October 10, 2016

Via FAX (303) 239-3799

Greg Shoop
Acting State Director
Colorado State Office
Bureau of Land Management
2850 Youngfield St.
Lakewood, CO 80215

Re: Protest of BLM December 7, 2017 Colorado River Valley-Grand Junction Competitive Oil and Gas Lease Sale.

Dear Director Shoop:

The Center for Biological Diversity (the "Center" or "CBD"), Living Rivers, Sierra Club, Waterkeeper Alliance, and Wilderness Workshop hereby formally protest the Bureau of Land Management's ("BLM") planned December 7, 2017 oil and gas lease sale, the Determination of NEPA Adequacy ("DNA") (DOI-BLM-CO-N050-2017-0051-DNA) for the sale of 28 parcels containing 27,283.79 acres in the Grand Junction and Colorado River Valley Field Offices in Mesa and Garfield Counties, pursuant to 40 CFR §3120.1-3.

We formally protest the inclusion of each of the 28 parcels of federal minerals for oil and gas leasing. Parcels included in this protest are listed as follows:

Colorado River Valley Field Office

SERIAL #: COC78669

Grand Junction Field Office

SERIAL #: COC78670	SERIAL #: COC78671	SERIAL #: COC78672	SERIAL #: COC78673	SERIAL #: COC78674	SERIAL #: COC78675	SERIAL #: COC78676
SERIAL #: COC78677	SERIAL #: COC78678	SERIAL #: COC78679	SERIAL #: COC78680	SERIAL #: COC78681	SERIAL #: COC78682	SERIAL #: COC78683

SERIAL #: COC78684	SERIAL #: COC78685	SERIAL #: COC78686	SERIAL #: COC78687	SERIAL #: COC78688	SERIAL #: COC78689	SERIAL #: COC78690
SERIAL #: COC78691	SERIAL #: COC78692	SERIAL #: COC78693	SERIAL #: COC78694	SERIAL #: COC78695	SERIAL #: COC78696	

PROTEST

I. Protesting Parties: Contact Information and Interests:

This Protest is filed on behalf of the Center for Biological Diversity, Living Rivers, Rocky Mountain Wild, Sierra Club, Waterkeeper Alliance, and Wilderness Workshop by:

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The Center is a non-profit environmental organization with over 61,000 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 and Razorback Sucker), endangered plant species like the DeBeque phacelia and Parachute beardtongue, 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.

Living Rivers is a nonprofit organization based in Moab, Utah that promotes river restoration through mobilization. By articulating conservation and alternative management strategies to the public, Living Rivers seeks to revive the natural habitat and spirit of rivers by undoing the extensive damage done by dams, and water-intensive energy development on the Colorado Plateau. Living Rivers has approximately 1,200 members in Utah, Colorado and other states. Living Rivers' members and staff use the public lands in Utah and 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.

Rocky Mountain Wild (RMW) is a Colorado non-profit organization with its mailing address at 1536 Wynkoop St., Suite #900, Denver, CO 80202. Rocky Mountain Wild was created by the merger of two of Colorado's trusted and effective conservation organizations, Center for Native Ecosystems and Colorado Wild. Recognizing the need to stem dramatic losses of native species and habitat, these organizations joined forces to protect, connect and restore wildlife and wild lands throughout the Southern Rocky Mountain region of Colorado, southern Wyoming, eastern Utah, and northern New Mexico. Rocky Mountain Wild, and its predecessor organizations, regularly review projects proposed on, or affecting, BLM lands that might

adversely affect wildlife, water quality, air quality, and other resources; comment extensively on proposed public land management decisions; and when necessary files administrative protests and lawsuits. Rocky Mountain Wild has a history of participating in BLM oil and gas leasing decisions through submitting comments, protests, and litigating when necessary. RMW members and staff recreate on and value the lands within and surrounding these lease sale parcels in the Grand Junction Field Office. Our members also will be impacted by air and water quality issues resulting from oil and gas development. Further, RMW and its members have been harmed through the lack of "hard look" NEPA analysis. Leasing of these parcels will impact their ability to use and enjoy this land, and be informed of the full range of impacts of this action and alternatives to this action. This irreparable harm can be remedied by a BLM decision to withdraw these parcels from the December 2017 Lease Sale.

