of this section), no action concerning the proposal shall be taken which would:

1. Have an adverse environmental impact; or

2. Limit the choice of reasonable alternatives.

(c) While work on a required program environmental impact statement is in progress and the action is not covered by an existing program statement, agencies shall not undertake in the interim any major Federal action covered by the program which may significantly affect the quality of the human environment unless such action:

1. Is justified independently of the program;

2. Is itself accompanied by an adequate environmental impact statement; and

3. Will not prejudice the ultimate decision on the program. Interim action prejudices the ultimate decision on the program when it tends to determine subsequent development or limit alternatives.

40 C.F.R. § 1506.1 (emphases added). While the agency has discretion in determining where this standard applies, approving lease of the parcels at issue here will limit the choice of alternatives and prejudice the ultimate decisions in two ongoing RMP revision processes, the Gunnison Sage-Grouse Rangewide Resource Management Plan Amendment Process, and the Tres Rios ACEC Resource Management Plan Amendment Process (see further discussion in sections V, B &C below).

B. BLM must defer parcels within the decision area for the ongoing Gunnison sage-grouse Resource Management Plan Amendment

The Bureau of Land Management initiated a process to amend all of the Resource Management Plans within the range of the Gunnison sage-grouse, including the Tres Rios RMP, through a Gunnison Sage-Grouse Rangewide Plan Amendment (GRPA). The BLM recently issued the draft Gunnison Sage-Grouse Rangewide Plan Amendment and Environmental Impact Statement (draft GRPA).[53] The Amendment was initiated in response to the USFWS 2014 decision to list the Gunnison sage-grouse as a threatened species under the Endangered Species Act. The USFWS listing decision identified the lack of adequate regulatory mechanisms in BLM Resource Management Plans as a major threat that contributed to the need for the Gunnison sage-grouse to be protected as threatened under the ESA. The purpose of the GRPA is to analyze the addition of conservation measures to existing BLM RMPs, including the Tres Rios RMP, in order to put adequate regulatory mechanisms to conserve Gunnison sage-grouse on public lands.

Leasing and subsequent development of all of parcels 7795, 7797, 7798, 7799, 7801, 7802, and 7805 will occur on or impact lands within the decision area for the GRPA, which includes: 1) occupied critical habitat 2) unoccupied critical habitat, and 3) non-habitat within 4 miles of a lek. Parcel 7795 includes 4 acres of occupied critical Gunnison sage-grouse habitat and roughly 86 acres of land within 4 miles of a lek. All seven of the parcels listed are in a location where some potential access roads bisect 0.6 mile buffers around leks, and where all potential access roads bisect occupied critical habitat and areas within 1.9 miles of leks. Thus, all seven parcels will impact lands within the decision area for the GRPA.

Further, the alternatives in the Draft Gunnison Sage-Grouse Rangewide Plan Amendment (draft GRPA) include a variety of protections for Gunnison sage-grouse from oil and gas development that would apply to the lands proposed for lease. For example, the plan considers: 1) closing occupied habitat to fluid mineral leasing (Alternative B, pp. 2-166 - 2-167), or applying a No Surface Occupancy stipulation to occupied habitat (Alternative C and Sub-Alternative D2, pp. 2-166-2-167), 2) implementing seasonal closures for motorized routes in occupied habitat (Alternative B, pp. 2-143 - 2-144) or in occupied habitat where a conflict has been identified (Alternative C and Sub-Alternative D2, pp. 2-143 - 2-144), 3) requiring a Master Development Plan in lieu of Application for Permit to Drill (APD) by APD processing for all but wildcat wells (Alternative B – in nonhabitat areas where activities have the potential to be disruptive to Gunnison sage-grouse, Alternative C and Sub-Alternative D2 – in occupied habitat; pp. 2-168 – 2-169), 4) prohibiting the siting of pipeline compressors (Alternative B – in nonhabitat areas where activities have the potential to be disruptive to Gunnison sage-grouse, Alternative C and Sub-Alternative D2 – in occupied habitat; pp. 2-169 - 2-170), 5) prohibiting surface disturbance within four miles of a lek (Alternative B, p. 2-183), and 6) designating all BLM administered surface lands within Gunnison sage-grouse habitat as an Area of Critical Environmental Concern (Alternative B, p. 2-190). Leasing these parcels would foreclose these management alternatives necessary to achieve the purpose and need of

[53] https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=39681&dctmId=0b0003e88073b43a

the GRPA, protect the San Miguel Basin population of Gunnison sage-grouse from significant negative impacts, and to conserve and recover Gunnison sage-grouse.

Leasing these parcels will undermine the ongoing RMP revision by foreclosing management alternatives currently under consideration that may be critical to the persistence of the San Miguel Basin population of Gunnison sage-grouse, and ultimately to achieving the goal of reaching a point where Gunnison sage-grouse is recovered and Endangered Species Act listing is no longer needed. Leasing these parcels is a major federal action which will have a significant adverse impact on Gunnison sage-grouse, and will determine subsequent development of occupied critical Gunnison sage-grouse habitat. Thus, leasing these parcels will limit the choice of alternatives and prejudice the ultimate decision in the ongoing Gunnison Sage-Grouse RMP Amendment, and the parcels should be deferred from the February 2017 oil and gas lease sale, in order to allow for additional review of appropriate protections for Gunnison sage-grouse habitat from oil and gas development through the GRPA process.

C. The BLM must defer parcels being considered for designation as Areas of Critical Environmental Concern through the ongoing Tres Rios ACEC RMP Amendment

Parcels 7378, 7787, 7795 and 7797 are within potential Areas of Critical Environmental Concern being considered for designation through the ongoing Tres Rios ACEC RMP Amendment and associated Environmental Assessment (DOI-BLM-CO-S010-2016-0018-EA).[54] These parcels should be deferred from the February 2017 oil and gas lease sale.

We are dedicated to conserving public lands resources and values in southwest Colorado, including specifically those resources and values that meet the relevance and importance criteria for ACEC designation. We engaged throughout the Tres Rios RMP revision, nominated ACECs and advocated for their designation. In addition to being prioritized in the Federal Land Policy and Management Act, ACECs are a critical administrative designation to promote and provide for sound stewardship of valuable and vulnerable public lands resources. We are glad to see BLM moving forward with addressing ACEC designation in the Tres Rios Field Office, which is a necessary step to rectify failures in the Tres Rios RMP, and also presents an important opportunity to assess areas with relevant and important values across the field office and put necessary administrative management in place to protect those values.

The 2015 Tres Rios RMP failed to comply with FLPMA and agency policy by failing to consider designating ACECs that were found to meet the relevance and importance criteria. As noted in the Tres Rios Proposed RMP, all areas which meet the relevance and importance criteria "must be identified as potential ACECs and fully considered for designation and management in resource management planning." BLM Manual 1613 at .21. If an area is not to be designated, the analysis supporting the conclusion "must be incorporated into the plan and associated environmental document." *Ibid.*

The Draft San Juan Land Management Plan evaluated 22 areas as potential ACECs and found 11 areas met the relevance and importance criteria. Of those 11 areas, only four were evaluated for designation

[54] http://www.blm.gov/co/st/en/BLM_Information/nepa/TRFO_NEPA/acecs.print.html

in the range of alternatives for the draft plan (Draft LRMP, Appendix U, p. 2). This clearly did not comply with FLPMA's requirement to prioritize designation of ACECs or Manual 1613's requirement to fully consider for designation **all areas** that meet the relevance and importance criteria. The Proposed RMP included updated relevance and importance findings for the 22 potential ACECs, finding that 19 of them meet the relevance and importance criteria. (Tres Rios Proposed RMP at Appendix U, Table U.1.) However, the Proposed RMP noted that the 15 areas which meet the relevance and importance criteria but were not evaluated for designation in the Draft LRMP could not be evaluated or designated in the Proposed RMP without supplemental NEPA analysis. Therefore, the PRMP states: "To correct this oversight, the BLM will consider these potential ACECs in a future plan amendment." Tres Rios Proposed RMP at Appendix U, p. 4. This is the purpose and need for the current amendment to the Tres Rios RMP.[55]

The parcels at issue here overlap with nominated ACECs that BLM is currently evaluating and considering for designation through the Tres Rios RMP Amendment. We are engaging in the Tres Rios RMP Amendment Process and have a long-standing interest in the designation of the potential ACECs being evaluated through the Tres Rios RMP Amendment. These parcels should be deferred pending completion of the Tres Rios ACEC Amendment, and full consideration of all of the information included in our scoping comments on the Tres Rios ACEC Amendment (Attachment 4).

Lease Parcel 7378 has significant overlap with 2 of the 15 nominated ACECs that BLM found met the relevance and importance criteria but that were not evaluated for designation in the draft or proposed RMP, and that are therefore now being considered for designation through the Tres Rios ACEC RMP Amendment, Spring Creek and Disappointment Valley (Tres Rios RMP/FEIS, Appendix U).[56] This parcel is proposed for lease without any stipulations that are aimed at protecting the relevant and important values identified in the potential Spring Creek and Disappointment Valley ACECs from negative impacts of oil and gas drilling.[57] Disappointment Valley meets the relevance and importance criteria because it contains two globally imperiled and BLM sensitive rare plant species (Appendix U, p. U9).[58] Spring Creek meets the relevance and importance criteria because it contains one globally imperiled rare and BLM sensitive plant species and two additional rare plant species (Appendix U, p. U25).[59] BLM lists two CSU stipulations to protect sensitive plants (including Gypsum Valley cat-eye) and Gypsum soils, that it states will be applied to protect the relevant and important values in these two ACECs (Tres Rios RMP/FEIS, Appendix U pp. U9-U10, and p. U25).[60] However, neither of these lease stipulations have been applied to parcel 7378[61], despite the presence of a known occurrence of the globally imperiled

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[55] http://www.blm.gov/style/medialib/blm/co/field_offices/san_juan_public_lands/land_use_planning/acec_docs.Par.71682.File.dat/App_U_ACEC_FINAL.pdf

[56] Id. at 55

[57] http://www.blm.gov/style/medialib/blm/co/programs/oil_and_gas/Lease_Sale/2017/february.Par.58526.File.dat/TRFO-DNA-Comment-Period.pdf

[58] Id. at 55

[59] Id. at 55

[60] Id. at 55

[61] Id. at 57

Gypsum Valley cateye within the parcel boundaries.[62] Issuing oil and gas leases in these two potential ACECs may preclude ACEC designation and/or management prescriptions to protect the relevant and important values within these potential ACECs, particularly given that the parcels are proposed for lease without lease stipulations necessary to protect the relevant and important values within these two potential ACECs.

Lease parcels 7795 and 7797 have small areas of overlap with the potential Dry Creek Basin Area of Critical Environmental Concern, one of the 15 nominated ACECs that BLM found met the relevance and importance criteria but that were not evaluated for designation in the draft or proposed Tres Rios RMP, and that are therefore now being considered for designation through the Tres Rios ACEC RMP Amendment (Tres Rios RMP/FEIS, Appendix U).[63] While the areas of overlap are small, the primary purpose of this nominated ACEC is to protect the San Miguel Basin population of Gunnison sage-grouse. Oil and gas leasing and subsequent development on parcels 7795, 7797, 7798, 7799, 7801, 7802, and 7805 will have significant negative impacts on the San Miguel Basin population of Gunnison sage-grouse (discussed in detail in section IV, A above), and thus on the relevant and important values within this potential ACEC. It is important to note that potential access routes for the parcel bisect the potential Dry Creek Basin ACEC and that traffic on these routes will have significant negative impacts on Gunnison sage-grouse (see further discussion in section IV, A above). In addition, a landscape level assessment of ACEC criteria for the Dry Creek Basin potential ACEC found that the potential Dry Creek Basin ACEC has a relatively high level of ecological connectivity compared with public lands across the West. (Attachment 4) Leasing of the proposed parcels will result in development of oil and gas wells and associated infrastructure directly adjacent to the potential ACEC, and between patches of occupied critical Gunnison sage-grouse habitat, which will is likely to significantly reduce the landscape-scale ecological connectivity of the lands within the potential ACEC. Landscape scale ecological connectivity is a relevant and important value within this ACEC, because it is a resource for the threatened Gunnison sage-grouse, and an important natural process. Leasing these parcels may preclude ACEC designation and/or management prescriptions necessary to protect the relevant and important values within the potential ACEC, including but not limited to the San Miguel Basin population of Gunnison sage-grouse and the landscape-scale ecological connectivity of the lands within the potential ACEC. These parcels should be deferred from the lease sale until the Tres Rios RMP ACEC Amendment is completed.

Lease parcel 7787 is within an ACEC we proposed in our scoping comments on the Tres Rios ACEC RMP Amendment. As described in our comments, the proposed "Navajo River" ACEC is comprised of slopes and rims of the Navajo River Canyon, giving it outstanding scenic values. It also neighbors roughly a dozen private ranch conservation easements that were acquired over the span of 15 years by the Great Outdoors Colorado's Navajo Watershed Project. Because drilling and development might compromise the ACEC qualities of the area, and would interfere with conservation protections already in place, we ask that BLM defer leasing Parcel 7787 until it evaluates our Navajo River ACEC proposal through the RMP Amendment process.

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[62] Id. at 4
[63] Id at 55

It is completely inappropriate for BLM to issues oil and gas leases in these potential ACECs that are being considered for designation in an ongoing RMP amendment process, particularly without lease stipulations to protect the relevant and important values in the potential ACECs (see further discussion under section IV, B above). The BLM Manual requires BLM to provide temporary management to protect resource values within nominated ACECs until they are considered for designation through a planning process (BLM Manual 1613, Areas of Critical Environmental Concern (part .21 (E)). Tres Rios BLM committed to providing temporary (interim) management that to protect these potential ACECs from significant resource value degradation until a plan amendment considering them for designation is completed.[64] BLM should not lease these parcels without adequate lease stipulations to protect relevant and important values prior to completion of the Tres Rios ACEC RMP Amendment Process.

Leasing these parcels will undermine the ongoing RMP revision by foreclosing management alternatives currently under consideration, including ACEC designation and management prescriptions needed to protect the relevant and important values within these ACECs. Leasing these parcels is a major federal action that will have a significant adverse impact on the relevant and important values within these potential ACECs, and will determine subsequent development of lands within these potential ACECs. Thus, leasing these parcels will limit the choice of alternatives and prejudice the ultimate decision in the ongoing Tres Rios ACEC RMP Amendment, and the parcels should be deferred from the February 2017 oil and gas lease sale, in order to allow for additional review of appropriate protections for relevant and important values within these potential ACECs, and in order to allow BLM to meet its obligations to: 1) prioritize designation of ACECs, and 2) to fully consider designation of nominated ACECs that meet the relevance and importance criteria.

D. The BLM must consult with the U.S. Fish and Wildlife Service prior to authorizing oil and gas drilling that will negatively impact Gunnison sage-grouse, and designated critical habitat.

The Gunnison sage-grouse is protected as a threatened species under the Endangered Species Act. The proposed leasing of parcels 7795, 7797, 7798, 7799, 7801, 7802, and 7805 is a federal action that may adversely affect Gunnison sage-grouse and result in adverse modification of designated critical habitat. The BLM must consult with the U.S. Fish and Wildlife Service prior to leasing these parcels for oil and gas development.

Authorizing leasing of the proposed parcels constitutes and agency "action" and the "action area" is all areas that will be affected directly or indirectly by the action, including all Gunnison sage-grouse habitat that may be impacted directly or indirectly by oil and gas development on the proposed parcels. The definition of agency "action" is broad and includes "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies," including programmatic actions.[65]

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[64] http://www.blm.gov/style/medialib/blm/wo/Planning_and_Renewable_Resources/colorado.Par.78826.File.pdf/Tres_Rios_RMP_Protest_Report_(February_6,_2015).pdf

[65] 50 C.F.R. § 402.02

Likewise, the "action area" includes "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action."[66]

The duties in ESA Section 7 are only fulfilled by an agency's satisfaction of the consultation requirements that are set forth in the implementing regulations for Section 7 of the ESA, and only after the agency lawfully complies with these requirements may an action that "may affect" a protected species go forward.[67]

The action agency must initially prepare a biological assessment (BA) to "evaluate the potential effects of the proposed action" on listed species.[68] If the action agency concludes that the proposed action is "not likely to adversely affect" a listed species that occurs in the action area, the Service must concur in writing with this determination.[69] If the Service concurs in this determination, then formal consultation is not required.[70] If the Service's concurrence in a "not likely to adversely affect" finding is inconsistent with the best available data, however, any such concurrence must be set aside.[71]

If the action agency concludes that an action is "likely to adversely affect" listed species or critical habitat, it must enter into "formal consultation" with the Service.[72] The threshold for triggering the formal consultation requirement is "very low;" indeed, "any possible effect ... triggers formal consultation requirements."[73]

Formal consultation commences with the action agency's written request for consultation and concludes with the Service's issuance of a "biological opinion."[74] The biological opinion states the Service's opinion as to whether the effects of the action are "likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat."[75] When conducting formal consultation, the Service and the action agency must evaluate the "effects of the action," including all direct and indirect effects of the proposed action, plus the effects of actions that are interrelated or interdependent, added to all existing environmental conditions – that is, the "environmental baseline."[76] The environmental baseline includes the past and present impacts of all Federal, state, and private actions and other human activities in the action area...."[77] The effects of the action must be considered together with "cumulative effects," which are "those effects of future State

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[66] Id.
[67] Pac. Rivers Council v. Thomas, 30 F.3d 1050, 1055-57 (9th Cir. 1994)
[68] 50 C.F.R. § 402.12
[69] Id. §§ 402.13(a) and 402.14(b)
[70] Id. § 402.13(a)
[71] See id. § 402.14(g)(8); 5 U.S.C. § 706(2)
[72] 50 C.F.R. §§ 402.12(k), 402.14(a)
[73] See Interagency Cooperation Under the Endangered Species Act, 51 Fed. Reg. 19,926 (June 3 1996).
[74] 50 C.F.R. § 402.02
[75] Id. § 402.14(g)(4). To "jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." Id. § 402.02.
[76] Id. §§ 402.14 and 402.02
[77] Id.

or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation."[78]

If the Service concludes in a biological opinion that jeopardy is likely to occur, it must prescribe "reasonable and prudent alternatives" to avoid jeopardy.[79] If the Service concludes that a project is not likely to jeopardize listed species, it must nevertheless provide an incidental take statement (ITS) with the biological opinion, specifying the amount or extent of take that is incidental to the action (but which would otherwise be prohibited under Section 9 of the ESA), "reasonable and prudent measures" (RPMs) necessary or appropriate to minimize such take, and the "terms and conditions" that must be complied with by the action agency to implement any reasonable and prudent measures.[80]

The ESA requires federal agencies to use the best scientific and commercial data available when consulting about whether federal actions may jeopardize listed species or adversely modify critical habitat.[81] Accordingly, an action agency must "provide the Service with the best scientific and commercial data available or which can be obtained during the consultation for an adequate review of the effects that an action may have upon listed species of critical habitat."[82] Likewise, "[i]n formulating its biological opinion...the Service will use the best scientific and commercial data available."[83] However, if the action agency failed "to discuss information that would undercut the opinion's conclusions," the biological opinion is legally flawed, and the ITS will not insulate the agency from ESA Section 9 liability.[84]

The BLM must consult with the U.S. Fish and Wildlife Service prior to authorizing leasing of parcels 7795, 7797, 7798, 7799, 7801, 7802, and 7805.

Thank you for considering these comments.

Sincerely,

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[78] *Id.*
[79] *Id.* § 402.14(h)(3).
[80] 16 U.S.C. § 1536(b)(4); 50 C.F.R. § 402.14(i).
[81] *See* 16 U.S.C. § 1536(a)(2).
[82] 50 C.F.R. § 402.14(d).
[83] *Id.* § 402.14(g)(8).
[84] *See Ctr. for Biological Diversity v. BLM ("CBD")*, 698 F.3d 1101, 1127-28 (9th Cir. 2012).

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EXHIBIT C

CENTER for BIOLOGICAL DIVERSITY Because life is good.

working through science, law and creative media to secure a future for all species, great or small, hovering on the brink of extinction.

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Via Electronic Mail and Fed Ex:

RE: Scoping Comments for the February 2017 Competitive Oil and Gas Lease Sale, Tres Rios Field Office

Dear Mr. Joyner,

The Center for Biological Diversity writes to submit the following scoping comments on the proposed February 2017 Competitive Oil and Gas Lease Sale, Tres Rios Field Office ("TRFO").

The Center is a non-profit environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law. The Center also works to reduce greenhouse gas emissions to protect biological diversity, our environment, and public health. The Center has over one million members and activists, including those living in Colorado who have visited these public lands in the TRFO for recreational, scientific, educational, and other pursuits and intend to continue to do so in the future, and are particularly interested in protecting the many native, imperiled, and sensitive species and their habitats that may be affected by the proposed oil and gas leasing.