The Sierra Club was founded in 1892 and is the nation's oldest grassroots environmental organization. The Sierra Club is incorporated in California, and has over 840,000 members nationwide and is dedicated to the protection and preservation of the environment. The Sierra Club's mission is to explore, enjoy and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; and to educate and enlist humanity to protect and restore the quality of the natural and human environments. The Sierra Club has a Rocky Mountain Chapter, with more than 20,500 members across Colorado, including members in the areas of this lease sale. The Sierra Club has members that live in, work and use this area for recreation such as hiking, snowshoeing, cross-country skiing, climbing, backpacking, camping, fishing and wildlife viewing, as well as for business, scientific, spiritual, aesthetic and environmental purposes.

Waterkeeper Alliance ("Waterkeeper") is a not-for-profit, member supported, international environmental organization based in New York City. Waterkeeper strengthens and grows a global network of grassroots leaders protecting everyone's right to clean water. Comprised of 336 Waterkeeper Member Organizations and Affiliates that are working in 37 countries on 6 continents around the world, including 176 in the United States and six in Colorado, Waterkeeper's goal is drinkable, fishable and swimmable water everywhere. Over the past several years, Waterkeeper, through its Clean and Safe Energy campaign, has increasingly engaged in public advocacy, administrative proceedings and litigation aimed at reducing the water quality and climate change impacts of fossil fuel extraction, transport and combustion, including from BLM-controlled lands, throughout the United States. Waterkeeper advocates for government policymakers and implementing agencies to take a rational and comprehensive approach to land management that accounts for the short-, medium- and long-range implications of fossil fuel exploitation on public lands, including foreseeable adverse impacts to water quality, water quantity and our climate. Waterkeeper Alliance and its member Waterkeeper Organizations and Affiliates have members, supporters and staff who have visited public lands in Colorado, including lands and waters that would be affected by actions under the lease sale, for recreational, scientific, educational, and other pursuits and intend to continue to do so in the future, and are particularly interested in protecting them from water-intensive energy development.

Wilderness Workshop ("WW") is a 501(c)(3) dedicated to preservation and conservation of the wilderness and natural resources of the White River National Forest and adjacent public lands, including the Colorado River Valley and the Grand Junction Field Offices. WW engages in research, education, legal advocacy and grassroots organizing to protect the ecological integrity of local landscapes and public lands. WW focuses on the monitoring and conservation of air and water quality, wildlife species and habitat, natural communities and lands of wilderness quality. WW was founded in 1967 and has approximately 800 members. Many of our members live, work, and recreate in and around, and otherwise use and enjoy lands managed by the BLM in the Colorado River Valley and Grand Junction Field Offices. All members have a great interest in the protection and enhancement of natural values in the area. WW has been closely monitoring proposals, developments, and management actions on local BLM lands for many years.

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]

(1) The Center et al.'s June 9, 2017 comments on the Determination of NEPA Adequacy for the instant December 2017 Lease Sale, attached here as Exhibit A and incorporated here by reference;

(2) The Center et al.'s March 10, 2016 scoping comment for the Royal Gorge-Grand Junction-Colorado River Valley December 2016 Lease Sale, attached here as Exhibit B and incorporated here by reference;

(3) The Center et al.'s September 10, 2016 60-Day Notice of Intent to Sue the BLM and U.S. Fish and Wildlife Service Pursuant to the Endangered Species Act Regarding Oil and Gas Exploration and Development in the Upper Colorado River Basin in Colorado, attached here as Exhibit C and incorporated here by reference;

(4) The Center et al.'s February 19, 2016 protest of BLM's Texas-Oklahoma April 2016 Lease Sale, attached here as Exhibit D and incorporated here by reference;

(5) Gerald Bartz's Report on Seismicity Risks NearTexas Parcels Offered in BLM's April 2017; and

[1] Hard copies of Exhibits A-E were delivered to BLM via FedEx earlier today, but will not be faxed along with this protest. CDs of all exhibits and references cited herein, and of all references cited in the exhibits, were also delivered to BLM via FedEx.

(6) Wilderness Workshop et al.'s June 8, 2017 comments on the Determination of NEPA Adequacy for the instant December 2017 Lease Sale, attached here as Exhibit F and incorporated here by reference.

For the many reasons discussed in this protest and Exhibits A-F, BLM cannot rely on a Determination of NEPA adequacy for the Grand Junction and Colorado River Valley 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 the effects of hydraulic fracturing or "fracking" and horizontal drilling. Accordingly, BLM's Determination of NEPA Adequacy is arbitrary and capricious. BLM must prepare an EIS, or, at minimum, address these effects in an Environmental Assessment, in compliance with NEPA and its implementing regulations. BLM has also failed to consult with Fish and Wildlife Service on the effects of new oil and gas leasing in compliance with the Endangered Species Act.

In addition, although BLM's Final DNA acknowledges receipt of the Center's comments on the draft DNA, the BLM fails to adequately respond to any of those comments. *See* Final DNA at Attachment F. This failure to address detailed and substantive comments undermines NEPA's twin aims of fostering informed decisionmaking and public participation. *See Forest Guardians v. U.S. Fish and Wildlife Service*, 611 F.3d 692, 717 (10th Cir. 2010) ("The purpose behind NEPA is to ensure that the agency will only reach a decision on a proposed action after carefully considering the environmental impacts of several alternative courses of action and *after taking public comment into account*."). Along the same lines, BLM has failed to make all documents supporting its leasing decision available to the public, undermining the public's ability to comment on the adequacy of the RMP-EIS in supporting its leasing decision. This includes the Technical Support Document for the Grand Junction RMP-EIS's air quality analysis, which is not found on BLM's website. The Center requested this document from BLM staff, but did not receive it before the protest deadline.

A. 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 the National Environmental Policy Act (NEPA), as previously explained in our comments on the DNA, *see* Ex. A pp. 2-33, and in the following comments below.

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 misplaced. Each of the EISs fails to address site-specific impacts that could foreseeably result from new leasing, including impacts on wildlife, water resources, air quality and public health impacts. 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, endangered fish, and cumulative effects of fracking renders the RMPs outdated and unreliable.

1. Site-Specific Analysis Is Required But Lacking.

In addition to all of the issues we raised in our comment on BLM's proposed DNA regarding various site-specific impacts BLM must analyze in an EIS, BLM must also address issues raised in the attached scoping comment on BLM's December 2016 Lease Sale for the Grand Junction and Colorado River Valley field offices, attached as Exhibit B and incorporated here by reference. The letter details various reasonably foreseeable impacts on air quality, public health, water resources, climate, species, land-use, and seismicity that are likely to result from oil and gas leasing. *See* Ex. B at 2-57.

BLM must also analyze the localized impacts of developing parcels in the Colorado River sub-basin, including parcels above the 15-Mile Reach. All of the parcels are within the Colorado River sub-basin,[2] such that water for oil and gas activities is likely to be drawn from this sub-basin. Moreover, many of the lease parcels drain into the Colorado River's 15-Mile

[2] Center Map of December 2017 Lease Parcels and Watersheds.

Reach,[3] which "provides some of the most important critical habitat, critical to the recovery of the Colorado pikeminnow and razorback sucker."[45] These include parcels: COC78678, -78679, -78681, -78678, -78669, -78670, -78672, -78673, -78674, -78675, -78676, -78677. The 15-Mile Reach runs from the Gunnison River confluence in Grand Junction, Colorado to 15 miles upstream, north of Palisade.[6] This critical habitat provides valuable spawning habitat for both the Colorado pikeminnow and razorback sucker; year-round habitat and "an optimum balance between temperature and food availability" for adult Colorado pikeminnow; and a crucial refuge for the endangered fish "should a catastrophic event cause a loss of populations in the Gunnison River or in the Colorado River below the Gunnison River confluence."[7] Given many of the parcels' position upstream from the 15-Mile Reach (or in areas that eventually flow into this reach), water used for oil and gas drilling and operations is likely to be drawn above this reach.