The Bureau of Land Management ("BLM") received nominations of parcels for the aforementioned sale, which requires the BLM to prepare an Environmental Impact Statement ("EIS") under the National Environmental Policy Act ("NEPA"). The BLM Colorado State Office is proposing to offer 16 parcels encompassing approximately 16,945.100 acres of federal lands in Montezuma, Dolores, San Miguel, and Archuleta Counties, Colorado (collectively, "planning area"). A significant portion of these parcels fall within Gunnison sage-grouse critical habitat, which should never be leased, under any circumstances.[1]

[1] *See* Center for Biological Diversity ("CBD"), Maps of Feb 2017 Nominated Parcels and Gunnison Sage-Grouse Critical Habitat (June 2016).

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The exploration and development of these parcels likely involves highly controversial and severely harmful extraction methods, including horizontal drilling and hydraulic fracturing (or "fracking"). The extraction and burning of fossil fuels worsens the climate crisis; endangers water, air, wildlife, public health, and local communities; and further undermines the protection of our public lands. Because new fossil fuel leasing within the planning area will contribute to worsening the climate crisis, the vast majority of all *proven* fossil fuels must be kept in the ground to preserve any chance of averting catastrophic climate disruption. Opening up new areas to oil and gas exploration and unlocking new sources of greenhouse gas pollution would only fuel greater warming and contravenes BLM's mandate to manage the public lands "without permanent impairment of the productivity of the land and the quality of the environment."[2] Full compliance with the spirit and objectives of NEPA and other federal environmental laws and regulations requires BLM to avoid these dangers by ending all new leasing in the planning area and all other areas that it manages in order to limit the climate change effects of its actions; at a minimum, it should defer any such leasing until such time as it can conduct a comprehensive review of the climate consequences of its leasing activities, at the national and regional scale.

Although BLM's existing land use plans[3] mention some of the potential impacts in very general terms, BLM must also include analyses of all foreseeable site-specific impacts. This includes a re-evaluation of conservation needs and objectives for increasingly scarce and/or fragile natural resources in the areas to be leased. The existing land use plans do not adequately analyze the relatively new and dangerous "unconventional" extraction methods, such as fracking and horizontal drilling, or the increased seismic risks from such extraction methods. Given the likelihood that fracking and other similarly harmful techniques would be employed in the exploration and development of the parcels, BLM must analyze and disclose the potential impacts resulting from such frequently used practices, at the lease-parcel scale and across the planning areas. The existing land use, or Resource Management Plans ("RMPs"), also fail to properly assess the impacts of leasing on climate change. Proceeding with new leasing and fracking proposals *ad hoc* in the absence of a comprehensive plan that addresses these changed conditions is premature and risks irreversible damage before the agency and public have had the opportunity to weigh the full costs of oil and gas extraction and consider necessary limits on fracking.

For the reasons set forth in this letter, we insist that BLM: (1) cease all new leasing of fossil fuels in the planning area, including oil and natural gas; or, at a minimum (2) defer the proposed February 2017 Sale pending a programmatic review of all federal fossil fuel leasing which must consider a "no leasing" and "no fracking" plan amendments. Should BLM proceed with the sale, BLM must: (1) initiate formal consultation with the Fish and Wildlife Service, as required by the Endangered Species Act ("ESA"); and (2) prepare a full EIS for the proposed lease sale in consideration of significant unexamined impacts from the consequences of leasing. Any such EIS must consider a full range of alternatives, including an alternative that bans new hydraulic fracturing and other unconventional well stimulation activities, and require strict controls on natural gas emissions and leakage.

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[2] *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).

[3] *See* BLM 2015, Tres Rios Field Office Resource Management Plan ("2015 TRFO RMP"); and BLM 2013 San Juan National Forest Land Resource Management Plan Final Environmental Impact Statement ("2013 RMP EIS").

I. BLM Must Defer All Parcels Containing Gunnison Sage Grouse Critical Habitat

Since the completion of the Tres Rios Field Office Resource Management Plan revision, the Gunnison Sage Grouse has been listed as a threatened species under the Endangered Species Act. In order to avoid potential jeopardy to the species, adverse modification of critical habitat, or impairment to the prospects for conservation and recovery of the Gunnision sage-grouse, BLM must avoid leasing of any parcel that is either (a) within Gunnision sage-grouse critical habitat or (b) likely to affect Gunnison sage-grouse critical habitat.

At a minimum, BLM must, prior to lease issuance, undergo formal consultation with the U.S. Fish and Wildlife Service in order to determine whether its proposed action will have direct, indirect, or cumulative effects on Gunnison sage-grouse and its critical habitat.

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

Climate change is a problem of global proportions resulting from the cumulative greenhouse gas emissions of countless individual sources. A comprehensive look at the impacts of fossil fuel extraction, and especially fracking, across the planning area affected by the leases in an updated RMP is absolutely necessary. BLM has *never* thoroughly considered the cumulative climate change impacts of *all* potential fossil fuel extraction and fracking (1) within the planning area, (2) across the state, and (3) across all public lands. Proceeding with new leasing proposals *ad hoc* in the absence of a comprehensive plan that addresses climate change and fracking is premature and risks irreversible damage before the agency and public have had the opportunity to weigh the full costs of oil and gas and other fossil fuel extraction and consider necessary limits on such activities. Therefore BLM must cease all new leasing at least until the issue is adequately analyzed in a programmatic review of all U.S. fossil fuel leasing, or at least within amended RMPs.

A. BLM Must Limit Greenhouse Gas Emissions By Keeping Federal Fossil Fuels In the Ground

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.[4] Keeping all unleased fossil fuels in the ground and banning fracking and other unconventional well stimulation methods would lock away millions of tons of greenhouse gas pollution and limit the destructive effects of these practices.

A ban on new fossil fuel leasing and fracking is necessary to meet the U.S.'s greenhouse gas reduction commitments. On December 12, 2015, 197 nation-state and supra-national

[4] *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).

organization parties meeting in Paris at the 2015 United Nations Framework Convention on Climate Change Conference of the Parties consented to an agreement (Paris Agreement) committing its parties to take action so as to avoid dangerous climate change. [5] As the United States signed the treaty on April 22, 2016[6] as a legally binding instrument through executive agreement,[7] the Paris Agreement commits the United States to critical goals—both binding and aspirational—that mandate bold action on the United States' domestic policy to rapidly reduce greenhouse gas emissions.[8]

The United States and other parties to the Paris Agreement recognized "the need for an effective and progressive response to the urgent threat of climate change on the basis of the best available scientific knowledge."[9] The Paris Agreement articulates the practical steps necessary to obtain its goals: parties including the United States have to "reach global peaking of greenhouse gas emissions *as soon as possible* . . . and to *undertake rapid reductions* thereafter in accordance *with best available science*,"[10] imperatively commanding that developed countries specifically "should continue taking the lead by undertaking economy-wide absolute emission reduction targets"[11] and that such actions reflect the "highest possible ambition."[12]

The Paris Agreement codifies the international consensus that climate change is an "urgent threat" of global concern,[13] and commits all signatories to achieving a set of global goals. Importantly, the Paris Agreement commits all signatories to an articulated target to hold the long-term global average temperature "to *well below 2°C* above pre-industrial levels and to *pursue efforts to limit the temperature increase to 1.5°C* above pre-industrial levels"[14] (emphasis added).

In light of the severe threats posed by even limited global warming, the Paris Agreement established the international goal of limiting global warming to 1.5°C above pre-industrial levels in order to "prevent dangerous anthropogenic interference with the climate system," as set forth in the UNFCCC, a treaty which the United States has ratified and to which it is bound.[15] The

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[5] United Nations Framework Convention on Climate Change, Adoption of the Paris Agreement, Proposal by the President, Draft decision -/CP.2, Art. 2. (2015)

[6] For purposes of this Petition, the term "treaty" refers to its international law definition, whereby a treaty is "an international law agreement concluded between states in written form and governed by international law" pursuant to article 2(a) of the Vienna Convention on the Law of Treaties, 1155 U.N.T.S. 331, 8 I.L.M. 679 (Jan. 27, 1980).

[7] *See* United Nations Treaty Collection, Chapter XXVII, 7.d Paris Agreement, List of Signatories; U.S. Department of State, Background Briefing on the Paris Climate Agreement, (Dec. 12, 2015), http://www. state.gov/ r/pa/prs/ps/2015/12/250592.htm.

[8] Although not every provision in the Paris Agreement is legally binding or enforceable, the U.S. and all parties are committed to perform the treaty commitments in good faith under the international legal principle of *pacta sunt servanda* ("agreements must be kept"). Vienna Convention on the Law of Treaties, Art. 26.

[9] *Id.*, Recitals.

[10] *Id.*, Art. 4(1).

[11] *Id.*, Art. 4(4).

[12] *Id*, Art. 4(3).

[13] *Id.*, Recitals.

[14] *Id.*, Art. 2.

[15] *See* United Nations Framework Convention on Climate Change, Cancun Agreement (2011) *available at* http://cancun.unfccc.int/ (last visited Jan 7, 2015); United Nations Framework Convention on Climate Change, Copenhagen Accord (2009) *available at* http://unfccc.int/meetings/copenhagen_dec_2009/items/5262.php (last

Paris consensus on a 1.5°C warming goal reflects the findings of the IPCC and numerous scientific studies that indicate that 2°C warming would exceed thresholds for severe, extremely dangerous, and potentially irreversible impacts.[16] Those impacts include increased global food and water insecurity, the inundation of coastal regions and small island nations by sea level rise and increasing storm surge, complete loss of Arctic summer sea ice, irreversible melting of the Greenland ice sheet, increased extinction risk for at least 20-30% of species on Earth, dieback of the Amazon rainforest, and "rapid and terminal" declines of coral reefs worldwide.[17] As scientists noted, the impacts associated with 2°C temperature rise have been "revised upwards, sufficiently so that 2°C now more appropriately represents the threshold between 'dangerous' and 'extremely dangerous' climate change."[18] Consequently, a target of 1.5 °C or less temperature rise is now seen as essential to avoid dangerous climate change and has largely supplanted the 2°C target that had been the focus of most climate literature until recently.

Immediate and aggressive greenhouse gas emissions reductions are necessary to keep warming below a 1.5° or 2°C rise above pre-industrial levels. Put simply, there is only a finite amount of CO_2 that can be released into the atmosphere without rendering the goal of meeting the 1.5°C target virtually impossible. A slightly larger amount could be burned before meeting a 2°C became an impossibility. Globally, fossil fuel reserves, if all were extracted and burned, would release enough CO_2 to exceed this limit several times over.[19]

The question of what amount of fossil fuels can be extracted and burned without negating a realistic chance of meeting a 1.5 or 2°C target is relatively easy to answer, even if the answer is framed in probabilities and ranges. The IPCC Fifth Assessment Report and other expert assessments have established global carbon budgets, or the total amount of remaining carbon that can be burned while maintaining some probability of staying below a given temperature target. According to the IPCC, total cumulative anthropogenic emissions of CO_2 must remain below about 1,000 gigatonnes ($GtCO_2$) from 2011 onward for a 66% probability of limiting warming to

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accessed Jan 7, 2015). The United States Senate ratified the UNFCC on October 7, 1992. *See* U.S. Congress, Ratification of Treaty Document titled The United Nations Framework Convention on Climate Change, adopted May 9, 1992, https://www.congress.gov/treaty-document/102nd-congress/38.

[16] *See* Paris Agreement, Art. 2(1)(a); U); United Nations Framework Convention on Climate Change, Subsidiary Body for Scientific and Technical Advice, Report on the structured expert dialogue on the 2013-15 review, No. FCCC/SB/2015/INF.1 at 15-16 (June 2015);IPCC AR5 Synthesis Report at 65 & Box 2.4.

[17] *See* Jones, C. et al, Committed Terrestrial Ecosystem Changes due to Climate Change, 2 Nature Geoscience 484, 484–487 (2009); Smith, J. B. *et al.*, Assessing Dangerous Climate Change Through an Update of the Intergovernmental Panel on Climate Change (IPCC) 'Reasons for Concern', 106 Proceedings of the National Academy of Sciences of the United States of America 4133, 4133–37 (2009); Veron, J. E. N. *et al.*, The Coral Reef Crisis: The Critical Importance of <350 ppm CO2, 58 Marine Pollution Bulletin 1428, 1428–36, (2009); ; Warren, R. J. *et al.*, Increasing Impacts of Climate Change Upon Ecosystems with Increasing Global Mean Temperature Rise, 106 Climatic Change 141–77 (2011); Hare, W. W. *et al.*, Climate Hotspots: Key Vulnerable Regions, Climate Change and Limits to Warming, 11 Regional Environmental Change 1, 1–13 (2011); ; Frieler, K. M. *et al.*, Limiting Global Warming to 2°C is Unlikely to Save Most Coral Reefs, Nature Climate Change, Published Online (2013) doi: 10.1038/NCLIMATE1674; ; M. Schaeffer *et al.*, Adequacy and Feasibility of the 1.5°C Long-Term Global Limit, Climate Analytics (2013).

[18] Anderson, K. et al., Beyond 'Dangerous' Climate Change: Emission Scenarios for a New World, 369 Philosophical Transactions, Series A, Mathematical, Physical, and Engineering Sciences 20, 20–44 (2011).

[19] Cimons,Marlene, Keep it in the Ground, Sierra Club, 350.org, Greenpeace (2016)

2°C above pre-industrial levels.[20] Given more than 100 $GtCO_2$ have been emitted since 2011,[21] the remaining portion of the budget under this scenario is well below 900 $GtCO_2$. To have an 80% probability of staying below the 2°C target, the budget from 2000 is 890 $GtCO_2$, with less than 430 $GtCO_2$ remaining.[22]

To have even a 50% probability of achieving the Paris Agreement goal of limiting warming to 1.5°C above pre-industrial levels equates to a carbon budget of 550-600 $GtCO_2$ from 2011 onward, [23] of which more than 100 $GtCO_2$ has already been emitted. To achieve a 66% probability of limiting warming to 1.5°C requires adherence to a more stringent carbon budget of only 400 $GtCO_2$ from 2011 onward, [24] of which less than 300 $GtCO_2$ remained at the start of 2015. An 80% probability budget for 1.5°C would have far less that 300 $GtCO_2$ remaining. Given that global CO_2 emissions in 2014 alone totaled 36 $GtCO_2$,[25] humanity is rapidly consuming the remaining burnable carbon budget needed to have even a 50/50 chance of meeting the 1.5°C temperature goal.[26]

According to a recent report by EcoShift Consulting commissioned by the Center and Friends of the Earth, unleased (and thus unburnable) 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;

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[20] IPCC, 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change; Summary for Policymakers at 27; IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change at 64 & Table 2.2 [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)] at 63-64 & Table 2.2 ("IPCC AR5 Synthesis Report").

[21] From 2012-2014, 107 GtCO2 was emitted (*see* Annual Global Carbon Emissions at http://co2now.org/Current-CO2/CO2-Now/global-carbon-emissions.html).

[22] 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; Meinshausen, M. *et al.*, Greenhouse gas emission targets for limiting global warming to 2 degrees Celsius, 458 Nature 1158, 1159 (2009).

[23] IPCC AR5 Synthesis Report at 64 & Table 2.2.

[24] *Id.*

[25] *See* CO2Now.org, Annual Global Carbon Emissions, https://www.co2.earth/global-co2-emissions? (accessed Apr 29, 2016).

[26] In addition to limits on the *amount* of fossil fuels that can be utilized, emissions pathways compatible with a 1.5 or 2°C target also have a significant temporal element. Leading studies make clear that to reach a reasonable likelihood of stopping warming at 1.5° or even 2°C, global CO2 emissions must be phased out by mid-century and likely as early as 2040-2045. *See, e.g.* Rogelj, Joeri *et al.*, Energy system transformations for limiting end-of-century warming to below 1.5°C, 5 Nature Climate Change 519, 522 (2015). United States focused studies indicate that we must phase out fossil fuel CO2 emissions even earlier—between 2025 and 2040—for a reasonable chance of staying below 2°C. *See, e.g.* Climate Action Tracker, http://climateactiontracker.org/countries/usa. Issuing new legal entitlements to explore for and extract federal fossil fuels for decades to come is wholly incompatible with such a transition.

- 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.[27]

Fracking has also opened up vast reserves that otherwise would not be available, increasing the potential greenhouse gas emissions that can be released into the atmosphere. BLM must consider a ban on this dangerous practice and a ban on new leasing to prevent the worst effects of climate change.

B. BLM Must Consider A Ban on New Oil and Gas Leasing and Fracking in a Programmatic Review and Halt All New Leasing and Fracking in the Meantime.

Development of unleased oil and gas resources will fuel climate disruption and undercut the needed transition to a clean energy economy. As BLM has not yet had a chance to consider no-leasing and no-fracking alternatives as part of any of its RMP planning processes or a comprehensive review of its federal oil and gas leasing program, BLM should suspend new leasing until it properly considers this alternative in updated RMPs or a programmatic EIS for the entire leasing program. BLM demonstrably has tools available to consider the climate consequences of its leasing programs, and alternatives available to mitigate those consequences, at either a regional or national scale.[28]

BLM would be remiss to continue leasing when it has never stepped back and taken a hard look at this problem at the programmatic 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 past, present, and potential future fossil fuel leasing and all other activities across all BLM lands and within the various planning areas at issue here, (2) consider their cumulative significance in the context of global climate change, carbon budgets, and other greenhouse gas pollution sources outside BLM lands and the planning area, and (3) formulate measures that avoid or limit their climate change effects. By continuing leasing and allowing new fracking in the absence of any overall plan addressing climate change BLM is effectively burying its head in the sand.

A programmatic review and moratorium on new leasing would be consistent with the Secretary of Interior's recent order to conduct a comprehensive, programmatic EIS (PEIS) on its coal leasing program, in light of the need to take into account the program's impacts on climate change, among other issues, and "the lack of any recent analysis of the Federal coal program as a whole."[29] Specifically, the Secretary directed that the PEIS "should examine how best to assess

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[27] 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

[28] *See, e.g.,* U.S. Bureau of Land Management Montana, North Dakota and South Dakota, Climate Change Supplementary Information Report (updated Oct. 2010) (conducting GHG inventory for BLM leasing in Montana, North Dakota and South Dakota); BLM, Proposed Rule: Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 6615 (Feb. 8, 2016) (proposing BLM-wide rule for prevention of methane waste).

[29] *See* Secretary of Interior, Order No. 3338, § 4 (Jan. 15, 2016)

the climate impacts of continued Federal coal production and combustion and how to address those impacts in the management of the program to meet both the Nation's energy needs and its climate goals, as well as how best to protect the public lands from climate change impacts."[30]

The Secretary also ordered a moratorium on new coal leasing while such a review is being conducted. The Secretary reasoned:

> Lease sales and lease modifications result in lease terms of 20 years and for so long thereafter as coal is produced in commercial quantities. Continuing to conduct lease sales or approve lease modifications during this programmatic review risks locking in for decades the future development of large quantities of coal under current rates and terms that the PEIS may ultimately determine to be less than optimal. This risk is why, during the previous two programmatic reviews, the Department halted most lease sales with limited exceptions.... Considering these factors and given the extensive recoverable reserves of Federal coal currently under lease, I have decided that a similar policy is warranted here. A pause on leasing, with limited exceptions, will allow future leasing decisions to benefit from the recommendations that result from the PEIS while minimizing any economic hardship during that review.[31]

The Secretary's reasoning is also apt here. A programmatic review assessing the climate change effects of public fossil fuels is long overdue. And there is no shortage of oil and gas that would preclude a moratorium while such a review is conducted, as evidenced by very low natural oil and gas prices. More importantly, BLM should not "risk[] locking in for decades the future development of large quantities of [fossil fuels] under current...terms that a [programmatic review] may ultimately determine to be less than optimal."[32] BLM should cancel the sale and halt all new leasing and fracking until a programmatic review is completed.

III. The Dangers of Hydraulic Fracking and Horizontal Drilling

Unconventional extraction methods like horizontal drilling and hydraulic fracturing bring with them 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. Although the 2013 RMP EIS briefly mentions hydraulic fracturing and horizontal drilling in its vague and broad discussion of general impacts "related to fluid minerals development,"[33] it does not talk about the impacts that such practices will have on the specific resources in the areas that BLM is offering for this lease sale. The 2015 TRFO RMP makes no mention at all of these practices. The use of hydraulic fracturing within the planning area is both readily foreseeable and already occurring with significant environment environmental consequences. The proposed leasing action is part of a dramatic recent increase in oil and gas leasing in the areas at issue, and reflects increased industry interest in developing Colorado's fossil fuel resources. The entire basis for this surge of interest is the possibility that hydraulic fracturing and other advanced

[30] *Id.* § 4(c).
[31] *Id.* § 5.
[32] *Id.*
[33] See e.g. BLM 2013, RMP EIS at 275.

recovery techniques will allow the profitable exploitation of geologic formations previously perceived as insufficiently valuable for development. 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."[34]

NEPA regulations and case law require that BLM evaluate all "reasonably foreseeable" direct and indirect effects of its leasing prior to the "irretrievable" consequences of oil and gas leasing.[35] 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.[36] Site-specific analyses of the consequences of harmful extraction practices, such as hydraulic fracturing, are therefore required at the leasing stage.