The lease auction is highly likely to result in water-intensive practices such as horizontal well development and fracking, and consequently, severe impacts to the endangered fish and the 15-Mile Reach. The Reasonably Foreseeable Development Scenario for the 2015 revised Grand Junction Resource Management Plan (Grand Junction RMP) projects significant expansion of horizontal well development and fracking in the Grand Junction Field Office, where 98% of the lease acreage occurs: over 2,100 new horizontal wells could be developed in this field office through 2029.[8] Most of the lease acreage falls within areas having either "high potential" or "moderate" potential for Mancos shale development, which would be developed with horizontal wells.[9] These projections for Mancos shale development, however, are likely underestimates, as the U.S. Geological Survey recently updated its projections for natural gas development potential in the Mancos shale play to be 40 times higher than previously estimated in 2003.[10] Industry reports also confirm that the Piceance Basin is poised for expanded Mancos shale play development, in light of the shale play's enormous development potential, excess available pipeline capacity from the Piceance Basin to the west coast, and easy access to liquefied natural gas (LNG) markets in Asia.[11]Moreover, as natural gas prices rise, increased exploration and development in the Piceance Basin, including the Mancos shale play, will become more likely.[12]

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[3] *Id*.; *see also* Center Map of December 2017 Lease Parcels--an online map is available at http://center.maps.arcgis.com/apps/View/index.html?appid=5c7c934d5093482689f5dc8d52d79218.

[4] 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 ("1999 PBO"), 37 (Dec. 1999). .

[5] *Id*.

[6] 2008 PBO at 4.

[7] 1999 PBO at 37.

[8] BLM, Grand Junction Reasonably Foreseeable Development Scenario for Oil and Gas, Grand Junction Field Office, Colorado ("RFD"), 46 (June 18, 2012).

[9] *See* Center Map of December 2017 Lease Parcels & Mancos Shale Development Potential.

[10] 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, 2016 (June 2016), available at https://www.usgs.gov/news/usgs-estimates-66-trillion-cubic-feet-natural-gas-colorado-s-mancos-shale-formation; Webb, Dennis, Congress advised about potential of Mancos Shale gas, Grand Junction Sentinel (July 12, 2016), http://www.gjsentinel.com/news/articles/congress-advised-about-potential-of-mancos-shale-g.

[11] Harpole, John, Piceance Basin to the Pacific: The Economic Advantage the Piceance Basin Has Over Other North American Shale Plays, Colorado Mesa University, Unconventional Energy Institute, 6-9, 29-37 (April 2017); Webb, Dennis, Pipeline capacity gives Piceance an edge in gas market, Grand Junction Sentinel (Jun.

Some of the lease parcels near or upstream from the 15-Mile Reach are within or adjacent to areas with existing horizontal well development, or areas proposed for horizontal well development, suggesting a high likelihood that the lease parcels will also be horizontally drilled and fracked.[13] For example, parcels COC78681, -78679, and -78678 are within the Black Hills Exploratory Proposal, a plan approved by BLM in 2013 allowing Black Hills Plateau Production, LLC (Black Hills) to develop 24 horizontal wells near De Beque, Colorado.[14] These parcels and parcel COC78680 also fall within or directly adjacent to Black Hills' proposed areas for the DeBeque Southwest and Homer Deep Master Development Plans, which together would allow a total of 80 horizontal wells to develop the Mancos shale play over a three to five year period.[15] A number of other parcels are only within several miles north of these planning areas (parcels COC78672, -78673, -78674, -78675, -78676, -78677) and thus also likely to be subject to Mancos shale development.