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;[37] however, companies now use permutations of "slick-water" fracturing fluid developed in the mid-1990s.[38] 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.[39] 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.[40] In addition to the base fluid and proppant, a mixture of chemicals are used, for purposes such as increasing the

[34] Arthur, J. Daniel et al., Hydraulic Fracturing Considerations for Natural Gas Wells of the Marcellus Shale at 2 (Sep. 2008) ("Arthur") at 9.
[35] *See* N.M. ex rel. Richardson v. BLM, 565 F.3d 683, 717-18 (10th Cir. 2009) (citing 42 U.S.C. § 4332(2)(C)(v)) (An assessment of all 'reasonably foreseeable' impacts must occur at the earliest practicable point, and must take place *before an 'irretrievable commitment of resources'* is made.") (emphasis added).
[36] Id. at 717 (citing to Pennaco Energy, Inc. v. United States DOI, 377 F.3d 1147, 1160 (10th Cir. 2004)) (The Tenth Circuit has concluded that issuing an oil and gas lease without an NSO stipulation constitutes an "irretrievable commitment of resources.").
[37] 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).
[38] New York State Department of Environmental Conservation, Final 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 (2015) ("NYDEC SGEIS") at 5-5.
[39] *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").
[40] Arthur at 10.

viscosity of the fluid, keeping proppants suspended, impeding bacterial growth or mineral deposition.[41]

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.[42] A congressional report sampling incomplete industry self-reports found that "[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."[43] 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.[44] 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.[45]

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.[46] 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."[47] New York State halted fracking within its borders in 2008, continued the moratorium in 2014 and banned the practice in 2015. The state's seven-year review concluded that fracking posed risks to land, water, natural resources and public health.[48] [49] Also, New Jersey's legislature recently passed a bill that would prevent fracking waste, like toxic wastewater and drill cuttings, from entering its borders,[50] and Pennsylvania, ground zero for the fracking debate, has banned "natural-gas

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[41] Arthur at 10.
[42] Waxman 2011b; *see also* Colborn, Theo et al., Natural Gas Operations for a Public Health Perspective, 17 Human 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").
[43] Waxman 2011b at 8.
[44] Colborn 2011 at 1.
[45] Colborn 2011 at 1.
[46] Castelvecchi, Davide, *France becomes first country to ban extraction of natural gas by fracking*, Scientific American (Jun. 30, 2011).
[47] CNN Staff Writer, *Vermont first state to ban fracking*, CNN U.S. (May 17, 2012).
[48] 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 .
[49] RT Network staff writer, *It's official: New York bans fracking*, RT Network (June 30, 2015) https://www.rt.com/usa/270562-new-york-fracking-ban/
[50] Tittel, Jeff, *Opinion: Stop fracking waste from entering New Jersey's borders* NJ Times (Jul 14, 2012) *available at* http://www.nj.com/times-opinion/index.ssf/2012/07/opinion_stop_fracking_waste_fr.html .

exploration across a swath of suburban Philadelphia . . . ."[51] Numerous cities and communities, like Buffalo, Pittsburgh, Raleigh, Woodstock, and Morgantown have banned fracking.[52]

Separate from hydraulic fracturing, the second technological development underlying the recent shale boom is the use of horizontal drilling. Shale oil and shale gas formations are typically located far below the surface, and as such, the cost of drilling a vertical well to access the layer is high.[53] The shale formation itself is typically a thin layer; however, such that a vertical well only provides access to a small volume of shale—the cylinder of permeability surrounding the well bore.[54] Although hydraulic fracturing increases the radius of this cylinder of shale, this effect is often itself insufficient to allow profitable extraction of shale resources.[55] Horizontal drilling solves this economic problem: by drilling sideways along the shale formation once it is reached, a company can extract resources from a much higher volume of shale for the same amount of drilling through the overburden, drastically increasing the fraction of total well length that passes through producing zones.[56] The practice of combining horizontal drilling with hydraulic fracturing was developed in the early 1990s.[57]

A third technological development is the use of "multi-stage" fracking. In the 1990s industry began drilling longer and longer horizontal well segments. The difficulty of hydraulic fracturing increases with the length of the well bore to be fractured, however, both because longer well segments are more likely to pass through varied conditions in the rock and because it becomes difficult to create the high pressures required in a larger volume.[58] In 2002 industry began to address these problems by employing multi-stage fracking. In multi-stage fracking, the operator treats only part of the wellbore at a time, typically 300 to 500 feet.[59] Each stage "may require 300,000 to 600,000 gallons of water," and consequently, a frack job that is two or more stages can contaminate and pump into the ground over a million gallons of water.[60]

Notwithstanding the grave impacts that these practices have on the environment, this new combination of multi-stage slickwater hydraulic fracturing and horizontal drilling has made it possible to profitably extract oil and gas from formations that only a few years ago were

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[51] Philly.com, *Fracking ban is about our water*, The Inquirer (Jul. 11, 2012).
[52] CBS/AP, *Pittsburgh Bans Natural Gas Drilling* (2010) http://www.cbsnews.com/stories/2010/11/16/national/main7060953.shtm; Wooten, Michael *City of Buffalo Bans Fracking*, WGRZ.com News (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), *available at* http://www.wvmetronews.com/news.cfm?func=displayfullstory&storyid=46214.
[53] CITI, Resurging North American Oil Production and the Death of the Peak Oil Hypothesis at 9 (Feb.15, 2012) ("CITI"); United States Energy Information Administration, Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays at 4 (Jul. 2011) ("USEIA 2011"); Orszag, Peter, *Fracking Boom Could Finally Cap Myth of Peak Oil* (Jan. 31, 2011) ("Orszag").
[54] *Id.*
[55] *Id.*; Arthur at 8 (Figure 4).
[56] Venoco, Inc., Monterey Shale Focused Analyst Day Slide Show at 23 (May 26, 2010) ("Venoco Slide Show"), USEIA 2012a at 63.
[57] *Id.*
[58] NYDEC SGEIS at 5-93.
[59] *Id.*
[60] *Id.*

generally viewed as uneconomical to develop.[61] The effect of hydraulic fracturing on the oil and gas markets has been tremendous, with many reports documenting the boom in domestic energy production. A recent congressional report notes that "[a]s a result of hydraulic fracturing and advances in horizontal drilling technology, natural gas production in 2010 reached the highest level in decades."[62] A 2011 U.S. EIA report notes how recently these changes have occurred, stating that "only in the past 5 years has shale gas been recognized as a 'game changer' for the U.S. natural gas market."[63] With respect to oil, the EIA notes that oil production has been increasing, with the production of shale oil resources pushing levels even higher over the next decade:

> Domestic crude oil production has increased over the past few years, reversing a decline that began in 1986. U.S. crude oil production increased from 5.0 million barrels per day in 2008 to 5.5 million barrels per day in 2010. Over the next 10 years, continued development of tight oil, in combination with the ongoing development of offshore resources in the Gulf of Mexico, pushes domestic crude oil production higher.[64]

Thus, it is evident that fracking, including fracking with the most recent techniques that have been associated with serious adverse impacts in other areas of the country, is poised to expand; it is further evident that the oil and gas industry is still exploring new locations to develop, and the nation has not yet seen the full extent of fracking's impact on oil and gas development and production.

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. Further, given the failures of the existing 2015 TRFO RMP and 2013 RMP EIS to adequately address the impacts of fracking, it would be inappropriate for BLM to simply refer to the environmental analyses from these documents.

IV. 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. Impacts on Water Resources Specific to Unconventional Stimulation Methods, Such as Hydraulic Fracturing and Horizontal Drilling

[61] *See* CITI at 9 ; USEIA 2011 at 4; Orszag,
[62] Waxman 2011b at 1.
[63] USEIA 2011 at 4.
[64] USEIA 2012a at 2

While much remains to be learned about fracking,[65] it is clear that the practice poses serious threats to water resources. Across 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,[66] Wyoming,[67] Texas,[68] Pennsylvania,[69] Ohio,[70] and West Virginia.[71]

The likelihood that the sale will result in fracking raises several issues that BLM must address:

- Where will the water come from and what are the impacts of extracting it?
- What chemicals will be used in the drilling and fracking process?
- How will BLM ensure the collection and disclosure of that information?
- What limitations will BLM place on the chemicals used in order to protect public health and the environment?
- What measures will BLM require to ensure adequate monitoring of water impacts, both during and after drilling?
- What baseline data is available to ensure that monitoring of impacts can be carried out effectively? How will BLM collect baseline data that is not currently available?
- Much of the fracking fluid return to the surface as toxic waste. Where will the discharge go?
- Is there the potential for subsurface migration of fracking fluids, or the potential for those fluids to escape into the groundwater by way of a faulty casing?
- What kinds of treatment will be required?

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

[66] 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).

[67] U.S. Environmental Protection Agency, Draft Investigation of Ground Water Contamination near Pavillion, Wyoming (2011) ("USEPA Draft Pavillion Investigation"); DiGiulio, Dominic C. et al. Impact to Underground Sources of Drinking Water and Domestic Wells from Production Well Stimulation and Completion Practices in the Pavillion, Wyoming, Field, Environ. Sci. Technol., 2016, 50 (8), pp. 4524–4536, abstract available at http://pubs.acs.org/doi/abs/10.1021/acs.est.5b04970.

[68] 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. Sco. Technol., DOI: 10.1021/es4011724 (published online July 25, 2013) ("Fontenot 2013").

[69] 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").

[70] 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").

[71] Begos, K., *Four States Confirm Water Pollution*, Associated Press (January 5, 2014), *available at* 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).

- What is the potential footprint and impact of the necessary treatment facilities?

BLM's analysis of potential impacts to water must take account of all significant and "foreseeable" impacts to water that may arise from the sale, including the following issues.

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.[72] 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.[73] As much as 25 percent of fracking chemicals are carcinogens,[74] and flowback can even be radioactive.[75] 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 these impacts 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.[76] This waste can reach fresh water aquifers and drinking water.

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.[77] If spilled, the effects of produced water or brine can be more severe and longer-lasting than oil spills, because salts do not biodegrade or break down over time.[78] The only way

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[72] 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").

[73] 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").

[74] Colborn 2011.

[75] 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).

[76] EPA 2015 at ES-12.

[77] 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; Lauer, Nancy E. Brine Spills Associated with Unconventional Oil Development in North Dakota. Environmental Science & Technology Article ASAP, DOI: 10.1021/acs.est.5b06349 (April 27, 2016), available at http://pubs.acs.org/doi/abs/10.1021/acs.est.5b06349 (finding contaminants such as ammonium, selenium, and lead at produced-water spill sites in North Dakota, and contamination in violation of national water quality regulations

[78] *Id.* at G (observing contamination from produced water "is remarkably persistent in the environment" and "elevated levels of salts and trace elements…can be preserved in spill sites for at least months to years"); King, Pamela, *Limited study supports findings on bigger brine spill risks*, E&E News (Nov. 4, 2015) ("King 2015").

to deal with them is to remove them.[79] The accumulation of long-lived isotopes of radium has been observed in the sediments and soils of produced-water spill sites.[80] Due to its relatively long half-life, radium contamination could remain in the soil for thousands of years.[81] 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.[82] Given the massive volumes of chemicals and wastewater produced, their potentially harmful constituents, and their persistence in the environment, the potential for environmental disaster is real.

Fluids must be transported to and/or from the well, which presents opportunities for spills.[83] 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. Government Accountability Office (GAO) study found that up to 1,365 truck loads can be required just for the drilling and fracturing of a single well pad[84] 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).[85] 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.[86]

The EIS should evaluate how often accidents can be expected to occur, and the effect of chemical and fluid spills on present resources. Such analysis should also include identification of the particular harms faced by communities near oil and gas fields. 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.[87] 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 causes of spills include equipment failure (most commonly, blowout

[79] *Id.*
[80] Lauer 2016 at G.
[81] *Id.*
[82] King 2015.
[83] Warco, Kathy, *Fracking truck runs off road; contents spill*, Observer Reporter (Oct 21, 2010).
[84] 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.
[85] NYDEC SGEIS at Ch. 6 Potential Environmental Impacts (2015) at 6-306 –*available at* http://www.dec.ny.gov/docs/materials_minerals_pdf/fsgeis2015.pdf.
[86] 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).
[87] EPA 2015 at ES-10.

preventer failure, corrosion and failed valves) and failure of container integrity.[88] Spills can result from accidents, negligence, or intentional dumping.

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 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.[89] Fracking and other unconventional techniques likewise pose inherent risks to groundwater due to releases below the surface, and these risks must be properly evaluated.[90] 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.[91] 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,[92] Wyoming,[93] Pennsylvania,[94] Ohio,[95] West Virginia,[96] and Texas.[97] 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.[98] Older wells that

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[88] EPA 2015 at ES-11.
[89] *See, e.g.*, Fontenot 2013; Jackson 2013.
[90] Vengosh 2014.
[91] Myers, Tom, Potential Contamination Pathways from Hydraulically Fractured Shale to Aquifers, National Groundwater Association (2012).
[92] 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).
[93] U.S. Environmental Protection Agency, Draft Investigation of Ground Water Contamination Near Pavillion, Wyoming (2011) ("EPA Draft Pavillion Investigation").
[94] 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").
[95] 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.*
[96] Begos, Seattle Times, Jan 6. 2014.
[97] Darrah 2014.
[98] 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 Conservation (Jan 8, 2013); *see also* Davies, Richard J. et al. Oil and gas wells and their integrity: Implications for shale and unconventional resource exploitation, Marine and Petroleum Geology 56 (2014) 239e254, available at http://ac.els-cdn.com/S0264817214000609/1-s2.0-S0264817214000609-main.pdf?_tid=7344676e-d5f1-11e5-9200-

may not have been designed to withstand the stresses of hydraulic fracturing but which are reused for this purpose are especially vulnerable.[99]

Current federal rules do not ensure well integrity. 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.

Also, fluids and hydrocarbons may contaminate groundwater by migrating through newly created or natural fractures.[100] 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."[101] 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.

A well in which stimulation operations are being conducted may also "communicate" with nearby wells, which may lead to groundwater and surface contamination, particularly if the nearby wells are improperly constructed or abandoned.[102] 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.[103] 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.[104] Wells as far away as 1.8 miles away have provided pathways for surface contamination.[105] The EIS must consider long-term studies on the potential for fluid migration through newly created subsurface pathways

According to the EPA, "evidence of any fracturing-related fluid migration affecting a drinking water resources…could take years to discover."[106] Another study based on modeling

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00000aab0f02&acdnat=1455767050_bdf90f64ecdb607187778614024039c4 (documenting 6.3% of wells in the Marcellus shale experienced well barrier or integrity failure between 2005 and 2013).

[99] EPA 2015 at 6-11.

[100] 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).

[101] EPA 2015 at 6-55.

[102] *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.

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

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

[105] King, Pamela, *'Frack hits' provide pathways for methane migration study*, E&E News (Oct. 21, 2015).

[106] EPA 2015 at 6-56 – 6-57.

found that advective transport of fracking fluid from a fracked well to an aquifer could occur in less than 10 years.[107]

Contamination of groundwater of drinking water sources is a real risk. The EPA's Draft Investigation of Groundwater Contamination near Pavillion, Wyoming, found that chemicals found in samples of groundwater were from fracked wells.[108] These results have been confirmed with follow-up analyses.[109] Groundwater contamination in the Barnett Shale region is likely a result of unconventional well development activities.[110] One study detected "multiple volatile organic carbon compounds throughout the region, including various alcohols, the BTEX family of compounds, and several chlorinated compounds" in private and public drinking water well samples drawn from aquifers overlying the Barnett shale formation."[111] Another study found that "arsenic, selenium, strontium and total dissolved solids (TDS) exceeded the Environmental Protection Agency's Drinking Water Maximum Contaminant Limit (MCL) in some samples from private water wells located within 3 km of active natural gas wells.[112] Many of the detected compounds were associated with unconventional oil and gas extraction.[113]

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.[114] At the surface, pits or tanks can leak fracking fluid or waste.[115] Surface pits, in which wastewater is often dumped, are a major source of pollution. In California, a farmer was awarded $8.5 million in damages after his almond trees died when he irrigated them with well water that had been contaminated by nearby oil and gas operations. The contamination was traced to unlined pits where one of California's largest oil and gas producers for decades dumped billions of gallons of wastewater that slowly leached pollutants into nearby groundwater.[116]

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[107] Myers, Tom, Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers, Ground Water 50, no. 6, p. 1 (2012).
[108] EPA Draft Pavillion Investigation.
[109] 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).
[110] Hildenbrand, Zacariah, A Comprehensive Analysis of Groundwater Quality in The Barnett Shale Region, Environ. Sci. Technol. Just Accepted Manuscript June 16, 2015) DOI: 10.1021/acs.est.5b01526
[111] *Id.*
[112] 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").
[113] *Id.*
[114] Natural Resources Defense Council, Water Facts: Hydraulic Fracturing Can Potentially Contaminate Drinking Water Sources (2012) at 2; Food and Water Watch, The Case for a Ban on gas Fracking (June 2011) at 7 ("Food & Water Watch 2011")
[115] *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.
[116] Renee Sharp & Bill Allayuad, California Regulator: See No Fracking, Speak No Fracking at 6 (2012); *see also* Miller, Jeremy, *Oil and Water Don't Mix with California Agriculture*, High Country News (2012).

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.[117] In some areas hydraulic fracturing may occur at shallower depths or within the same formation as drinking water resources, resulting in direct aquifer contamination.[118] 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.[119] 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 any proposed setbacks must be evaluated.

3. Water Depletion

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 required to frack each well.[120] These volumes far exceed the amounts used in conventional natural gas development.[121]

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.[122]

Withdrawal of large quantities of freshwater from streams and other surface waters will undoubtedly have an impact on the environment.[123] 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 Colorado, farmers have had to fallow fields due to

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[117] 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).

[118] EPA 2015 at ES-15.

[119] 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).

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

[121] *See* Clark, Corrie E. et al., Life Cycle Water Consumption for Shale Gas and Conventional Natural Gas, Environ. Sci. Technol., 2013, 47 (20), pp 11829–11836, abstract *available at* http://pubs.acs.org/doi/abs/10.1021/es4013855.

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

[123] *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.

astronomical water prices.[124] 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.[125] Reductions in stream flows may also lead to downstream water quality problems by diminishing the water bodies' capacity for dilution and degradation.

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.[126] Depleted aquifer water resources may also adversely affect agriculture, species habitat and ecosystems, and human health.

The freshwater in the planning areas therefore would be greatly affected by the increased demand for water if fracking and other unconventional oil and gas extraction are permitted. A 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 planning area due to climate change, drought, and increasing population growth.

B. Disposal of Drilling and Fracking Wastes Will Contaminate Water Resources

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 underground injection disposal wells.[127]

[124] 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.

[125] *Id.*

[126] Freyman, Monika and Ryan Salmon, Hydraulic Fracturing and Water Stress: Growing Competitive Pressures for Water, CERES, 9 (2013) ("Freyman 2013"), *available at* http://www.ceres.org/resources/reports/hydraulic-fracturing-water-stress-water-demand-by-the-numbers.

[127] EPA 2015, 8-20, 8-36, 8-48, 8-65, 8-70; USGS, Indication of Unconventional Oil and Gas Wastewaters Found in Local Surface Waters, available at http://toxics.usgs.gov/highlights/2016-05-09-uog_wastes_in_streams.html.

U.S. EPA has found that California's Class II underground injection well program to be insufficiently protective of groundwater resources.[128]

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

C. 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 areas for lease. 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,[129] it is particularly important that the impact of runoff is considered as part of the NEPA process.

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. Oil and gas activities could also increase the risk of toxic spills and leaks, harming aquatic species that inhabit areas downstream from spill sites. A pair of studies that compared water quality downstream from a wastewater injection site in West Virginia to that of upstream areas found (1) downstream sites had elevated levels of endocrine-disrupting chemicals at levels known to adversely affect aquatic organisms; and (2)

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[128] 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).

[129] 33 U.S.C. § 1342(l)(2).

microbial communities in downstream sediments had lower diversity and shifts in community composition, altering microbial activity and potentially impacting nutrient cycling.[130]

Physical habitats such as banks, pools, runs, and 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.

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

Oil and gas development, and particularly the practice of fracking, pose an immense threat to water resources. 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.[131] 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.[132] 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.