Horizontal drilling and fracking require millions of gallons of water and hundreds of tons of fracking chemicals, and results in the production of millions of gallons of wastewater for the development of a single horizontal well, as more fully explained in Exhibit C. For example, between 2014 and 2015, Black Hills used an average of 75.5 acre-feet of fresh water for a single well or over 24.6 million gallons to develop and frack a single horizontal well.[16] And because freshwater used for fracking and drilling is irreversibly contaminated and permanently disposed of underground, these depletions result in a permanent loss of the Colorado River Basin's water.[17] In contrast, "[r]oughly 90–95% of water used indoors returns to a wastewater treatment plant and is ultimately released to streams,[18] while 45% of irrigation water returns to surface waters.[19] Fracking and horizontal drilling techniques thus entail significant depletion and contamination risks to water resources and aquatic species.

17, 2017), http://www.gjsentinel.com/news/articles/pipeline-capacity-gives-piceance-an-edge-in-gas-ma; *see also* Laramie Energy, LLC, EnerCom Conference, 21 (Aug. 16, 2017) (map depicting areas of stacked horizontal well potential).

[12] *See id*. at 2, 4, 19-23 (noting Laramie's plans to develop Mancos shale); The Associated Press, Drilling in Piceance Basin in northwest Colorado picking up, Denver Post (Feb. 13, 2017), http://www.denverpost.com/2017/02/13/piceance-basin-drilling-increasing/ (noting uptick in Piceance basin drilling as of early 2017, and Laramie's expansion plans as gas prices rise).

[13] *See* Center Map of December 2017 Lease Parcels.

[14] *See* BLM, Environmental Assessment, Black Hills DeBeque Exploratory Proposal EA, DOI-BLM-CO-130-2012-0021-EA & Decision Record (May 2013).

[15] *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); Black Hills Plateau Production, LLC, 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); Tel. Comm. between Wendy Park and BLM, Colorado River Valley Field Office, Project Lead Allen Crockett on or around May 6, 2016 (noting proposed plans have been revised from 140 horizontal wells over a 20-year period to 80 horizontal wells over a three to five-year period).

[16] *See* Exhibit A and Exhibit I attached thereto (BLM Water Depletion Logs).

[17] *See* Western Resources Advocates, Fracking Our Future, 14-15 (July 2012), available at http://www.westernresourceadvocates.org/frackwater/fracking_our_future_july_2012.pdf.

[18] *Id*. at 15.

[19] *Id*. (citing U.S. Geological Survey, Estimated Withdrawals and Use of Water in Colorado, 2005, 47 (2010), available at http://pubs.usgs.gov/sir/2010/5002/pdf/SIR10-5002.pdf).

The 15-Mile Reach and endangered fish are especially sensitive to these risks. Severe dewatering of this reach in late summer and early fall results in extremely low water conditions, reducing habitat and overall habitat quality for the Colorado pikeminnow and razorback sucker.[20] The 15-Mile Reach "is affected more than any of the other reaches by water depletions because it is located downstream of several large diversions and upstream of the Gunnison River."[21] Flows impact this reach "to a greater degree than the other reaches."[22] Further, the loss of adequate flows in the Upper Basin generally is so serious that U.S. Fish and Wildlife Service (Service) has determined that *any* depletion of Upper Basin stream flows adversely affects and jeopardizes the endangered fish.[23] This includes the two other endangered fish found in the Upper Colorado River Basin, the humpback chub and bonytail, which use habitat downstream of the 15-Mile Reach.[24]

The Upper Colorado Endangered Fish Recovery Program ("Recovery Program") established by the Service as the reasonable and prudent alternative to avoid jeopardy to the species aims to offset these depletion effects, but has fallen short.[25] Under the programmatic biological opinion governing depletions in the Colorado River above its confluence with the Gunnison River ("1999 PBO"), the Recovery Program should maintain an average monthly flow of 810 cfs in the 15-Mile Reach during the late summer and early fall, in drought years, to increase and stabilize endangered fish populations.[26] 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."[27] The Recovery Program, however, "still

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[20] 1999 PBO at 36, 37.
[21] *Id*. at 36.
[22] *Id* at 45.
[23] BLM, White River Field Office Proposed Resource Management Plan Amendment and Final Environmental Impact Statement for Oil and Gas Development, 3-71 (2015) ("WRFO RMPA-FEIS") ("The FWS has determined that any federally authorized depletion from the Upper Colorado River Basin has an adverse effect on listed Colorado River fishes."); USFWS, Biological Opinion for BLM Resource Management Plan (RMP), Price Field Office (PFO), 138 (Oct. 27, 2008) ("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, USFWS, Region 6 Memorandum, dated July 8, 1997), available at http://www.blm.gov/style/medialib/blm/ut/price_fo/Planning/rod_approved_rmp.Par.2742.File.dat/Price%20Biological%20Opinion.pdf; USFWS, Biological Opinion for BLM Resource Management Plan (RMP), Vernal Field Office (VFO), 113 (Oct. 23, 2008)(same), available at http://www.blm.gov/style/medialib/blm/ut/vernal_fo/planning/rod_approved_rmp.Par.4719.File.dat/VernalBiologicalOpinion.pdf.
[24] 1999 PBO at at 54.
[25] 2008 PBO at 2.
[26] *Id*. at 42; 1999 PBO at 40-41.
[27] *See* 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, 34-35 (Oct. 7, 2015) ("2015 Sufficient Progress Assessment"); *see also* 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, 32 (1995), available at http://www.coloradoriverrecovery.org/documents-publications/technical-reports/isf/OsmundsonNelson1995.pdf ("Osmundson 1995").

struggles" to meet this minimum flow, and such flows "may be unattainable."[28] Average monthly flows dropped below 810 cfs seven times in the 24-month period between 2012 and 2013.[29] Further, climate change threatens to increase the frequency and severity of low-flow conditions in this reach and throughout the rest of the Upper Basin, weakening the Program's ability to supplement natural flows in dry years.[30]

Massive depletions from horizontal drilling and fracking therefore threaten to exacerbate low-flow conditions and contribute to inhospitable conditions in the 15-Mile Reach. Contrary to BLM's past assertions, the 2008 Biological Opinion for the Fluid Mineral Program (2008 PBO) does not adequately account for these effects, notwithstanding the fact that past depletions have stayed within the overall Basin-wide depletion threshold established by the 2008 PBO. The one-time mitigation fee payment to the Recovery Program required by the 2008 PBO would not adequately offset the impact of these depletions in the 15-Mile Reach and areas downstream, given the Program's failure to maintain average monthly flows at 810 cfs in this reach. Moreover, the 2008 Biological Opinion for the Fluid Mineral Program also improperly averages out the effects of annual depletions over the entire year, and concludes that because annual depletions are a small fraction of overall annual flows, such depletions are negligible. This flawed analytical approach glosses over the actual effects of individual depletions under real-time conditions. For example, the 2008 PBO ignores the effect of withdrawing millions of gallons of water—or potentially tens of millions of gallons of water—within the span of several days or a few weeks when flows are already low, and their actual effects on the fish. Conceivably, a single massive withdrawal could rapidly reduce flows and reduce habitat, desiccate spawning and nursery grounds, strand fish in small pools, and force adult pikeminnow to migrate downstream.

The 2008 PBO is also unreliable because it fails to take into account a host of new information and circumstances that have arisen since its adoption suggesting that water depletions from oil and gas development may have greater effects than previously anticipated in the 2008 PBO. This includes new information about horizontal drilling, its greater water depletion effects compared to conventional vertical wells, and the potential for increased horizontal well development in western Colorado; climate change effects on Colorado River Basin flows; mercury and selenium contamination effects on the endangered fish; Colorado pikeminnow and humpback chub population declines; and the Recovery Program's increasing inability to maintain a minimum recommended flow of 810 cfs in the 15-Mile Reach, among other issues.[31] Indeed, on May 31, 2017, in response to the Center's 60-Day Notice of Intent to Sue regarding BLM's failure to reinitiate consultation on the 2008 PBO in light of this new information, BLM formally reinitiated consultation. BLM submitted to the Service a Programmatic Biological Assessment (2017 PBA) finding that water depletions associated with federal oil and gas activities in western Colorado over the next ten years "may affect, is likely to adversely affect" the endangered fish, triggering a 135-day period for the Service to complete a