V. 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

[130] Akob, D.M., et al., 2016, Wastewater disposal from unconventional oil and gas development degrades stream quality at a West Virginia injection facility: Environmental Science and Technology, doi:10.1021/acs.est.6b00428 (Advanced Web release); Kassotis, C.D., et al., 2016, Endocrine disrupting activities of surface water associated with a West Virginia oil and gas Industry wastewater disposal site: Science of the Total Environment, v. 557–558, p. 901910, doi:10.1016/j.scitotenv.2016.03.113. The two studies are summarized at: http://toxics.usgs.gov/highlights/2016-05-09-uog_wastes_in_streams.html.

[131] 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).

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

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. BLM should disallow new leasing, or else adopt a no-fracking alternative, which 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

Unconventional oil and gas operations emit large amounts of toxic air pollutants,[133] 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.[134] 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.[135] 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.[136] 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.[137] The VOCs emitted include the BTEX compounds – benzene, toluene, ethyl benzene, and xylene – which are listed as Hazardous Air Pollutants.[138] There is substantial evidence showing the grave harm from these pollutants.[139] Recent studies and reports confirm the pervasive and extensive amount of VOCs emitted by unconventional oil and gas extraction.[140] In particular, a study

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[133] 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.
[134] U.S. EPA, Hazardous Air Pollutants, *available at* http://www.epa.gov/haps (accessed Jan. 10, 2016).
[135] Center for Biological Diversity, Air Toxics One Year Report, p. 1 (June 2014).
[136] 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).
[137] 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.
[138] 42 U.S.C. § 7412(b).
[139] Colborn 2011; McKenzie 2012; Food & Water Watch 2011.
[140] 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).

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.[141] Another study determined that vehicle traffic and engine exhaust were likely the sources of intermittently high dust and benzene concentrations observed near well pads.[142] Recent studies have found that oil and gas operations are likely responsible for elevated levels of hydrocarbons such as benzene downwind of the Denver-Julesburg Fossil Fuel Basin, north of Denver.[143] Another study found that oil and gas operations in this area emit approximately 55% of the VOCs in northeastern Colorado.[144]

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,[145] 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.[146] 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.[147] 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 . . . ."[148]

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.[149] Ozone can result in serious health conditions, including heart and lung disease and mortality.[150] A recent study of ozone pollution in the Uintah Basin of northeastern Utah, a rural area that experiences hazardous tropospheric ozone

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

[142] McCawley 2013.

[143] 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").

[144] 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).

[145] *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.

[146] Fiore, Arlene et al., Linking Ozone Pollution and Climate Change: The Case for Controlling Methane, 29 Geophys. Res Letters 19 (2002).

[147] 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).

[148] 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.

[149] 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.

[150] U.S. Environmental Protection Agency, Integrated Science Assessment (ISA) for Ozone (O3) and Related Photochemical Oxidants (2013).

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.[151]

Oil and gas operations can also emit hydrogen sulfide. The hydrogen sulfide is contained in the natural gas and makes that gas "sour."[152] Hydrogen sulfide may be emitted during all stages of operation, including exploration, extraction, treatment and storage, transportation, and refining. Long-term exposure to hydrogen sulfide is linked to respiratory infections, eye, nose, and throat irritation, breathlessness, nausea, dizziness, confusion, and headaches.[153]

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[154] that is especially harmful.[155] Vehicles traveling on unpaved roads also kick up fugitive dust, which is particulate matter.[156] Further, both NO_X and VOCs, which as discussed above are heavily emitted by the oil and gas industry, are also particulate matter precursors.[157] Some of the health effects associated with particulate matter exposure are "premature mortality, increased hospital admissions and development of chronic respiratory disease."[158]

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.[159] 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.[160] 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

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[151] 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, Environ Sci and Technology (Jan 14, 2013), DOI: 10.1021/es304119a.

[152] Sierra Club Comments.

[153] U.S. Environmental Protection Agency, 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").

[154] Earthworks, Sources of Oil and Gas Pollution (2011).

[155] Bay Area Air Quality Management District, Particulate Matter Overview, Particulate Matter and Human Health (2012).

[156] 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").

[157] EPA RIA at 2-2.

[158] 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).

[159] Colborn 2011 at 8.

[160] 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").

amounts of particulate matter emissions.[161] Further, these proppants often include silica sand, which increases the risk of lung disease and silicosis when inhaled.[162] 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.[163]

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 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.

B. Sources of Air Emissions

Harmful air pollutants are emitted during every stage 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 result 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.[164] 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.[165]

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 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.

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[161] *Id.*

[162] 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.

[163] SCAQMD Revised Draft Staff Report PR1148-2 at 15.

[164] 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").

[165] Allen, D. T. *et al., (2013), Measurements of Methane Emissions at Natural Gas Production Sites in the United States*, 110 *Proc.* Natl. Acad. Sci. 44 (2013) ("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.

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.[166]
>
> *Sulfur Dioxide* (SO_2) has been shown to cause an array of adverse respiratory effects including bronchoconstriction and increased asthma symptoms.[167] 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.[168]
>
> *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.[169] 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 (reduced oxygen to the heart), often accompanied by chest pain (angina), when exercising

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[166] 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).

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

[168] *Id.*

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

or under increased stress.[170] 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.[171]

Ozone (O_3) can trigger or worsen asthma and other respiratory ailments.[172] 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.[173]

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, Colorado, detected 57 chemicals between July 2010 and October 2011, including 44 with reported health effects.[174] 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.[175]

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.[176] While none of the detected chemicals exceeded governmental safety thresholds of exposure, the study

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[170] *Id.*
[171] *Id.*
[172] U.S. Environmental Protection Agency, Ground Level Ozone, *available at* http://www.epa.gov/airquality/ozonepollution/health.html (accessed July 29, 2015).
[173] 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) ("Colborn 2012); *see* note 120 & accompanying text below.
[174] Colborn et al., An Exploratory Study of Air Quality Near Natural Gas Operations, 20 Human and Ecological Risk Assessment: An International Journal. 1, 21-22 (2012) (pages refer to page numbers in attached manuscript and not journal pages) ("Colborn 2012"), *available at* http://www.tandfonline.com/doi/full/10.1080/10807039.2012.749447.
[175] Colborn 2012, p. 11.
[176] *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."[177] 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.[178] 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.[179] 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.[180]

Another study reviewed exposures to emissions from unconventional natural gas development 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.[181].

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.

VI. Fossil Fuel Development Will Exacerbate Climate Change

BLM must take a hard look, pursuant to NEPA, at 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 and gas 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.

[177] *Id.*, pp. 11-12.
[178] *Id.* p. 12.
[179] *Id.*, p. 10-11.
[180] *Id.*, p. 12.

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.

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 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. Significant sources of emissions in oil production include pneumatic devices, dehydrators and pumps, and compressors, and system upsets.[182]

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.[183] New research shows methane leakage from some gas wells may be as high at 17.3 percent.[184] Moreover, new research has shown that unconventional gas wells are up to 2.7 times more likely than a conventional well to have a cement or casing impairment, which can lead to methane leaks.[185] The intersection of new fractures with nearby

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[182] U.S. Environmental Protection Agency, National Gas STAR Program, Basic Information, Major Methane Emission Sources and Opportunities to Reduce Methane Emissions ("USEPA, Basic Information").

[183] 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").

[184] Caulton, Dana R. et al., *Toward a Better Understanding and Quantification of Methane Emissions from Shale Gas Development*, 111 Proc. Natl. Acad. Sciences 17 (2014); Schneising, Oliver, et al., Remote Sensing of Fugitive Methane Emissions from Oil and Gas Production in North American Tight Geologic Formations, Earth's Future 2, doi:10.1002/2014EF000265 (2014); Allen, D. T. *et al., (2013), Measurements of Methane Emissions at Natural Gas Production Sites in the United States*, 110 *Proc.* Natl. Acad. Sci. 44 (2013) ("Allen 2013"); *Zavala-Araizaa, Daniel et al., Reconciling divergent estimates of oil and gas methane emissions, 112 Proc. Natl. Acad. Sciences 51 (2015), available at* www.pnas.org/cgi/doi/10.1073/pnas.1522126112 *(leakage rate 1.5% of production in Barnett shale or twice EPA's estimate); Vaidyanathan, G, Bad news for the climate as methane leaks far surpass previous estimates,E&E News (Dec. 8, 2015) (leakage rate in Barnett shale equal to annual emissions of 8,000 cars).*

[185] Ingraffea, Anthony R, et al., *Assessment and Risk Analysis of Casing and Cement Impairment in Oil and Gas Wells in Pennsylvania, 2000 – 2012*, 111 Proc. Natl. Acad. Sciences 30 (2014).

abandoned wells can also result in methane migration to the surface.[186] Leakage can also occur during storage, processing, and distribution to customers.[187]

Natural gas emissions are generally about 84 percent methane.[188] 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.[189] 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."[190] 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.[191]

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.[192] 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.[193]

The EIS must weigh the no-leasing and no-fracking alternatives' climate-change benefits against the impacts of allowing new leasing and fracking, and 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

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[186] King, Pamela. *'Frack hits' provide pathways for methane migration study* , E&E News (Oct. 21, 2015).
[187] Howarth, R. W. A bridge to nowhere: methane emissions and the greenhouse gas footprint of natural gas, Energy Science and Engineering 2014; 2(2): 47–60, 49 ("Howarth 2014").
[188] 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").
[189] 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).
[190] 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).
[191] 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).
[192] 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. Nat'l. Acad. Sci. 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)
[193] Tollefson, Jeff, *Methane leaks erode green credentials of natural gas*, Nature News (Jan 2, 2013).

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 planning area, (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

In addition to quantifying the total emissions that would result from the lease sale, an EIS should consider the environmental effects of these emissions, resulting from climate disruption's ecological and social effects.[194] Release of greenhouse gases (from extraction, leakage, and downstream combustion) is not merely a reasonably foreseeable consequence of fracking extraction, it is the necessary and intended consequence. CEQ and the courts have repeatedly cautioned federal agencies that they cannot ignore either climate change generally, or the combustion impacts of fossil fuel extraction in particular.[195]

Under the Paris Agreement, discussed above in Section I subsection "A", nearly 200 governments, including the United States, agreed to the commitments enumerated in the Paris Agreement to "strengthen the global response to the threat of climate change."[196] The Paris Agreement codified the international consensus that the climate crisis is an urgent threat to human societies and the planet, with the parties recognizing that:

> Climate change represents an *urgent and potentially irreversible threat to human societies and the planet* and thus requires the widest possible cooperation by all countries, and their participation in an effective and appropriate international response, with a view to accelerating the reduction of global greenhouse gas emissions (emphasis added).[197]

Numerous authoritative scientific assessments have established that climate change is causing grave harms to human society and natural systems, and these threats are becoming increasingly dangerous. The Intergovernmental Panel on Climate Change (IPCC), in its 2014 Fifth Assessment Report, stated that: "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" and that "[r]ecent climate

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[194] *See* Council on Environmental Quality, Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts 11 (Dec. 18, 2014), *available at* https://www.whitehouse.gov/administration/eop/ceq/initiatives/nepa/ghg-guidance (instructing agencies to consider indirect and connected actions, including "downstream" emissions). Although the CEQ guidance is still in draft form and not binding, it is arbitrary for agencies to ignore its reasoning without explanation.

[195] *See* 40 C.F.R. §§ 1508.7, 1508.8; *Center for Biological Diversity v. Nat'l Highway Transp. Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008); *Utahns for Better Transp. v. U.S. Dep't of Transp.*, 305 F.3d 1152, 1176 (10th Cir. 2002); *Dine Citizens Against Ruining Our Env't v. U.S. Office of Surface Mining*, 82 F.Supp.3d 1201, 1212-14 (D. Colo. 2015).

[196] Paris Agreement, Art. 2(1).

[197] Paris Agreement, Decision, Recitals.

changes have had widespread impacts on human and natural systems."[198]

The 2014 Third National Climate Assessment, prepared by a panel of non-governmental experts and reviewed by the National Academy of Sciences and multiple federal agencies similarly stated that "That the planet has warmed is 'unequivocal,' and is corroborated though multiple lines of evidence, as is the conclusion that the causes are very likely human in origin"[199] and "[i]impacts related to climate change are already evident in many regions and are expected to become increasingly disruptive across the nation throughout this century and beyond."[200] The United States National Research Council similarly concluded that: "[c]limate change is occurring, is caused largely by human activities, and poses significant risks for—and in many cases is already affecting—a broad range of human and natural systems."[201]

The IPCC and National Climate Assessment further decisively recognize the dominant role of fossil fuels in driving climate change:

> While scientists continue to refine projections of the future, observations unequivocally show that climate is changing and that the warming of the past 50 years is primarily due to human-induced emissions of heat-trapping gases. These emissions come mainly from burning coal, oil, and gas, with additional contributions from forest clearing and some agricultural practices.[202]
> ***
> CO_2 emissions from fossil fuel combustion and industrial processes contributed about 78% to the total GHG emission increase between 1970 and 2010, with a contribution of similar percentage over the 2000–2010 period (*high confidence*).[203]

These impacts ultimately emanating from the extraction and combustion of fossil fuels are harming the United States in myriad ways, with the impacts certain to worsen over the coming decades absent deep reductions in domestic and global GHG emissions. EPA recognized these threats in its 2009 Final Endangerment Finding under Clean Air Act Section 202(a), concluding that greenhouse gases from fossil fuel combustion endanger public health and welfare: "the body of scientific evidence compellingly supports [the] finding" that "greenhouse gases in the atmosphere may reasonably be anticipated both to endanger public health and to

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[198] IPCC AR5 Synthesis Report at 2.
[199] Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment(U.S. Global Change Research Program). doi:10.7930/J0Z31WJ2 ("Third National Climate Assessment") at 61 (quoting IPCC, 2007:. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller, Eds., Cambridge University Press, 1-18.).
[200] Third National Climate Assessment at 10.
[201] National Research Council, Advancing the Science of Climate Change (2010), available at www.nap.edu. ("Advancing the Science of Climate Change") at 2.
[202] Third National Climate Assessment at 2.
[203] IPCC AR5 Synthesis Report at 46.

endanger public welfare."[204] In finding that climate change endangers public health and welfare, EPA has acknowledged the overwhelming evidence of the documented and projected effects of climate change upon the nation:

Effects on air quality: "The evidence concerning adverse air quality impacts provides strong and clear support for an endangerment finding. Increases in ambient ozone are expected to occur over broad areas of the country, and they are expected to increase serious adverse health effects in large population areas that are and may continue to be in nonattainment. The evaluation of the potential risks associated with increases in ozone in attainment areas also supports such a finding."[205]

Effects on health from increased temperatures: "The impact on mortality and morbidity associated with increases in average temperatures, which increase the likelihood of heat waves, also provides support for a public health endangerment finding."[206]

Increased chance of extreme weather events: "The evidence concerning how human induced climate change may alter extreme weather events also clearly supports a finding of endangerment, given the serious adverse impacts that can result from such events and the increase in risk, even if small, of the occurrence and intensity of events such as hurricanes and floods. Additionally, public health is expected to be adversely affected by an increase in the severity of coastal storm events due to rising sea levels."[207]

Impacts to water resources: "Water resources across large areas of the country are at serious risk from climate change, with effects on water supplies, water quality, and adverse effects from extreme events such as floods and droughts. Even areas of the country where an increase in water flow is projected could face water resource problems from the supply and water quality problems associated with temperature increases and precipitation variability, as well as the increased risk of serious adverse effects from extreme events, such as floods and drought. The severity of risks and impacts is likely to increase over time with accumulating greenhouse gas concentrations and associated temperature increases."[208]

Impacts from sea level rise: "The most serious potential adverse effects are the increased risk of storm surge and flooding in coastal areas from sea level rise and more intense storms. Observed sea level rise is already increasing the risk of storm surge and flooding in some coastal areas. The conclusion in the assessment literature that there is the potential for hurricanes to become more intense (and even some evidence that Atlantic hurricanes have already become more intense) reinforces the judgment that coastal communities are now endangered by human-induced climate change, and may face substantially greater risk in the future. Even if there is a low probability of raising the destructive power of hurricanes, this threat is enough to support a finding that coastal communities are endangered by greenhouse gas air pollution. In addition, coastal areas face other adverse impacts from sea level rise such as land loss due to inundation,

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[204] Final Endangerment Finding, 74 Fed. Reg. at 66,497.
[205] *Id.*
[206] *Id.*
[207] *Id.* at 66,497-98.
[208] *Id.* at 66,498.

erosion, wetland submergence, and habitat loss. The increased risk associated with these adverse impacts also endangers public welfare, with an increasing risk of greater adverse impacts in the future."[209]

Impacts to energy, infrastructure, and settlements: "Changes in extreme weather events threaten energy, transportation, and water resource infrastructure. Vulnerabilities of industry, infrastructure, and settlements to climate change are generally greater in high-risk locations, particularly coastal and riverine areas, and areas whose economies are closely linked with climate-sensitive resources. Climate change will likely interact with and possibly exacerbate ongoing environmental change and environmental pressures in settlements, particularly in Alaska where indigenous communities are facing major environmental and cultural impacts on their historic lifestyles."[210]

Impacts to wildlife: "Over the 21st century, changes in climate will cause some species to shift north and to higher elevations and fundamentally rearrange U.S. ecosystems. Differential capacities for range shifts and constraints from development, habitat fragmentation, invasive species, and broken ecological connections will likely alter ecosystem structure, function, and services, leading to predominantly negative consequences for biodiversity and the provision of ecosystem goods and services."[211]

In addition to these acknowledged impacts on public health and welfare more generally, climate change is causing and will continue to cause serious impacts on natural resources that the Department of Interior is specifically charged with safeguarding.[212]

Impacts to Public Lands: Climate change is causing and will continue to cause specific impacts to public lands ecosystem services. Although public lands provide a variety of difficult-to-quantify public benefits, one recent Forest Service attempt at quantification estimates the public land ecosystem services at risk from climate change at between $14.5 and $36.1 billion annually.[213] In addition to the general loss of ecosystem services, irreplaceable species and aesthetic and recreational treasures are at risk of permanent destruction. High temperatures are causing loss of glaciers in Glacier National Park; the Park's glaciers are expected to disappear entirely by 2030, with ensuing warming of stream temperatures and adverse effects to aquatic ecosystems.[214] With effects of warming more pronounced at higher latitudes, tundra ecosystems on Alaska public lands face serious declines, with potentially serious additional climate feedbacks from melting permafrost.[215] In Florida, the Everglades face severe ecosystem

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[209] *Id.*
[210] *Id.*
[211] *Id.*; *see also* Third National Climate Assessment at 195-219.
[212] *See* Federal Land Policy and Management Act of 1976, 43 U.S.C. §§ 1701(a)(8), 1712(c)(1); Multiple-Use Sustained Yield Act of 1960, 16 U.S.C. § 528; National Environmental Policy Act of 1969, 42 U.S.C. §§ 4331-4332.
[213] Esposito, Valerie et al., Climate Change and Ecosystem Services: The Contribution and Impacts on Federal Public Lands in the United States, USDA Forest Service Proceedings RMRS-P-64 at 155-164 (2011).
[214] U.S. Environmental Protection Agency, Climate Change and Public Lands (1999).
[215] *See* National Climate Assessment at 48; Collins, M. et al., Long-term Climate Change: Projections, Commitments and Irreversibility, Ch 12 at 1096-7 in *Climate Change 2013: The Physical Science Basis, Contribution of Working Group 1 to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*

disruption from already-occurring saltwater incursion.[216] Sea level rise will further damage freshwater ecosystems and the endangered species that rely on them.

Impacts to Biodiversity and Ecosystems: Across the United States ecosystems and biodiversity, including those on public lands, are directly under siege from climate change—leading to the loss of iconic species and landscapes, negative effects on food chains, disrupted migrations, and the degradation of whole ecosystems.[217] Specifically, scientific evidence shows that climate change is already causing changes in distribution, phenology, physiology, genetics, species 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 extirpations.[218] Because climate change is occurring at an unprecedented pace with multiple synergistic impacts, climate change is predicted to result in catastrophic species losses during this century. For example, the IPCC concluded that 20% to 30% of plant and animal species will face an increased risk of extinction if global average temperature rise exceeds 1.5°C to 2.5°C relative to 1980-1999, with an increased risk of extinction for up to 70% of species worldwide if global average temperature exceeds 3.5°C relative to 1980-1999.[219]

In sum, climate change, driven primarily by the combustion of fossil fuels, poses a severe and immediate threat to the health, welfare, ecosystems and economy of the United States. These impacts are felt across the nation, including upon the public lands the Secretary of the Interior is charged with safeguarding. A rapid and deep reduction of emissions generated from fossil fuels is essential if such threats are to be minimized and their impacts mitigated.

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

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(2013); MacDougall, A. H., et al., Significant contribution to climate warming from the permafrost carbon feedback, 5 Nature Geoscience 719-721 (2012), doi:10.1038/ngeo1573.

[216] *See* National Climate Assessment at 592; Foti, R., Met al., Signs of critical transition in the Everglades wetlands in response to climate and anthropogenic changes, 110 Proceedings of the National Academy of Sciences6296-6300, (2013), doi:10.1073/pnas.1302558110.

[217] National Climate Assessment at 13.

[218] *See* Parmesan, C. and G. Yohe, A globally coherent fingerprint of climate change impacts across natural systems, 421 Nature 37–42 (2003); Root, T. et al., Fingerprints of global warming on wild animals and plants, 421 Nature 57–60 (2003); Chen, I. et al., Rapid range shifts of species associated with high levels of climate warming, 333 Science 1024–1026 (2011).

[219] Intergovernmental Panel on Climate Change, Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller, Eds., Cambridge University Press (2007). Other studies have predicted similarly severe losses: 15%-37% of the world's plants and animals committed to extinction by 2050 under a mid-level emissions scenario, *see* Thomas et al., Extinction risk from climate change, 427 Nature 145–8 (2004)); the potential extinction of 10% to 14% of species by 2100 if climate change continues unabated, *see* Maclean, I. M. D. and R. J. Wilson, Recent ecological responses to climate change support predictions of high extinction risk, 108 Proceedings of the National Academy of Sciences of the United States of America 12337-12342 (2011); and the loss of more than half of the present climatic range for 58% of plants and 35% of animals by the 2080s under the current emissions pathway, in a sample of 48,786 species, *see* Warren, R. J. et al., Increasing Impacts of Climate Change Upon Ecosystems with Increasing Global Mean Temperature Rise, 106 Climatic Change 141–77 (2011)..

and has previously performed a "social cost of carbon" analysis in prior environmental reviews.[220] 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."[221] 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.[222]

Further, other analytical tools exist to evaluate the cost of methane emissions.[223] EPA has peer reviewed and employed such a tool in its "Regulatory Impact Analysis of the Proposed Emission Standards for New and Modified Sources in the Oil and Natural Gas Sector."[224]

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. BLM must provide an accounting of these potential costs in an EIS.

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[220] *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).

[221] BLM, Roberson Internal Memo.

[222] *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).

[223] *See* Marten A.L., Kopits K.A., Griffiths C.W., Newbold S.C., Wolverton A. 2014, online publication (2015, print publication). "Incremental CH4 and N2O mitigation benefits consistent with the US Government's SC-CO2 estimates," Climate Policy 15(2):272-298, abstract available at http://www.tandfonline.com/doi/abs/10.1080/14693062.2014.912981.

[224] *See* USEPA, Social Cost of Carbon, *available at* http://www3.epa.gov/climatechange/EPAactivities/economics/scc.html (noting application of social cost of methane supported by peer review); USEPA, Regulatory Impact Analysis of the Proposed Emission Standards for New and Modified Sources in the Oil and Natural Gas Sector, Ch. 4, available at http://www3.epa.gov/airquality/oilandgas/pdfs/og_prop_ria_081815.pdf.

VII. Impacts to Sensitive Species of Plants and Wildlife

The expansion of oil and gas development activities will harm wildlife 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 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.[225] 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,"[226] a no-fracking alternative minimizing industrial development and its harmful effects on wildlife must be considered.

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.[227]

[225] *See* Center for Biological Diversity, Review of Impacts of Oil and Gas Exploration and Development Activity on Wildlife (June 20, 2015). This review presents the findings of numerous studies and reports on the impacts of hydraulic fracturing on wildlife.
[226] 43 U.S. Code § 1701(a)(8).
[227] 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).

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, 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.[228]

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. For example, one study found that grassland bird species' habitat have been degraded by oil development in the Bakken shale region, as evidenced by their avoidance of these areas. Grassland birds avoided areas within 150 meters of roads, 267 meters of single-bore well pads, and 150 meters of multi-bore well pads.[229] In areas of dense development, these habitat effects are greatly multiplied for sensitive species, such as the Sprague's pipit (*Anthus spragueii*), which avoided areas within 350 meters of single-bore well pads. The EIS must quantify the potential cumulative loss of habitat for sensitive species.[230]

B. Water Depletion

Water depletion also affects 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

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[228] Johnson, N., Pennsylvania energy impacts assessment: Report 1: Marcellus shale natural gas and wind, Nature Conservancy – Pennsylvania Chapter (2010) at 10.

[229] Thompson, Sarah J. et al. Avoidance of unconventional oil wells and roads exacerbates habitat loss for grassland birds in the North American great plains, Biological Conservation 192 (2015) 82–90, *available at* https://www.researchgate.net/publication/282292567_Avoidance_of_unconventional_oil_wells_and_roads_exacerbates_habitat_loss_for_grassland_birds_in_the_North_American_great_plains.

[230] *Id.*

and domestic animals. In 2013, a company admitted to dumping wastewater from fracking operations into the Acorn Fork Creek in Kentucky, causing a massive fish kill.[231] Among the species harmed was the blackside dace, a threatened minnow species.[232] 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.[233] The discharge of fracking wastewater into the Susquehanna River in Pennsylvania is suspected to be the cause of fish abnormalities, including high rates of spots, lesions, and intersex.[234] 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.[235]

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.[236] 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.[237] Recently, new information has come to light that operators in California have been dumping wastewater into hundreds of unpermitted open pits.[238] The EIS must take into account the impact of both unpermitted, illegal waste pits as well as those that are regulated.

Contaminants from spills not only directly harm species exposed to these contaminants but can enter the food chain and harm predators. A recent study found that in watersheds where hydraulic fracturing occurs, a top predator , riparian songbird in headwater systems, the Louisiana Waterthrush (*Parkesia motacilla*), accumulated metals associated with the fracking process. "In both the Marcellus and Fayetteville shale regions, barium and strontium were found at significantly higher levels in feathers of birds in sites with fracking activity than at sites without fracking."[239] While the study did not resolve the pathway for these metals entering the

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[231] 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).
[232] *Id.*
[233] 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).
[234] 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
[235] Adams, Mary Beth, Land Application of Hydrofracturing Fluids Damages a Deciduous Forest Stand in West Virginia, 40 Journal of Environmental Quality 1340 (2011).
[236] *See, e.g.,* Ramirez, P. Jr., Bird Mortality in Oil Field Wastewater Disposal Facilities, 46 Environ Mgmt 5: 820 (2010).
[237] 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) ("Zou 2006").
[238] 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.
[239] Latta, Steven C., et al., Evidence from two shale regions that a riparian songbird

food chain, their findings suggested that "hydraulic fracturing may be contaminating surface waters and underscores the need for additional monitoring and study to further assess ecological and human health risks posed by the increasingly widespread development of unconventional sources of natural gas around the world."[240]

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.[241] Climate disruption is already causing changes in distribution, phenology, physiology, genetics, species 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.[242] 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.[243] Other studies have predicted similarly severe losses: 15-37 percent of the world's

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accumulates metals associated with hydraulic fracturing," *Ecosphere* vol. 6(9), Article 144 (September 2015), *available at* http://www.esajournals.org/doi/pdf/10.1890/ES14-00406.1.

[240] *Id.*

[241] Warren, R. et al., Quantifying the benefit of early climate change mitigation in avoiding biodiversity loss, 3 Nature Climate Change 678 (2013) ("Warren 2013").

[242] 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").

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

plants and animals committed to extinction by 2050 under a mid-level emissions scenario[244]; the extinction of 10 to 14 percent of species by 2100 if climate change continues unabated.[245] 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.[246] 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.[247] In Wyoming, an increasing density of wells was associated with decreased numbers of Brewer's sparrows, sage sparrows, and vesper sparrows.[248] In the Fayetteville Shale of central Arkansas, the proportional abundance of sensitive aquatic taxa, including darters, was negatively correlated with gas well density.[249] The EIS must consider the population-level impacts that oil and gas development may have on wildlife in the planning areas.

G. Endangered, Threatened, and Sensitive Species

BLM must use the existing readily available data to identify which endangered, threatened, or sensitive species that are of critical concern with regards to the lands included in, or in immediate proximity to, the proposed sale parcels. BLM's EIS must discuss any impacts to such species, including the Gunnison sage-grouse, Colorado greenback cutthroat trout, and any 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.

In addition, BLM must consult with the Service regarding the impacts of the lease sale on affected listed species, in compliance with its section 7 obligations under the ESA. To the extent that BLM relies on its section 7 programmatic consultations for the several management plans governing the lease sale, that reliance is not proper for any of the listed species affected by BLM's action. The potential for fracking and horizontal drilling and its associated impacts within the planning area constitutes "new information reveal[ing] effects of the [RMPs] that may affect

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[244] Thomas, C.D. et al., Extinction Risk from Climate Change, 427 Nature 8:145 (2004).
[245] Maclean and Wilson 2011.
[246] Warren 2013.
[247] Holloran, M.J. et al., Yearling Greater Sage-Grouse Response to Energy Development in Wyoming, 74 Journal of Wildlife Management 1:65 (2010).
[248] Gilbert, Michelle M. & Anna D. Chalfoun, Energy Development Affects Populations of Sagebrush Songbirds in Wyoming, 75 The Journal of Wildlife Management 4:816 (2011).
[249] 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).

listed species or critical habitat in a manner or to an extent not previously considered [in the prior section 7 programmatic consultations]." 50 CFR § 402.16(b). BLM must therefore reinitiate consultation on all of the planning documents for these areas. In any case, it must formally consult over the lease sale's potential adverse effects on listed species and consider the full scope of fracking and other drilling activities that could affect these species.

1. The EIS Must Analyze the Impacts of Oil and Gas Development on Gunnison Sage-Grouse Habitat

Many of the parcels are located within the current range of Gunnison sage-grouse and sensitive sage-grouse habitat. BLM must either withdraw these parcels within sage-grouse habitat or prepare an EIS addressing the impacts of new leasing on the species. The recently-revised Tres Rios RMP was found to be likely to adversely impact Gunnison sage-grouse and its critical habitat.[250] 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.[251]

The Gunnison sage-grouse, *Centrocercus minimus*, was listed as threatened under the Endangered Species Act in November 2014.[252] Habitat loss and fragmentation is the primary cause of the species' decline in abundance and distribution.[253] 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

[250] *See* Bureau of Land Management, Record of Decision, Tres Rios Resource Management Plan Revision I-16 (2015);

[251] 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).

[252] U.S. Fish and Wildlife Service, Federal Register Notice: Threatened Status for Gunnison Sage-Grouse, Final Rule 79 Fed. Reg. 69,192 (Nov. 20, 2014) ("Final Listing Rule"). 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).

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

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).[254]

The Monticello-Dove Creek and San Miguel Basin areas in particular have been a principle areas of sagebrush loss,[255] and the Fish and Wildlife Service (or "the Service") has identified oil and gas development as a stressor likely to increase in the future.[256]

Significantly, the Service found that the Monticello-Dove Creek and San Miguel Basin populations only barely exceed the population and habitat requirements necessary to sustain a viable population[257] and that currently-occupied population may not be enough to sustain the long-term viability of that population:

> 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 the Tres Rios RMP Revision FEIS, completed prior to the listing of the species, does not address with any specificity the questions of (a) whether the areasproposed for leases 7795, 7797, 7798, and 7801 is potentially suitable for habitat or species restoration or recovery, and therefore potentially essential for the conservation of the Monticello-Dove Creek or San Miguel Basin populations or the species as a whole, or (b) whether oil and gas leasing immediately adjacent to critical habitat for the San Miguel Basin

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[254] *Id.* at 69,255-56.
[255] *Id.* at 69,228.
[256] *Id.* at 69,256.
[257] U.S. Fish and Wildlife Service, Federal Register Notice: Designation of Critical Habitat for Gunnison Sage-Grouse ("Final Critical Habitat Rule"), 79 Fed. Reg. at 69,316.

population will jeopardize the continued existence of the species or adversely modify critical habitat.

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.[258] 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 2015 TRFO RMP nor the 2013 RMP FEIS contains any analysis of whether the areas proposed for leasing are suitable and/or necessary for recovery of a viable Gunnison sage-grouse San Miguel Basin population. 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.

Based on our comparison of nominated parcel data with Fish and Wildlife Service critical habitat data, it appears that BLM proposes to defer all or portions of nominated parcels 7786, 7793, 7794, 7795, 7797, 7798, 7801, and 7804 that fall directly within designated critical habitat for the San Miguel Basin population.[259] We strongly support the deferral and exclusion of all designated critical habitat from leasing. However, the remaining portions of parcels 7795, 7797, 7798, 7799, 7801, 7802, 7804, 7805, and 7806 proposed for leasing all fall within two miles or less of Gunnison sage-grouse critical habitat. As BLM is certainly aware, extensive scientific literature shows adverse impacts from oil and gas development on other grouse species with similar habitat needs from a minimum proximity of two miles up to a maximum of 12.4 miles.[260] BLM must analyze prior to leasing, under both NEPA and ESA Section 7, the reasonably foreseeable indirect and cumulative effects of leasing and resulting drilling activity on the San Miguel Basin population of Gunnison sage-grouse. This analysis must include a hard look at the foreseeable amount and location of well pads, roads, pipelines, compressors and other infrastructure and amount and timing of human activity, and how this may affect the San Miguel Basin population, its occupied and unused seasonal habitats, and its potential for recovery.

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[258] 50 C.F.R. §402.14(g)(3).

[259] See Center for Biological Diversity, Maps of Feb 2017 Nominated Parcels and Gunnison Sage-Grouse Critical Habitat (June 2016) ("Gunnison Sage-Grouse Habitat Maps").

[260] *See* Daniel J. Manier et al., Conservation Buffer Distance Estimates for Greater Sage-Grouse—A Review, USGS Open File Report 2014-1239.

In listing the Gunnison sage-grouse as threatened rather than endangered, the Fish and Wildlife Service relied on a conclusion that "we consider the development of leasable minerals such as oil and gas a low threat to the species," based on the fact that only a small number of wells are currently active within (25) or adjacent to (18) occupied habitat.[261] Prior to leasing additional minerals adjacent to critical habitat, BLM and the Service must take a hard look at the foreseeable development that could result from that leasing, and whether a significant change in the amount of drilling in the San Miguel Basin area could alter the degree to which oil and gas development threatens the species' survival and recovery.

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 depletions within and adversely affect endangered fish that inhabit areas downstream of the lease areas. 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.[262] 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.[263]

The 2013 RMP EIS – published five years after the PBO was adopted – 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

[261] 79 Fed. Reg. at 69,223.

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.[264]

The 2013 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-feet, or approximately 496 acre-feet to 589 acre-feet per year.[265] 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.[266]

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.[267] 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.[268] 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,[269] but the PBO assumed that within the Grand Junction planning area 0.77 acre-feet per well would be depleted.[270] 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.

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[262] BLM Instruction Memorandum CO-2011-022 (April 11, 2011) ("All of the estimates in the PBO were based on using conventional vertical drilling technology.").
[263] PBA at 8.
[264] Tres Rios RMP EIS at 244.
[265] *Id.* at 245.
[266] 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.
[267] *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.
[268] *See id.*
[269] BLM 2011-2014 Water Depletion Logs submitted to Fish & Wildlife Service.
[270] PBA at 8.

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 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.[271] More than 300 earthquakes with magnitude (M) $\geq$ 3 occurred between 2010 through 2012, compared with an average of 21 per year between 1967 and 2000.[272] Moreover, although earthquakes with magnitude (M) $\geq$ 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.[273] Mid-continent states experiencing elevated levels of seismic activity include Arkansas, Colorado, New Mexico, Ohio, Oklahoma, Texas, and Virginia.[274]

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.[275] Much of the fracking wastewater is a byproduct of oil and gas production and is routinely disposed of by

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[271] 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").
[272] Ellsworth 2013.
[273] Keranen 2013.
[274] Ellsworth 2013.
[275] *Id.*

injection into wells specifically designed and approved for this purpose. The injected fluids push stable faults past their tipping points, and thereby induce earthquakes.[276] 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.[277] 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.[278] 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.[279] Other large earthquakes attributed to wastewater injection include an M5.3 in Colorado,[280] M4.9 in Texas,[281] M4.7 in Arkansas,[282] and M3.9 in Ohio.[283]

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,[284] and the Department of Energy[285]:

(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;

[276] 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.

[277] 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.

[278] Chow, Lorraine. November 19, 2015. Strong Earthquake Rattles Oklahoma, Felt in 7 Other States. https://ecowatch.com/2015/11/19/oklahoma-earthquake-fracking/

[279] Ellsworth 2013, Keranen 2013.

[280] Rubinstein, J.L. et al., The 2001–present triggered seismicity sequence in the Raton Basin of southern Colorado/northern New Mexico, 104 Bull. Seismol. Soc'y of America 5 (2014).

[281] 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).

[282] 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).

[283] 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).

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

[285] 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).

(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);

(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. BLM Must Defer Leasing Pending Designation of Areas of Critical Environmental Concern

The BLM's Tres Rios Field Office is currently "preparing a Resource Management Plan (RMP) Amendment and associated Environmental Assessment (DOI-BLM-CO-S010-2016-0018-EA) for the Tres Rios Field Office in order to evaluate and consider management prescriptions for 18 Areas of Critical Environmental Concern (commonly known as ACECs) nominated during scoping for the Tres Rios Field Office RMP." Proposed leases 7378 and 7792 fall within the Dry Creek Basin Area of Critical Environmental Concern currently undergoing evaluation by the BLM.[286] In order to preserve the opportunity to adopt meaningful protective measures for the Dry Creek Basin ACEC, BLM must, at a minimum, defer the issuance of any new fluid mineral leases pending the completion of the statutorily-required ACEC evaluation and designation process.

FLPMA, 43 U.S.C. § 1712(c), provides that "In the development and revision of land use plans, the Secretary shall give priority to the designation and protection of areas of critical environmental concern." BLM has already found that the Dry Creek Basin meets its "relevance" and "importance" criteria for ACEC designation due to the presence of Gunnison sage-grouse:

> This nominated ACEC contains BLM lands within the San Miguel Basin PCA. Elevation is about 5,300 to 6,700 feet. This nominated ACEC contains the Dry Creek Basin subpopulation of the San Miguel population of the Gunnison sage-grouse (Centrocercus minimus), which is a species that is restricted to a small area in western Colorado and eastern Utah. Its range has diminished due to the loss, fragmentation, and degradation of sagebrush shrublands caused by agricultural development, mining and energy development, reservoirs, power lines, roads, urban development, and treatments to control sagebrush (including burning, mechanical methods, and herbicides). Livestock overgrazing, the spread of non-native grasses and forbs, and the accelerating increase in the size and extent of wildfires due to the widespread invasion by cheatgrass (Braun 1998) have also affected habitat quality. Management of the San Miguel Basin population of the Gunnison sage-grouse is a cooperative effort with the BLM, Colorado Parks and Wildlife (CPW), State Wildlife Areas, Natural Resources Conservation Service, and private landowners, and management is guided by the Gunnison Sage-grouse Rangewide Conservation Plan.
>
> This site meets the relevance criteria because it contains G1 ranked Gunnison sage-grouse (and its habitat), which is a rare (G1 rank) wildlife resource, and this site meets the relevance criteria because the Gunnison sage-grouse is a wildlife resource that is on the BLM State Director's sensitive species list. This site also meets the relevance criteria because it contains G2 ranked Gypsum Valley cat-eye, which is a natural system in the form of a rare (G2 rank) terrestrial plant species. This site also meets the relevance criteria because Gypsum Valley cat-eye is a natural system that is on the BLM State Director's sensitive species list.

[286] *See* Center's Gunnison Sage-Grouse Habitat Maps. Portions of proposed leases 7793, 7794, 7795, and 7797 also fall within the proposed Dry Creek Basin ACEC, but according to Map 3 posted by the BLM Tres Rios Field Office, those areas appear to be proposed for deferral. We support the deferral of all pending ACEC areas from leasing, and BLM should give the same treatment to proposed parcels 7378 and 7792.

> Gunnison sage-grouse meet the importance criteria because its rarity (G1 rank) gives it more than locally significant qualities , which give it special worth, distinctiveness, and cause for concern, and it meets the importance criteria because its rarity gives it qualities or circumstances that make it sensitive, rare, unique, threatened, and vulnerable to adverse change. Gunnison sage-grouse and Gypsum Valley cat-eye also meet the importance criteria because of their designation on the BLM State Director's sensitive species list, which gives them special worth, meaning, distinctiveness, and cause for concern, and which recognizes them as warranting protection in order to carry out the mandates of FLPMA. Gunnison sage-grouse and Gypsum Valley cat-eye also meet the importance criteria because of their designation as high-priority species in the San Juan Biodiversity Model, which gives them special worth, meaning, distinctiveness, and cause for concern, and which recognizes them as warranting protection in order to carry out the mandates of FLPMA.[287]

Because the proposed leasing of areas adjacent to Gunnision sage-grouse critical habitat within the Dry Creek Basin would significantly alter the degree of threat to the species from oil and gas development, BLM cannot rely on the contention that (pre-listing) RMP management measures would be sufficient to alleviate the threat to Gunnison sage-grouse within the Dry Creek ACEC. Therefore, in order to comply with FLPMA's mandate to protect Areas of Critical Environmental Concern, BLM should refrain from leasing within the proposed ACEC at least until it can adequately evaluate the management measures necessary to provide for the survival and recovery of Gunnison sage-grouse.