[28] USFWS, Final 2015-2016 Sufficient Progress Assessment ("2016 Sufficient Progress Assessment"), 38 (Dec. 20, 2016).
[29] Exhibit C, and Exhibit I attached thereto (Water Depletion Logs).
[30] *See* Exhibit C, and Exhibit A attached thereto at 3 (noting ability to buffer Colorado River system will become more difficult as streamflows decrease).
[31] *See* Exhibit C at 8-35.

new biological opinion. The PBA updates well and water depletion projections for each sub-basin of the Upper Colorado River Basin. Most significantly, it projected increased horizontal well development in the Colorado River sub-basin, including areas close to where some of the instant lease parcels are located (e.g., "[i]n the [Grand Junction Field Office] north of Debeque, CO in the South Shale Ridge area").[32] It further found that water depletions in the Colorado River sub-basin, would be over six times the depletions projected in the 2008 PBO, or 2,463 acre-feet compared to 379 acre-feet projected for that sub-basin annually.[33] Indeed, in 2015 that depletion threshold was exceeded by almost twice the threshold, due to the drilling of several horizontal wells in the Colorado River sub-basin.[34] And unlike the previous 2008 PBO, the 2017 PBA acknowledges climate change, mercury, and selenium effects on the endangered fish, including the increased difficulty of meeting minimum recommended flows due to climate change.[35] Accordingly, the 2008 PBO does not present a full and accurate portrayal of the effects of fluid-mineral related depletions on the endangered fish and their critical habitat, including localized effects in the 15-Mile Reach and the Colorado River sub-basin.

BLM must also analyze the impacts of the increased risk of spills and leaks on critical habitat. One parcel (COC78669) overlaps with this habitat.

Finally, many other sensitive species and wildlife inhabit or use the areas to be leased, including greater sage-grouse, mule deer, elk, bald eagles, and rare plants (e.g., DeBeque milkvetch), but BLM has failed to acknowledge the potential for an array of effects from oil and gas development, including habitat fragmentation and disturbance, impairment of breeding activities, and disruption of migration routes.[36] Moreover, the GJFO RMP acknowledges that there is incomplete information related to specific resources in the Field Office.[37] Specifically, BLM makes clear that the RMP lacks information including field inventory of "soils and water conditions," "vegetation composition," "wildlife and special status species occurrence and condition," and "cultural and paleontological resources."[38] BLM's reliance on a DNA in this case assumes that proposed stipulations will protect resources, but that is not a certainty. The lack of field inventories means that proposed stipulations may not line up with values. For example, the Grand Junction RMP claims that 50 occurrences of 28 significant plant communities have been identified, but with a disclaimer that the list is neither complete nor conclusive as "changes are expected over the life time of the RMP, and new significant plant communities are expected to be located and recorded over time."[39] Now is the time to undertake site-specific surveys that weren't completed for the RMPs, before leases are sold.

[32] 2017 PBA at 13; *see also* Center Map of December 2017 Lease Parcels (showing parcel locations in relation to South Shale Ridge and De Beque, Colorado).
[33] 2017 PBA at 19, 24.
[34] Exhibit C, and Exhibit I attached thereto (Water Depletion Logs).
[35] 2017 PBA at 37-41.
[36] Rocky Mountain Wild Species Maps & ABI Screen.
[37] GJFO RMP-EIS at 4-6.
[38] *Id*.
[39] *Id*. at 3-76.

BLM's failure to analyze in an EIS the impacts of new oil and gas development on site-specific resources violates NEPA's requirement to analyze all reasonably foreseeable effects of its leasing decision.