X. 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.

XI. BLM Must Prepare an Environmental Impact Statement

[287] BLM Tres Rios Final EIS Appendix U, Summary of Findings for Nominated ACECs, at 14.

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.

A. 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.[288] Similarly, the New York Draft DEC concluded that the health and environmental risks from fracking supports its ban in New York State. In Colorado, several anti-fracking grassroots groups have emerged along with petitions to ban the practice in Colorado, which to date have garnered several thousand signatures.[289] 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 the planning area in association with the lease sale is sufficient to trigger the need for an EIS. 40 C.F.R. § 1508.27(b)(4).

B. 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 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"

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[288] U.S. Environmental Protection Agency, Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources (November 2011).

[289] Petitions available at: http://petitions.moveon.org/sign/ban-hydaulic-fracturing http://petitions.moveon.org/sign/stop-fracking-in-colorado

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.

C. 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.[290] 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.[291] 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.[292] 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.

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[290] 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")

[291] Wiserman, Hannah, Untested Waters: the Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation, Fordham Envtl. Law Rev. 115 at 138-39 (2009).

[292] *Id.*

XII. 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. [293]

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) (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 and coal extraction not only fuel the climate crisis but entail significant public health risks and harms to the environment. Accordingly, the

[293] *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)

EIS should thoroughly analyze the alternative of no new fossil fuel leasing, and no fracking or other unconventional well stimulation methods within the TRFO planning area. 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.

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EXHIBIT D

CENTER for BIOLOGICAL DIVERSITY Because life is good.

June 13, 2016

Via Electronic Delivery

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Re: Comments on November 2016 Royal Gorge-Grand Junction-Colorado River Valley-Tres Rios Lease Sale

Dear Ms. Jones, Ms. Sales, and BLM Tres Rios Field Office:

The Center for Biological Diversity (the "Center" or "CBD"), 350 Colorado, Colorado Riverkeeper, Green River Action Project, Living Rivers, Rocky Mountain Wild, and Sierra Club write to submit the following comments on the proposed November 2016 Competitive Oil and Gas Lease Sale. The Bureau of Land Management ("BLM") Grand Junction, Tres Rios, and Royal Gorge Field Offices are asking the public to submit comments on:

(1) a Determination of NEPA Adequacy ("DNA") for the sale of 24 parcels containing 18,349.47 acres in the Grand Junction and Colorado River Valley Field Offices in Mesa and Garfield Counties;

(2) a Determination of NEPA Adequacy for the sale of five parcels containing 4,912.33 acres in the Tres Rios Field Office in Dolores County; and

(3) an Environmental Assessment ("EA") evaluating the sale of six parcels encompassing 1801.63 acres of federal lands in the Royal Gorge Field Office in Huerfano, Las Animas, Lincoln, and Washington Counties.

Several of our groups previously submitted scoping comments on the Royal Gorge, Grand Junction, and Colorado River Valley Field Office lease parcels, which are attached as Exhibit A and incorporated herein by reference. The Center also previously protested the inclusion of the five Tres Rios parcels in the February 2016 lease auction, which BLM deferred until the instant November 2016 lease auction. The protest is attached as Exhibit B and also incorporated here by reference.

For the many reasons discussed in our scoping comments, the Tres Rios protest, and this letter, BLM cannot rely on a Determination of NEPA adequacy for the Grand Junction, Colorado River Valley, and Tres Rios parcels. Various site-specific impacts of the proposed leasing are not addressed in the governing RMP-EISs, and the RMP-EISs do not otherwise fully disclose foreseeable environmental effects of new oil and gas development, including hydraulic fracturing or "fracking." BLM must prepare an EIS, or, at minimum, address these effects in an EA. Likewise, the Environmental Assessment for the Royal Gorge parcels lack adequate site-specific analysis of oil and gas leasing impacts and cannot tier to the outdated Royal Gorge and Northeastern Colorado RMPs, which have not been revised in over 20 years.

I. BLM Cannot Rely on a Determination of NEPA Adequacy for the Grand Junction and Colorado River Valley Parcels

BLM's preparation of Determinations of NEPA Adequacy for parcels within the Grand Junction and Colorado River Valley Field Offices is wholly improper and violates NEPA. The DNAs tier to the Final Environmental Impact Statement for the Resource Management Plan ("RMP-EIS" and "RMP") governing each respective field office, but BLM's reliance on the RMP-EISs is woefully misplaced. Each of the EISs fails to address site-specific impacts that could foreseeably result from new leasing, including impacts on wildlife, water resources, geological hazards, and air quality. Nor do the RMP-EISs provide a complete analysis of the cumulative impacts of new oil and gas development, including greenhouse gas emissions, to properly support a DNA. Further, new information has arisen since the RMPs were adopted, revealing significant, reasonably foreseeable effects that BLM must take into account in its leasing decision, but which the RMPs do not, and could not have, considered.

Case law and NEPA itself make clear that BLM is required to perform and disclose an analysis of environmental impacts *before* the issuance of an oil and gas lease. *N.M. ex rel. Richardson v. BLM*, 565 F.3d 683, 716 (10th Cir. 2009). In the Tenth Circuit, "assessment of all 'reasonably foreseeable' impacts must occur at the earliest practicable point, and must take place before an irretrievable commitment of resources' is made." *Id.* at 718 (citations omitted).

The issuance of a lease is an "irretrievable commitment of resources." *See id.*; *Sierra Club v. Peterson*, 717 F.2d 1409, 1414 (D.C. Cir. 1983); *Pennaco Energy, Inc. v. U.S. Dep't of Interior*, 377 F.3d 1147, 1160 (10th Cir. 2004). Under BLM's interpretation of its regulations,

absent a no surface occupancy stipulation, a lessee cannot be prohibited entirely "from surface use of the leased parcel once its lease is final." *See Richardson*, 565 F.3d at 718 (citing 43 C.F.R. § 3101.1-2 ["A lessee shall have the right to use so much of the leased lands as is necessary to explore for, drill for, mine, extract, remove and dispose of all the leased resource in a leasehold subject to: Stipulations attached to the lease . . . [and other] reasonable measures . . . ."]); *see also* BLM Handbook H-1624-1 ("By law, these impacts [from oil and gas development] must be analyzed before the agency makes an irreversible commitment. In the fluid minerals program, this commitment occurs at the point of lease issuance.").

Instead of disclosing reasonably foreseeable impacts, however, BLM improperly tiers to the EISs for the respective governing RMPs, in violation of NEPA. The RMP-EISs lack any analysis of the impacts of oil and gas development in the specific local areas at issue, and BLM unlawfully postpones disclosure of site-specific impacts when such analysis is possible now. The RMPs also contain incomplete or inadequate analysis of greenhouse gas emissions and hydraulic fracturing, hiding the full climate change impacts and public health risks of new leasing. Finally, new information arising since the RMPs' adoption concerning significant public health, water depletion, seismic, endangered fish, and cumulative effects of fracking renders the RMPs outdated and unreliable.

A. Site-Specific Analysis Is Required But Lacking

NEPA establishes action-forcing procedures that require agencies to take a "hard look" at environmental consequences of the proposed action. *Pennaco Energy, Inc.*, 377 F.3d at 1150; *see also N.M. ex rel. Richardson*, 565 F.3d at 714. In the matter at hand, BLM has not taken any look, let alone the requisite "hard look," at the potential impacts of oil and gas development on the parcels. Instead, the agencies' decision to proceed with the May 2016 lease sale is based solely on the analysis contained in the RMP-FEIS.

The RMP-EISs perform only broad and generalized analysis of the RMP's effects on resources throughout the planning area. The Grand Junction RMP-EIS provides only a highly general overview of the range of possible impacts on a very broad scale – the analysis area covers nearly 1.1 million acres[1] of public lands in the Grand Junction planning area, which is too general to meaningfully address the foreseeable impacts to the parcels at issue. The RMP FEIS for the Colorado River Valley Field Office is similarly generalized and broad-scale, covering an analysis area of 567,000 acres administered by BLM.[2]

The RMP-FEIS therefore does not contain any of the required analysis of environmental impacts likely to occur from oil and gas development *in the areas to be leased.* Any and all significant environmental consequences of site-specific projects such as this one must be reviewed and disclosed. For example, the following site-specific impacts must be addressed:

Impacts on Local Water Resources

[1] Grand Junction RMP-FEIS ("GJFO RMP-FEIS") at ES-1.
[2] Colorado River Valley RMP-FEIS ("CRVFO RMP-FEIS") at 1-5.

Numerous streams flow through or near the areas to be leased,[3] but the RMP-EISs' discussion of water resources provides no sense of how specific streams and watersheds would be impacted by increased oil and gas development, including already impaired streams and watersheds. Both RMP-EISs simply assume that mitigation measures such as setbacks would limit impacts and "benefit" water quality.[4] But this approach sidesteps meaningful consideration of how runoff and spills from existing development, declining stream flows, and other sources of water pollution (e.g., grazing, agriculture, erosion), in connection with oil and gas development of the parcels to be leased could exacerbate already degraded conditions, or threaten local aquatic species with already diminished populations.[5]

For instance, streams cross or are near Parcels 7611, 7598, 7616, 7613, 7612, 7620, 7625, 7622, which lie within heavily developed areas.[6] These streams appear to be within the impaired Colorado River watershed. New development could hinder attainment of water quality standards and adversely modify critical habitat for the endangered fish.[7] The same goes for parcel 7602, which partially underlies Plateau Creek, an impaired stream inhabited by sensitive species such as the bluehead sucker, flannelmouth sucker, and roundtail chub.[8]

Many parcels are near or underlie the Colorado River, which is a high risk flood area.[9] In addition, recent mudslides, which have created dams or sag ponds blocking stream flow on Grand Mesa, have the potential to cause flooding of Plateau Creek when the stopped water eventually breaks.[10] In the event of flooding, pits, tanks, and other storage devices could be at risk of toppling, breaching, or overflowing, risking contamination of surface and groundwater. Floods in Colorado have shown that weather events may result in uncontrolled chemical spills and leaks on a massive scale.[11] The Grand Junction RMP-FEIS fails to acknowledge this risk.

The RMP-FEIS also fail to acknowledge risks specific to fracking near dams, as the leasing of parcels 7603, 7604, 7629 would allow. Recently, the U.S. Army Corps of Engineers in Texas "adopted a 4,000 foot exclusion zone at Joe Pool Dam within which no drilling will be

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[3] *See* BLM Competitive Oil and Gas Lease Sale Parcel Maps at pp. 2-5 ("BLM GJFO/CRVO Parcel Maps"), available at http://www.blm.gov/style/medialib/blm/co/programs/oil_and_gas/Lease_Sale/2016/november.Par.5253.File.dat/Competitive_Oil Gas_Lease_Sale_Nov2016_05032016.pdf.

[4] GJFO RMP-FEIS at 4-88-4-89; CRVFO RMP-FEIS at 4-101, 4-109.

[5] For example, Clear Creek, which is adjacent to Parcel 7600, is impaired.

[6] *Compare* BLM GJFO/CRVFO Parcel Maps at p. 2 *with* Rocky Mountain Wild Species Map No. 9.

[7] Rocky Mountain Wild ("RMW"), Species Map No. 9. RMW's maps are available at http://rockymountainwild.org/rocky-mountain-oil-gas-leasing under the heading for BLM Colorado's November 2016 lease auction.

[8] GJFO RMP-FEIS at 3-108.

[9] Mesa County, Public Works-Floodplain Management, Local Flood Hazard, available at http://www.mesacounty.us/publicworks/floodplain/template.aspx?id=9837; GJFO RMP at __.

[10] Lofholm, Nancy. Grand Mesa mudslide poses more danger to Collbran area residents, Denver Post (May 27, 2014), available at http://www.denverpost.com/2014/05/27/grand-mesa-mudslide-poses-more-danger-to-collbran-area-residents/; The Daily Sentinel, Pond Breach Gashes Slide (May 27, 2016), available at http://www.gjsentinel.com/news/articles/pond-breach-gashes-slide.

[11] 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/.

allowed, regardless of depth" to protect its structural integrity.[12] The Army Corps also noted that "in order to protect the [dam] from induced seismicity, [the Corps] will work to limit injection wells within five miles of the Joe Pool project."[13] The agency found these measures "necessary to ensure that public safety is not reduced as a result of mineral related activities at Joe Pool."[14] There is no indication that BLM (or the Bureau of Reclamation) has analyzed the effects of fracking near Vega Reservoir and whether protective measures are needed to prevent contamination or structural integrity problems with the reservoir.

Effects on Local Air Quality

Increased development could worsen poor air quality in those areas that already have significant well development. The Grand Junction RMP only generally acknowledges the potential for new fluid mineral development to contribute to air quality problems, including "localized increased risk of impacts on human health."[15] This statement does not supply an adequate analysis of how neighboring communities, such as DeBeque (less than a mile from parcel 7588) or popular recreational areas, such as Vega State Park (which contains or abuts parcels 7602, 7604, and 7629), would be affected. A proper site-specific analysis must quantify emissions, assess the impact on human health, and discuss mitigation measures.

Industrialization and Habitat Fragmentation Impacts

In areas untouched by oil and gas development, new oil and gas leasing could significantly alter and industrialize relatively pristine or rustic landscapes and degrade prime habitat for wildlife, but the potential for such effects is not disclosed. For example, the area surrounding parcel 7600 is relatively undeveloped, and the parcel itself is within a Potential Habitat Conservation Area ranked by Colorado State University's (CSU) Colorado Natural Heritage Program as "very high biodiversity significance" for its many imperiled plant species.[16] Pipelines and roads accessing the parcels could significantly degrade and fragment this important habitat. Numerous greater sage-grouse leks also surround the parcel[17] but the potential effects of fragmentation within this particular area is not at all addressed in any NEPA documentation.[18]

A number of parcels also overlap with or are upstream from several Potential Conservation Areas noted to have "Outstanding Biodiversity Significance,"[19] or other areas of

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[12] U.S. Army Corps of Engineers, Memorandum for Record: Dam Safety Implications of Drilling, Hydrofracturing and Extraction, Joe Pool Dam, Grand Prairie, Texas, p. 1 (cover page) (Feb. 17, 2016), available at http://www.swf.usace.army.mil/Portals/47/docs/pao/JoePoolDrillingStudy_14Mar16_PublicRelease_Secured.pdf.
[13] *Id.*
[14] *Id.*
[15] GJFO RMP-FEIS at 4-33.
[16] Colorado State University (CSU), Level 4 Potential Conservation Area (PCA) Report for Clear Creek (Nov. 29, 2015), available at http://www.cnhp.colostate.edu/download/documents/pca/L4_PCA-Clear%20Creek%20to%20Golden_11-29-2015.pdf.
[17] *See* BLM GJFO/CRVO Parcel Maps, p. 2 (parcel 7600 is within an area with no producing leases); Rocky Mountain Wild, Species Map 7.
[18] The DNA does not even refer to the 2015 Colorado Greater Sage-Grouse RMP Amendments.
[19] CSU, Level 4 Potential Conservation Area (PCA) Reports for Colorado River, Rare Plants of the Wasatch, and Mount Callahan (Nov. 29, 2015), available at http://www.cnhp.colostate.edu/download/documents/pca/L4_PCA-

rare plant occurrence.[20] Notwithstanding CSU stipulations to avoid development in occupied habitat, buffers do not eliminate the threat of spills, invasive weeds, dust transport, and pollinator disturbance. The cumulative impact of developing near sensitive plant populations on multiple lease parcels within the same area could weaken these strongholds and increase the chance of losing a local population. The EIS does not assess the cumulative impact to sensitive plant species within these Potential Conservation Areas.

Several parcels are documented to contain ESA-listed Colorado hookless cactus and therefore surface disturbance within these areas should be fully avoided to minimize impacts on the cactus.[21] This is especially because successful restoration of disturbed habitat has not been documented.[22] The Grand Junction RMP-EIS, however, contains no discussion as to how fluid mineral development could impact hookless cactus, let alone the specific populations found on these parcels. The Colorado River Valley RMP-FEIS similarly lacks any discussion of the importance of existing populations on the parcels at issue; the potential for loss of unoccupied habitat (which would not be protected by any stipulation), reducing suitable habitat for population expansion and recovery opportunities; and the threat that oil and gas activities on these parcels would pose to the population as a whole.

BLM must evaluate the potential for clustering development outside areas with NSOs and resulting noise, public health, water quality, scenic, and other impacts. For example, several parcels overlap three different patches of critical habitat for the DeBeque phacelia.[23] NSOs could result in clustering wellpad development along their borders, increasing surface disturbance and industrialization of these areas.

B. Analysis of Site-Specific Impacts Is Feasible

The analysis of site-specific impacts must occur at the leasing stage, because leasing is highly likely to result in development of the parcels at issue and production of fluid mineral resources. A multitude of effects are readily foreseeable as discussed above and in our previous scoping comment, incorporated herein by reference.

Rather than conduct any environmental review of the parcels before proceeding with the lease sale, BLM suggests that it may postpone analysis until an Application for Permit to Drill ("APD") is submitted for a specific well. In *Richardson*, the Tenth Circuit rejected the contention that site-specific analysis may be deferred until the APD stage in all cases. Rather, the inquiry of whether site-specific analysis is required is "necessarily contextual" and "fact-specific." *Id.*

Colorado%20River_11-29-2015.pdf; http://www.cnhp.colostate.edu/download/documents/pca/L4_PCA-Rare%20Plants%20of%20the%20Wasatch_11-29-2015.pdf; http://www.cnhp.colostate.edu/download/documents/pca/L4_PCA-Mount%20Callahan_11-29-2015.pdf.

[20] RMW Species Map Nos. 8, 9.

[21] RMW ABI Screen (Parcels 7585, 7586, 7614, 7588), available at http://rockymountainwild.org/_site/wp-content/uploads/16-065_CONov2016EAScreen.xlsx; *see also* Endangered and Threatened Wildlife and Plants; Taxonomic Change of Sclerocactus Glaucus to Three Separate Species, 74 Fed. Reg. 47112 (Sept. 15, 2009), available at https://www.gpo.gov/fdsys/pkg/FR-2009-09-15/pdf/E9-22125.pdf#page=1.

[22] CRVFO RMP-FEIS at 4-272.

[23] RMW Species Map Nos. 8, 9 (Parcels 7584, 7585, 7587, 7588, 7614, 7617 overlap with critical habitat); *see also* CBD critical habitat map.

In the instant lease sale, BLM cannot seriously dispute that offering the parcels is likely to result in oil and gas development and the production of oil and gas. The parcels are offered for the sole purpose of promoting oil and gas development. Almost all of the parcels for lease are near or adjacent to areas with producing leases.[24] Numerous actively producing oil and gas wells are near the parcels for lease.[25] The lease parcel areas have also been identified by BLM as generally having "very high," "high," and "moderate" potential for both conventional oil and gas development and Mancos shale gas development.[26] Further, a recent USGS study notes increasing interest in the Piceance Basin's Mancos shale play in western Colorado should be expected, as a result of its findings that the play contains technically recoverable natural gas reserves that are only second to the Marcellus shale in volume.[27] Total technically recoverable resources of the Mancos/Mowry Total Petroleum Systems are 66.3 trillion cubic feet of gas, 74 million barrels of oil, and 45 million barrels of natural gas liquids.[28] This volume is over 40 times USGS's 2003 estimate of total natural gas reserves for this shale play.[29] These reserves underlie large areas of the Grand Junction, Colorado River Valley, White River, Uncompahgre, and Gunnison Field Offices.[30]

BLM can also project the type of development that would likely occur in the leased areas. Various maps prepared by BLM show the several formations underlying the parcels which could be developed, including areas of "high potential" coalbed methane gas development, conventional well development, and Mancos Shale play development.[31] And because many of the areas for lease are adjacent to or near areas that are already producing, the type of development (e.g., horizontal v. vertical well, natural gas v. oil v. coalbed methane) within these area should give some indication of the foreseeable type of development that could occur in the areas for lease.[32] BLM's own studies provide readily available information that could be used to project the total footprint of leasing within these areas. The Reasonably Foreseeable Development Scenario for the Grand Junction RMP estimates potential development levels per township, average number of wells per pad, and total surface disturbance for the various types of wells that could be developed, including disturbance from well pads, pipelines, and roads.[33] It is

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[24] *See* BLM GJFO/CRVO Parcel Maps (e.g., parcels, 7584, 7585, 7586, 7587, 7588, 7598, 7599, 7600, 7602, 7603, 7604, 7611, 7612, 7613, 7614, 7615, 7616, 7617, 7618, 7620, 7622, 7625, 7626, 7629).

[25] RMW, Nearby Oil/Gas Development Maps 8-9, available at http://rockymountainwild.org/_site/wp-content/uploads/16-065_CONov2016EA_OGDevelopment_Map8_v1.pdf, http://rockymountainwild.org/_site/wp-content/uploads/16-065_CONov2016EA_OGDevelopment_Map9_v1.pdf.

[26] *See* RMW, Reasonably Foreseeable Development Oil and Gas Potential Maps (included in our CD of references but not on RMW's website).

[27] USGS, Assessment of Continuous (Unconventional) Oil and Gas Resources in the Late Cretaceous Mancos Shale of the Piceance Basin, Uinta-Piceance Province, Colorado and Utah, Fact Sheet 2016-3030 (May 2016), available at http://pubs.usgs.gov/fs/2016/3030/fs20163030.pdf.

[28] *Id.*

[29] Asssociated Press, Colorado Has 40 Times More Natural Gas Than Previously Estimated, Wall Street Journal (June 8, 2016), available at http://www.wsj.com/articles/colorado-has-40-times-more-natural-gas-than-previously-estimated-1465430936.

[30] CBD Mancos Shale and BLM Field Offices Map.

[31] BLM, GJFO Reasonably Foreseeable Development Scenario, Figures 9-11 (June 2012); BLM, Glenwood Springs (now CRVFO) Reasonably Foreseeable Development Scenario, Maps 3-15, 17-21 (2014).

[32] *See* notes 24- 25 above; *see also* RMW, Nearby Oil/Gas Development Maps.

[33] BLM, Reasonably Foreseeable Development Scenario at 35-37.

also highly likely that hydraulic fracturing practices would be employed, which are necessary to recover "tighter" reserves that dominate the Piceance Basin.[34] The EA for the November 2016 Lease Auction for the Royal Gorge Field Office also describes how greenhouse gas emissions and other pollutants from wells may be estimated.[35]

For example, it is highly likely that fracking and horizontal well development would occur on many of the lease parcels. A number of parcels are only within a few miles of the Homer Deep and DeBeque Southwest Unit Master Development Plan areas, for which numerous horizontal wells have been proposed.[36] These proposed plans project the average number of wells per well pad, total surface disturbance, and average per well water depletion, which could inform an environmental analysis of the lease parcel areas.[37] The Reasonably Foreseeable Development Scenario for the Grand Junction RMP estimates similar figures for projected horizontal well development.[38] BLM also tracks water depletion figures for horizontal wells in each field office and throughout the Upper Colorado River Basin, which provide a reasonable basis for per well water use estimate.[39]

That BLM cannot precisely determine the type and amount of development that could occur on these lease parcels is a red herring. NEPA requires "reasonable forecasting," which includes the consideration of "reasonably foreseeable future actions…even if they are not specific proposals." *See N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1079 (9th Cir. 2011) (citation omitted). "Because speculation is . . . implicit in NEPA," agencies may not "shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as crystal ball inquiry." *Id.* Further, while specific development plans have not yet been proposed, such plans are not necessary to predict that development in these areas would entail significant impacts. The problem of increased surface disturbance, water pollution, degradation of air quality, greenhouse gas emissions, and wildlife impacts from new oil and gas leasing are "readily apparent," and there are "enough specifics to permit productive analysis of [oil and gas development], including proposals for alternative ways of dealing with the problem." *Kern v. BLM*, 284 F.3d 1062, 1073 (9th Cir. 2002).

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[34] USGS 2016 (Mancos shale requires fracking, plus vertical drilling for shallower reserves and horizontal drilling for deeper reserves).

[35] *See* section III.A below; Royal Gorge Field Office EA at 21-24, 36, available at http://www.blm.gov/style/medialib/blm/co/programs/oil_and_gas/Lease_Sale/2016/november.Par.30486.File.dat/EA_Draft_RGFO_Nov_2016.pdf.

[36] *See* RMW, Maps of Homer Deep and DeBeque Southwest Master Development Plans and Nov. 2016 Lease Parcels (not found on RMW's website, but included in our CD of references).

[37] *See* Black Hills Plateau Production, LLC, Proposed Action: DeBeque Southwest Master Development Plan for Oil and Gas Exploration and Development Mesa County, Colorado, DOI-BLM-CO-N040-2015-0024-EA (May 2015) ("DeBeque Southwest MDP"), available at https://eplanning.blm.gov/epl-front-office/projects/nepa/48239/58991/64183/DeBeque_Southwest_MDP_Proposed_Action.pdf; Proposed Action: Homer Deep Master Development Plan for Oil and Gas Exploration and Development Mesa County, Colorado, DOI-BLM-CO-N040-2015-0025-EA, (March 2015) ("Homer Deep MDP"), available at https://eplanning.blm.gov/epl-front-office/projects/nepa/45789/56044/60736/HDMDP_Proposed_Action_3-24-2015.pdf.

[38] BLM, GJFO Reasonably Foreseeable Development Scenario at 35-37, 46.

[39] BLM, Water Depletion Logs Submitted to Fish and Wildlife Service (2010-2015) ("Water Depletion Logs").

C. Reliance on the RMPs Is Improper, Because They Fail to Properly Analyze Water Depletion, Greenhouse Gas, and Public Health Effects of Fracking and Horizontal Drilling

BLM cannot rely on the RMP-FEISs for the NEPA documentation, because that analysis is incomplete or inadequate in other respects. Aside from failing to analyze site-specific impacts, the Grand Junction and Colorado River Valley RMP-EISs fail to thoroughly address the water depletion, greenhouse gas, and public health impacts of increased horizontal drilling and hydraulic fracturing, fail to discuss adequate mitigation, and set forth toothless stipulations with open-ended exceptions.

Horizontal Drilling Is Not Addressed

The Grand Junction RMP fails to quantify and address in the EIS the water depletion impacts of horizontal drilling and resulting impacts on the endangered fish. Without providing any analysis it summarily concludes: "The RFD in the RMP does not exceed the amount of water depletions consulted on in the Programmatic Biological Opinion, in reference to the biological opinion (PBO) for water depletions associated with fluid mineral development in BLM's western Colorado Field Offices and their effects on the four Colorado River endangered fish."[40]

But as described in the Center's scoping comments on the lease auction and its protest of the Proposed Grand Junction RMP (incorporated herein by reference), the PBO does not take into account the effects of horizontal drilling, which have much larger water depletion effects than other types of drilling.[41] Water depletion logs submitted by BLM to Fish and Wildlife Service show that in FY2015, 14 new horizontal wells were drilled in the Colorado River Valley and Grand Junction Field Offices and consumed an average of 45.17 acre-feet of water or a total of 632.49 acre-feet of water.[42] The total amount of water depleted in the Colorado River ***sub-basin*** by all horizontal and vertical wells was 691.09 acre-feet of water, which exceeds the 379 acre-feet annual projection for this sub-basin by 1.8 times.

Numerous other horizontal wells are proposed within the Grand Junction and Colorado River Valley planning areas, as indicated in the attached spreadsheet (Exhibit C). For example, the aforementioned DeBeque Southwest and Homer Deep Master Development plans project the addition of 80 horizontal wells over a three to five-year period that would deplete approximately 34 acre-feet per well for drilling and completion alone.[43] This is likely an underestimate,

[40] GJFO RMP-FEIS at 6-195, 6-200.

[41] This comment section focuses on the Grand Junction Field Office RMP, because most of the parcels for lease are within the GJFO, or otherwise straddle both the GJFO and CRVFO. In any case, the Colorado River Valley RMP-FEIS fails to address horizontal drilling of the Mancos shale play in any meaningful way, let alone related water depletion effects, on the grounds that "development intensity, timing, and location of development of the deep marine shale was considered too speculative for quantitative impact analysis in connection with this planning process." CRVFO RMP-FEIS at 4-576.

[42] Water Depletion Logs.

[43] DeBeque Southwest MDP at 4; Homer Deep MDP at 4. The foregoing documents actually indicate that between these two units Black Hills is proposing to develop 140 wells over a five-year period. But according to BLM staff Allen Crockett the plans have been scaled back to 60 wells in DeBeque Southwest and 20 wells in Homer Deep over a three to five-year period. (Tel. Comm. between Wendy Park and Crockett on or around May 6, 2016.)

considering the same operator previously depleted an average of 77.60 acre-feet for eight horizontal wells in FY2015, and depleted 70.8 and 63.1 acre-feet of fresh water for two horizontal wells in FY2014.[44]

In any case, even assuming the project proponent's more conservative figures, depletions by these two master development plans alone would total approximately 528 acre-feet per year for five years, which still far exceeds the 379 acre-feet annual depletion threshold for the Colorado River sub-basin. And this figure only represents the depletion amount for 16 horizontal wells. The Reasonably Foreseeable Development Scenario for the Grand Junction Field Office projects a total of 2,107 horizontal wells over a 20-year period, which breaks down to an average of 105 horizontal wells per year over the life of the RMP.[45]

Moreover, as noted above, horizontal drilling is likely to expand throughout the Piceance Basin, including the Grand Junction, White River, and Colorado River Valley planning areas. A recent USGS study indicates vast natural gas resources in the Mancos shale play underlying the basin, as well as the occurrence of oil and natural gas liquids, which would make natural gas extraction in the Mancos shale play more profitable. Water depletions are thus very likely to exceed the original projections in the PBO.

In sum, the Grand Junction RMP-EIS's failure to quantify water depletions from new oil and gas development by itself renders the EIS inadequate to disclose the effects of new oil and gas leasing.[46] To the extent the EIS relies on the Programmatic Biological Opinion to provide the missing analysis, that document is not reliable, as it fails to account for water depletion effects of horizontal drilling. The EIS's statement that the Reasonably Foreseeable Development scenario for the planning area would not exceed water depletion amounts projected in the Programmatic Biological Opinion is unsupported and contradicted by ample evidence that water depletions for horizontal wells alone are likely to exceed the depletion threshold for the Colorado River sub-basin.[47] The Grand Junction RMP-EIS does not support a determination of NEPA adequacy as to the effects of new leasing on water depletions and the endangered fish. This is true regardless of the type and extent of development that could result from new leasing.

The RMP-EISs Fail to Fully Analyze Greenhouse Gas Emissions and Social Cost of Carbon

A Determination of NEPA Adequacy is also improper because the Grand Junction RMP-FEIS fails to fully quantify greenhouse gas emissions that would result from new oil and gas development. The RMP-FEIS does not take into account the full life-cycle emissions of oil and gas extracted within the planning area. Its greenhouse gas analysis omits emissions from transportation of extracted product to market or to refineries, refining and other processing, and combustion of the extracted end-use product, failing to disclose the full scope of greenhouse gas emissions that could result from new leasing.

[44] Water Depletion Logs.
[45] Grand Junction RFD at 44, 46.
[46] CBD et al. Protest of Grand Junction RMP at 21-23 (May 11, 2015).
[47] *See also* CBD Scoping Comment at 42; CBD et al. Protest of Grand Junction RMP at 4-10.

Additionally, as explained in the Center's Protest of the Grand Junction RMP and scoping comment, the RMP-EIS fails to analyze the social cost of carbon, a useful tool for evaluating the cumulative climate change impacts of greenhouse gas emissions. The Colorado River Valley Field Office RMP-EIS also lacks a full accounting of greenhouse gas emissions, excluding emissions from outside the study area (such as electricity generation power plants), , and a social cost of carbon analysis.[48]

The RMP-EISs Lack a Full Accounting of Public Health Impacts from Fracking

The Grand Junction RMP lacks adequate analysis of the potential public health impacts of hydraulic fracturing and oil and gas development, ignoring a number of studies that the Center presented to BLM in its protest of the Proposed Grand Junction RMP, before it was adopted. This includes studies that strongly suggest a link between oil and gas development and birth defects, low birth weight, poor infant health, cancer risk, and endocrine disruption effects. Other studies have since been published noting higher cardiology hospitalization rates linked to areas near oil and gas development and the need for minimum setbacks from oil and gas development to protect vulnerable populations. More detail is provided in the Center's scoping comment (see pp. 27-28, 52-56). BLM's conclusion that "[t]o date, no studies have documented significant cancer-based or noncancer-based public health risks from oil and gas operations using emission rates and operational practices typical of current development in the GJFO" is therefore misleading.[49]

Further, the RMP-FEIS's analysis does not address the increased public health risks that could result from greater shale gas and horizontal well development. This includes increased hazardous pollutant emissions from larger rigs, more fracking chemicals transported to and stored at the well pad for fracking deeper and longer boreholes, more wells concentrated on a single well pad, and greater waste generation (including drilling cuttings and produced water). BLM's assumption that "[n]o substantial new hazardous materials uses and (or) waste generating [would] occur[] within the planning area," is erroneous, ignoring the potential for greater waste generation from more wells and longer boreholes drilled.[50] The GJFO Reasonably Foreseeable Development Scenario projects that over half of all wells could be horizontal wells. This assumption is also baseless because BLM lacks specific knowledge of the chemicals used for fracking throughout the planning area, and even where chemical identities are known, information about their health effects may be lacking. (See Scoping Comment at 55-56.)

The RMP-EIS also dismisses the potential for earthquakes caused by increased wastewater injection and fracking as "very rare," despite numerous studies linking earthquake activity in the central U.S. to high rates of wastewater injection. (See Scoping Comment at 49-52.)

[48] CRVFO RMP-FEIS at 4-49.
[49] GJFO RMP-FEIS 4-442.
[50] *Id.* at 4-441.

Finally, it is unclear whether the RMP-FEIS takes into account how attainment of the new stricter federal ozone standard adopted in late 2015 would be impacted by increased oil and gas development. [51]

The Colorado River Valley Field Office RMP-EIS contains similar defects, dismissing felt incidences of induced seismicity to be "very rare," and failing to take into account studies on increased risks of endocrine disruption, birth defect, and cardiology hospitalization risk near oil and gas development.[52]

D. The RMP-FEISs Do Not Consider New Information that Has Arisen Since Adoption of the RMPs

The Grand Junction and Colorado River Valley RMP-EISs are also not adequate to assess the impacts of new leasing because new information since their adoption has arisen, which must be taken into account in analyzing the lease auction's effects. This includes the following:

Mancos Shale Play and Horizontal Development Potential Is Greater than Previously Anticipated

As already discussed above, a recent USGS study shows the potential for much greater development potential of the Mancos shale play in western Colorado, and BLM's FY2015 water depletion logs show enormous water depletion effects of horizontal drilling (required to develop deeper layers of the Mancos shale play). Much greater impacts from horizontal drilling and fracking are greater than anticipated under the RMP-EISs adopted in 2014 and 2015.

Climate Change Is Reducing Stream Flows in the Colorado River Basin

The Grand Junction RMP-EIS dismissed the effects of climate change on water resources. The best available scientific data indicate that climate change is resulting in higher temperatures in the Colorado River Basin, reduced snowpack, reduced runoff, and increased drought, *which have already reduced* and will continue to reduce stream flows in the Basin.[53] In March 2016, scientists published the first empirical study demonstrating a link between warmer spring temperatures and reduced runoff in the Basin, verifying predictive models.[54] The Center's attached literature review (Exhibit E) provides more specific detail regarding these climate change effects on Colorado River stream flows. BLM must take into account these climate change effects on the endangered fish and other aquatic resources, in connection with its evaluation of the water depletion effects of increased oil and gas development.

Population Numbers of the Endangered Fish Are Declining

[51] 2015 National Ambient Air Quality Standards (NAAQS) for Ozone (March 14, 2016), available at https://www.epa.gov/ozone-pollution/2015-national-ambient-air-quality-standards-naaqs-ozone .
[52] CRVFO RMP-FEIS at 3-217.
[53] Wolf, Shaye Ph.D. Impacts of Climate Change on the Colorado River Basin, Center for Biological Diversity (March 10, 2016) ("Wolf 2016") (Exhibit E).
[54] *See id.* at 2.

Colorado pikeminnow populations are in decline throughout the Green River and Colorado River Basin, indicating that the Recovery Plan for the endangered fish has not been effective and that the impacts of oil and gas development on the endangered fish may be more severe than previously anticipated.

According to Fish and Wildlife Service, the latest 2014 Colorado River sub-basin population number of 501 is "cause for great concern," and catch of sub-adults and adults in 2013 and 2014 "were near lowest observed in the history of the project."[55] 2015 catch numbers are within the same range, which suggests that the population estimate for 2015 will be similar to the 2014 estimate.[56] The Green River sub-population is "in decline throughout the entire Green River Subbasin" and has fallen under 2,000, below the minimum viable population of 2,600 adults.[57] The Yampa River portion of the sub-basin population also "remains low and may be in further decline."[58]

Humpback chub numbers are also low. Fish and Wildlife Service is "concerned that wild populations of humpback chub in Black Rocks and Westwater Canyon of the Colorado River (near the Colorado-Utah state line) have not recovered from declines detected in the late 1990's. The reason for those population declines is uncertain."[59] After this steep reduction, the Black Rocks/Westwater population continued to decline.[60] In 2008, the population "dropped below the population size downlist criterion (MVP = 2,100 adults) for the first time."[61] In 2011 and 2012, the core population estimates were 1,846 and 1,718, respectively.[62]

The Desolation/Gray Canyons population has also not met the population-size downlist criterion, and was observed to be "trending downward" based on 2006-2007 population estimates.[63] This trend has been attributed to "increased nonnative fish abundance and habitat changes associated with dry weather and low river flows."[64] The 2014 estimate is 1,863 adults, substantially below the 2,100-adults recovery criterion.[65]

These declining numbers not only show that the endangered fish may be more sensitive to oil and gas development than previously assumed, but they strongly suggest that the Recovery Program is not achieving recovery targets nor adequately offsetting water depletion effects as intended.

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[55] USFWS 2015 Sufficient Progress Memo at 23, 36 (Oct. 7, 2015) ("Sufficient Progress Memo") (noting average monthly flows significantly below 810 cfs in 15-mile reach in 2012 and 2013), available at.
[56] *See* USFWS, Monitoring the Colorado Pikeminnow Population in the Mainstem Colorado River via Periodic Population Estimates, p. 3 (Nov. 2015), available at http://www.coloradoriverrecovery.org/documents-publications/work-plan-documents/arpts/2015/rsch/127.pdf (showing similar capture rates of pikeminnow in 2014 and 2015).
[57] Sufficient Progress Memo at 7.
[58] *Id.*
[59] *Id.* at 36.
[60] *Id.* at 13.
[61] *Id.*
[62] *Id.* at 13-14.
[63] *Id.* at 12.
[64] *Id.* at 23.
[65] *Id.* at 12.

The Recovery Program is Not Meeting Recommended Flows

The 15-mile reach is one of the most important habitats for the Colorado pikeminnow. The Endangered Fish Recovery Program's latest Sufficient Progress Assessment indicates that recommended flows for dry years in the 15-mile reach of the Colorado River were not met in 2012 and 2013.[66] Flows also fell short of recommended levels in 2015, despite it being a normal precipitation year. In August and October 2015, the 15-mile reach missed the target of a minimum average flow of 1,240 acre-feet for normal precipitation years.[67] This normal-year shortfall (following an "above-average" year) strongly suggests that minimum recommended flows for later dry years will almost certainly not be met when water will be scarcer, and as declining stream flows overall due to climate change weaken the Recovery Program's ability to supplement natural flows in dry years.[68]

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The foregoing information also compels reinitiation of consultation on the Programmatic Biological Opinion for the endangered fish. (See Scoping Comment at 41-48.)

E. The RMP-FEIS Does Not Describe Effective Mitigation

The Determination of NEPA Adequacy is also flawed because numerous stipulations set forth in the Grand Junction and Colorado River Valley RMP-EISs and applied to the proposed lease parcels are vague or contain broad and general exceptions without any objective criteria for how they should be applied. Significant impacts could result from the application of these extremely general stipulations. The EISs fail to acknowledge these effects, and their conclusions that stipulations would avoid or reduce significant impacts are unsupported.

For example, GJ-CSU-4 for Collbran and Mesa/Powderhorn Sourcewater Protection Areas and Jerry Creek Watershed provides:

> **Stipulation:** All surface disturbances within sourcewater protection areas and the Jerry Creek watershed are required to avoid interference with watershed resource values.
> **Purpose:** To protect watershed resource values.

This stipulation provides no objective binding criteria for avoidance of "interference with watershed resource values," or any specific explanation of what that means.

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[66] *Id.* at 34 (noting average monthly flows significantly below 810 cfs in 15-mile reach in 2012 and 2013); *id.* at 31 (recognizing need to reduce the amount of time flows drop below 810 cfs in the 15-Mile Reach).
[67] USGS Surface Water Data for Colorado: USGS Surface Water Monthly Statistics for "USGS 09106150 COLO RIVER BELOW GRAND VALLEY DIV NR PALISADE, CO," available at http://waterdata.usgs.gov/co/nwis/uv?site_no=09106150 (last visited April 19, 2016).
[68] *See* Wolf 2016 at 3 (noting ability to buffer Colorado River system will become more difficult as streamflows decrease).

Numerous stipulations also allow exceptions without specific criteria for their application. For example, GJ-CSU-9 for BLM Sensitive Plants Species Occupied Habitat provides:

> **Stipulation:** For plant species listed as sensitive by BLM, special design, construction, and implementation measures may be required within a 100-meter (328 feet) buffer from the edge of occupied habitat. In addition, relocation of operations by more than 200 meters (656 feet) may be required.

Application of the stipulation is not only uncertain but is subject to the vague exception that:

> The Authorized Officer may grant an exception to a stipulation if it is determined that the factors leading to its inclusion in the lease have changed sufficiently such that: 1) the protection provided by the stipulation is no longer justified or necessary to meet resource objectives established in the RMP; or 2) proposed operations would not cause unacceptable impacts.

But "unacceptable impacts" are not defined. Numerous other leasing stipulations contain the same sweeping exceptions.[69]

The Determination of NEPA Adequacy's exclusive reliance on the RMP-EISs, which in turn rely on these extremely vague stipulations to conclude that significant effects will be reduced or avoided, is improper.

II. Reliance on a Determination of NEPA Adequacy for the Tres Rios Parcels Is Improper.

For similar reasons described above, a Determination of NEPA Adequacy for the proposed leasing of the Tres Rios parcels is also improper. The Center's December 2015 protest of the Tres Rios lease sale, incorporated by reference herein as Exhibit B, describes site-specific issues for the Tres Rios lease parcels that the Tres Rios RMP-EIS does not address, numerous flaws in the Tres Rios RMP-EIS's greenhouse gas emissions and public health analyses, and deficiencies in the proposed stipulations.[70]

III. The Environmental Assessment for the Royal Gorge Parcels Fails to Analyze and Mitigate Significant Environmental Effects

The EA for the Royal Gorge Field Office (RGFO EA) fails to adequately describe and address significant impacts on various resources within the planning area—including effects on greenhouse gas emissions, seismicity, ferruginous hawks and other raptors, and big game—such that a finding of no significant impact is untenable.

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[69] *See, e.g.*, stipulations for DeBeque Phacelia NSO, wildlife CSU, visual resources CSU.

[70] The Center retracts its comment on p. 5 of the Tres Rios Protest that Parcel 77456 "is partially within the Jim Olterman-Lone Cone State Wildlife Area" and must therefore include an NSO stipulation for protection of state wildlife areas.

In addition, as described in the Center's scoping comment and protest of the Royal Gorge Field Office's November 2015 lease auction (Exhibit D, incorporated here by reference), BLM should halt all new leasing until the 20+year old RMPs governing the Royal Gorge Field Office have been updated to consider the cumulative impacts of greenhouse gas emissions and hydraulic fracturing throughout the planning area. Tiering to these RMPs is inappropriate when the RMPs have never considered the impacts of fracking and other unconventional oil and gas techniques at the scale they are likely to be used for shale-area drilling within the planning area today. *See Ctr. for Biological Diversity v. Bureau of Land Mgmt.*, 937 F. Supp. 2d 1140, 1156-57 (N.D. Cal. 2013) (holding tiering to outdated RMP that did not address fracking was improper). Further, allowing new leasing while this update is pending would prejudice the consideration of the Center's proposed no leasing-no fracking alternative for the Eastern Colorado planning area.

A. The EA Fails to Quantify Greenhouse Gas Emissions

The EA fails to quantify the specific emissions that could potentially result from the RGFO lease auction, including emissions from transport of the extracted product to market or refineries, refining or processing, and end-use combustion of the extracted product. This is despite the EA's implicit acknowledgement that such analysis is possible.

The EA notes that the RGFO has projected the potential number of wells per township that could be developed within the areas to be leased in the Reasonably Foreseeable Development Scenario for the RGFO.[71] It also provides a per well estimate of greenhouse gas emissions from well development and production activities.[72] In addition, the EA notes that emissions from combustion could be assessed "by using per-well annual production values" (based on "production data for each county and ranges of [reasonably foreseeable development] ranges for each Lease Parcel").[73] These figures could be "converted to energy equivalent and ranges of [reasonably foreseeable development] with the following CO2e emissions factors: ~ 52 mmMT CO2e per QBtu consumption of natural gas and ~ 61 mmMT of CO2e per QBtu consumption of petroleum, derived using the Annual Energy Outlook (AEO) 2014 Report."[74] Despite acknowledging that ample information is available to forecast combustion emissions, the EA stops short of performing this analysis. Existing production information could also be used to estimate the potential emissions from transportation and processing.

Finally, like the Grand Junction, Colorado River Valley, and Tres Rios RMP-EISs, the EA fails to perform any social cost of carbon analysis.

B. The EA Fails to Address Induced Seismicity

The EA contains no analysis whatsoever of the potential for wastewater injections or fracking near and around the parcels at issue to induce earthquakes. (See Scoping Comment at 49-52.) Parcel 7583 in Huerfano County in southern Colorado appears to be within or very close to an area that is susceptible to earthquakes induced by human activity. A recent USGS study

[71] EA at 23-24.
[72] *Id.* at 21-22.
[73] *Id* at 36.
[74] *Id.*

assessing wastewater injection-induced earthquake risk in the central U.S. concluded that "[t]he potential damage probabilities from an earthquake in 2016 are particularly high in parts of north-central Oklahoma, northern Texas, southern Colorado/northern New Mexico, and north-central Arkansas."[75] These earthquakes could threaten the physical safety, homes, and other property of residents in surrounding communities. The EA must disclose this risk and describe effective mitigation to reduce the threat of induced seismicity.

C. The EA Does Not Identify Adequate Mitigation to Protect Ferruginous Hawks and Other Raptors

Ferruginous Hawk habitat is found throughout the RGFO and potentially on all of the parcels for lease. Oil and gas activities disturb the hawk's breeding and chick-rearing activities, but the EA fails to provide sufficient mitigation for this disturbance. The EA notes that a no surface occupancy buffer of only 1/8 mile away from nests would be required, when BLM and the Forest Service have previously noted that such small buffers are inadequate to protect nesting areas for the hawk.

The EA for last year's RGFO November 2015 lease sale notes that existing 1/8-mile stipulations to protect the Ferruginous Hawk are inadequate, and that the "best available science" requires a one-mile buffer to protect Ferruginous Hawks provides the following discussion of impacts to the ferruginous hawk:

> Raptors are protected by a suite of stipulations (CO-03, CO-18, and RG-05) that require no surface occupancy within one-eighth of a mile of nests and a timing limitation to protect raptor nesting and fledgling habitat. *It is widely noted that 1/8 of a mile buffer for ferruginous hawk is highly ineffective protection based on the best available science, and that this does not protect inactive nests which may be used in alternate years.* This species is very sensitive to disturbance during breeding season, and such actions would cause nest failure, including abandonment of chicks; *best available science emphasizes a one-mile buffer. New stipulations developed for this species for a 1/2 mile buffer may be incorporated into future leases.*[76]

CO-03 directs that "[n]o surface occupancy or use is allowed…[t]o protect raptor nests within a one-eighth mile radius from the site." CO-18 is a timing stipulation prohibiting surface use, except operation and maintenance of production facilities, from February 1 through August 15, "[t]o protect raptor (this includes golden eagles, all accipiters, falcons [except the kestrels], all butteos, and owls) nesting and fledgling habitat during usage for one-quarter mile around the

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[75] USGS, 2016 One-Year Seismic Hazard Forecast for the Central and Eastern United States From Induced and Natural Earthquakes, Open-File Report 2016–1035 (March 2016), available at https://pubs.er.usgs.gov/publication/ofr20161035.

[76] BLM, Environmental Assessment for the RGFO November 2015 Competitive Oil & Gas Lease Sale, pp. 53-54 (Nov. 2015) ("RGFO 2015 Lease Sale EA"), available at http://www.blm.gov/style/medialib/blm/co/programs/oil_and_gas/Lease_Sale/2015/november_2015.Par.28735.File.dat/RGFO_Nov_15_EA.pdf.

nest site." BLM appears to interpret these stipulations to prohibit disturbance within one-eighth mile of a raptor nest or within one-quarter mile of nesting and fledgling habitat.[77]

Despite BLM's clear recognition that 1-mile buffers are necessary to avoid Ferruginous Hawk nest failure and abandonment of chicks, the 2015 EA cryptically notes that "[n]ew stipulations developed for this species for a *1/2 mile* buffer *may* be incorporated into *future* leases."[78] In other words, BLM seems to anticipate the possible imposition of improved but still inadequate half-mile buffers on future leases, but not on the leases at issue in the 2015 lease sale. Nor is any provision made for half-mile buffers on the instant leases.

A one-eighth mile buffer (equivalent to 0.125 miles or 201 meters) is also inadequate to protect raptors in general. The EIS for the Pawnee National Grasslands land-use plan required a minimum 500-meter buffer (approximately 1/3 mile) from all raptor nests. The PNG EIS, however, notes that even this buffer could be inadequate to protect raptors:

> The Forest Service nest buffer of 500 meters…provides some measure of protection albeit potentially inadequate compared to more recent literature. Colorado Parks and Wildlife suggests a buffer of 800 meters [0.50 miles] and Environment Canada (2009) suggests a buffer of 1000 meters [0.62 miles]. Keeley and Bechard (2011) found that hawks flush at distances of greater than 600 meters [0.37 miles].[79]

A mere one-eighth-mile buffer could therefore lead to adverse effects on numerous raptors that nest on leased parcels and result in significant effects on raptors. The instant RGFO EA makes no effort, however, to discuss the inadequate buffers and stipulations, potential significant effects that could result, and mitigation to avoid these effects, despite BLM's awareness of these issues in the November 2015 lease sale.[80]

Further, the EA makes no attempt to determine whether raptor nests actually exist on the parcels at issue, which are all split-estate parcels, but substantial raptor nesting habitat could exist in the areas at issue. Parcels 7591, 7592,75 93 are all located within the Central Shortgrass Potential Conservation Area, in which ferruginous hawks have been documented.[81] Given the potential for failed nests within the lease sale area and the uncertain numbers of nests within and around the areas to be leased. BLM cannot reasonably claim that "no significant impact" would result from the lease sale.

D. Stipulations for Protection of Big Game Are Inadequate

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[77] *Id.* at 54.
[78] *Id.*
[79] U.S. Forest Service, Final Wildlife Report for Oil and Gas Leasing Analysis- Environmental Impact Statement, Arapaho Roosevelt National Forest and Pawnee National Grassland, p. 44 (Dec. 2014), available at http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/95573_FSPLT3_2397782.pdf.
[80] These issues were raised in CBD's protest of the November 2015 Lease Auction (Exhibit D).
[81] CSU, Level 4 Potential Conservation Area (PCA) Report for Central Shortgrass (Nov. 29, 2015), available at http://www.cnhp.colostate.edu/download/documents/pca/L4_PCA-Central%20Shortgrass_11-29-2015.pdf.

BLM's finding of no significant impact is also flawed in that it fails to take into account mule deer habitat losses that could result from oil and gas production within winter habitat. A recent study shows that oil and gas development causes significant habitat loss 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 adistance 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.[82]

The EA recognizes these habitat loss effects on mule deer and elk.[83] However, the only protections provided for big game habitat are timing limitation stipulations (CO-09, RG-08, RG-14), which prohibit surface use during the winter or calving months, but this measure does nothing to avoid or offset the impacts of the substantial habitat loss resulting from big game avoidance of oil and gas infrastructure. This is especially problematic, because extensive winter big game habitat and elk calving areas are found within the lease sale areas.[84] The EA's failure to adopt any mitigation measures to offset these losses render BLM's FONSI invalid.

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Thank you for your consideration of these comments. The Center, 350 Colorado, Colorado Riverkeeper, Green River Action Project, Living Rivers, Rocky Mountain Wild, and Sierra Club look forward to reviewing a legally adequate EIS for this proposed oil and gas leasing action.

Sincerely,

Wendy Park
Staff Attorney
Center for Biological Diversity

Micah Parkin
Executive Director
350 Colorado

[82] 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.
[83] EA at 54.
[84] *See* RMW ABI Screen; RMW Big Game Maps 2, 5 (parcels 7583, 7591, 7592, 7593), available at http://rockymountainwild.org/_site/wp-content/uploads/16-065_CONov2016EA_Game_Map2_v1.pdf; http://rockymountainwild.org/_site/wp-content/uploads/16-065_CONov2016EA_Game_Map5_v1.pdf; EA at 53-54.

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EXHIBIT E

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
COC77455
COC77456
COC77457
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:

Wendy Park
Staff Attorney
Center for Biological Diversity
1212 Broadway #800
Oakland, CA 94612
wpark@biologicaldiversity.org

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

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[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]

[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. Across 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]

[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

[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

[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

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[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

[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]
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> *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

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[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

[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

[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

[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) $\geq$ 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) $\geq$ 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

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[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.

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[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)

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[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,

Wendy Park
Staff Attorney
Center for Biological Diversity

EXHIBIT F

Impacts of Climate Change on the Colorado River Basin

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March 10, 2016

Anthropogenic climate change is profoundly impacting the Colorado River in ways that are altering temperature, streamflow, and the hydrologic cycle. As detailed below, changes observed to date include rising temperatures, earlier snowmelt and streamflow, decreasing snowpack, and declining runoff and streamflow. Modeling studies project that these changes will only worsen, including continued declines in streamflow and intensification of drought. Climate change is likely to have significant effects on endangered fish species in the Colorado River basin – the Colorado pikeminnow, razorback sucker, bonytail chub, and humpback chub – and the Colorado River ecosystem.

Rising temperatures

The Colorado River basin has warmed significantly during the past century, with average increases in surface temperature of 1.6°F (0.9°C) over the Southwest during 1901-2010 (Hoerling et al. 2013). The greatest warming has occurred in spring and summer, and in daytime high temperatures and nighttime low temperatures (Bonfils et al. 2008, Hoerling et al. 2013). Surface temperatures in the Southwest are projected to increase steeply in this century by an average of 4.5 to 7.9° F depending on the emissions scenario, with an average of 2.5 to 3°F of warming projected for 2021-2050 alone (Cayan et al. 2013). As explained below, warming temperatures are having significant effects on streamflow, drought severity, and the hydrologic cycle in the Southwest (Barnett et al. 2008, Woodhouse et al. 2016).

Earlier snowmelt and streamflow

In much of the Colorado River basin, snowmelt, snowmelt runoff, and streamflow timing have trended earlier since the mid-1950s, in parallel with warming temperatures (Hamlet et al. 2005, Stewart et al. 2005, Barnett et al. 2008, Hoerling et al. 2013, Garfin et al. 2014). The Colorado River basin's spring pulse from 1978-2004 shifted to two weeks earlier compared to flows before 1978 (Ray et al. 2008). Although there are both natural and human influences on these hydrologic trends, studies indicate that anthropogenic greenhouse gases began to impact snow-fed streamflow timing during 1950-1999 (Barnett et al. 2008, Hidalgo et al. 2009, Hoerling et al. 2013). Modeling studies have projected that snowmelt, spring runoff, and streamflow timing will continue to shift earlier across much of the Southwest (Stewart et al. 2004, Rauscher et al. 2008, Dettinger et al. 2015).

Decreasing snowpack

The Colorado River receives most of its water from winter snowpack from the Rocky Mountains, where 15% of the total basin areas generates 85% of the river flow (Dettinger et al. 2015). Across much of the Colorado River basin, the spring snowpack is decreasing and more winter precipitation is falling as rain instead of snow (Hamlet et al. 2005, Pierce et al. 2008, Das et al. 2009). Approximately half of the observed decline in snowpack in the western United States during 1950-1999 has been attributed to the effects of anthropogenic greenhouse gases,

ozone and aerosols (Pierce et al. 2008). Modeling studies project a continued reduction of Southwest mountain snowpack during February through May during this century, largely due to the effects of rising temperatures (Cayan et al. 2013, Dettinger et al. 2015).

Declining Runoff and Streamflow

Annual runoff in the Colorado River basin appears to be declining (USBR 2011), with significant consequences for reduced streamflow. During 2001–2010, warm temperatures and dry conditions reduced average naturalized flows in the Colorado River (measured at Lees Ferry) to the second-lowest-flow decade since 1901, to12.6 million acre-feet per year compared to the 1901–2000 average of 15.0 million acre-feet per year (Hoerling et al. 2013).

Modeling studies project that runoff and streamflow will continue to decrease substantially in the Colorado River basin during this century (Ray et al. 2008, Das et al. 2011, USBR 2011, Cayan et al. 2013, Georgakakos et al. 2014, Dettinger et al. 2015). Barnett and Pierce (2009) concluded that anthropogenic climate change is likely to reduce runoff in the Colorado River basin by 10-30% by 2050. Projected reductions in runoff range from 6-7% (Christensen and Lettenmaier 2007) to 45% (Hoerling and Eischeid 2007) depending on the models and methods used in each study (see Barnett and Pierce 2009 at Table 2). In the short term, Hoerling and Eischeid (2007) predict streamflow to decrease by 25% during 2006-2030, and by 45% during 2035-2060.

Importantly, numerous studies show that warming temperatures alone will cause runoff and streamflow declines in the Colorado River basin. For example, in a recent review, Vano et al. (2014) estimated that future streamflow in the Colorado River basin will be reduced by 5% to 35% due to rising temperature alone. When precipitation change is considered, a 5% decrease in precipitation would further reduce streamflow by 10% to 15% (Vano et al. 2014).

Moreover, warming temperatures will play an increasingly important role in causing runoff to decline in the Colorado River basin, and must be factored into streamflow forecasts (Woodhouse et al. 2016). An empirical study of the influence of precipitation, temperature, and soil moisture on upper Colorado River basin streamflow over the past century found that warmer temperatures have already resulted in flows less than expected based on precipitation levels (Woodhouse et al. 2016). Consistent with past research, the study found that cool season precipitation explains most of the variability in annual streamflow. However, temperature was highly influential in determining streamflow under certain conditions. The study concluded that "[s]ince 1988, a marked increase in the frequency of warm years with lower flows than expected, given precipitation, suggests continued warming temperatures will be an increasingly important influence in reducing future UCRB water supplies." The researchers warned that "streamflow forecasts run the risk of overprediction if warming spring and early summer temperatures are not adequately considered."

Increasing Drought Severity

Historically, droughts in the Colorado River basin were primarily driven by precipitation deficits. However, studies indicate that rising temperatures have begun to play a more important

role in driving droughts (Hoerling et al. 2013, Vano et al. 2014). Importantly, rising temperature superimposed on natural drought variability is expected to exacerbate the impacts of droughts (Seager et al. 2012, Cook et al. 2015). Modeling studies project that droughts in Southwest will intensify due to longer periods of dry weather and more extreme heat, leading to higher evapotranspiration and moisture loss (Seager et al. 2007, Cayan et al. 2010, Trenberth et al. 2013). In the Colorado River basin, future droughts are projected to be substantially hotter, and drought is projected to become more frequent, intense, and longer lasting than in the historical record (Garfin et al. 2014).

Reduced reservoir levels and unsustainable demand for water

Of the more than 90 reservoirs on the river and its tributaries, the two largest are Lake Mead and Lake Powell which together can store up to 85% of the total flow for the basin combined (Christensen et al. 2004). Reservoirs in the Colorado River basin are highly vulnerable to climate change, particularly because the amount of storage in reservoirs is sensitive to runoff changes (Barnett and Pierce 2008). Even small decreases in runoff have caused average reservoir levels to markedly decrease (Christensen et al. 2004). Christensen et al. (2004) predicted that climate change impacts on the hydrology of the Colorado River system would result in water demand (deliveries and evaporation) exceeding reservoir inflows (which would also be decreased), resulting in a degraded system. Likewise, Barnett and Pierce (2008) projected that a 10% reduction in runoff would result in requested water deliveries surpassing sustainable deliveries by 2040, while a 20% reduction in runoff would cause unsustainable water demands by 2025. A greater demand than supply makes the system more prone to long-term sustained droughts, as reservoirs will not have sufficient time to be naturally replenished and more water will be extracted from a dwindling supply than is sustainable (Christensen and Lettenmaier 2007). Reservoirs would spend additional time in a depleted state, weakening the system's buffering ability in years where there is low precipitation (Barnett and Pierce 2009).

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