2. Analysis of Site-Specific Impacts Is Feasible.

BLM has ample information to perform a more localized or site-specific analysis of oil and gas development in the areas for lease, but makes the poor excuse that not enough site-specific information regarding concrete development plans are available to perform such analysis. Even if precise effects may be unknown at this time, it can predict reasonably foreseeable effects of likely development scenarios, or a range of possible effects, in local areas resulting from oil and gas development.

For example, in the 2017 PBA, BLM has projected specific areas where horizontal development is likely, the total vertical and horizontal wells likely to be developed in those areas, and the amount of freshwater depletions associated with the new development. These projections rely on "recent data, industry trends, and best professional opinion to estimate anticipated activity over the next 10 year period," including "[p]rofessional judgment from the BLM petroleum engineers and private industry professionals working in the Action Area" —not site-specific development proposals.[40]

BLM's projections in the 2017 PBA are even so fine-grained as to predict higher water usage in certain areas than others and the number of wells expected in those areas. For example, the 2017 PBA projects that "Indian Valley in the WRFO and the White River basin located between Meeker, CO and Rangely, CO are projected to use an average of 51.6 AF/horizontal well. In the GJFO north of De Beque, CO in the South Shale Ridge area, average freshwater use estimates are 75.5 AF/horizontal well."[41] Water depletions in these areas are expected to be higher "due to local geology and very limited water recovery for water reuse."[42] It further projects that 80 and 68 horizontal wells will be drilled in those particular areas, respectively.[43] Some of the lease parcels may fall within this area of higher projected water use, as they occur several miles north of the South Shale Ridge ACEC and northwest of De Beque.[44] But even for those parcels that are not in this area, the 2017 PBA suggests BLM has already predicted the type, amount, and likely water depletion effects of development that can be expected in those areas, though the 2017 PBA only discloses projections at the field-office and sub-basin level.

In addition, BLM's Reasonably Foreseeable Development Scenario for the Grand Junction Field Office indicates areas where coalbed methane, conventional well, and Mancos shale development are likely.[45] Many of the lease parcels overlap with areas of "moderate,"

[40] 2017 PBA at 11.
[41] 2017 PBA at 13.
[42] 2017 PBA at 18, 23.
[43] 2017 PBA at 18, 23.
[44] Center Map of December 2017 Lease Parcels.
[45] Grand Junction RFD at 57-59.

"likely," and "highly likely" development potential of each of these well types, confirming that the type, amount, and potential effects of new development can be evaluated.[46]

3. 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 Grand Junction and Colorado River Valley RMP-FEISs to fulfill its obligations under NEPA, because those analyses are 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. The Center's DNA comment on the lease sale more fully explains these inadequacies of the Grand Junction and Colorado River Valley RMPs.[47] The following section presents additional issues or studies that the RMP-EISs fail to consider.

Horizontal Drilling Is Not Addressed

Horizontal drilling of "unconventional" wells entail far more severe environmental effects than vertical or conventional drilling. The Grand Junction and Colorado River Valley RMP-EISs fail to acknowledge these differences, or provide any analysis of their significance.

The George Washington National Forest Revised Forest Plan FEIS provides data illustrating some of the differences in surface and water use impacts between conventional and typical deep shale (horizontal) wells, and acknowledges significant differences in scale between the types of development. We have summarized some of these statistics in the table below, derived from those published in the Final Environmental Impact Statement for the Revised Land and Resource Management Plan for the George Washington National Forest.[48]

Activity	Conventional	Horizontal
Pad development (acres)	2.07	5.74
Access roads (acres)	4.85	9.7
Total surface disturbance (acres excluding pipeline disturbance)	6.92	15.44
Water use per well (drilling, gallons)	20,000	100,000
Water use per well (hydraulic fracturing, gallons)	400,000	5,000,000
Total water use per well pad	420,000	15,300,000
Area initially reclaimed	1.84	5.22

[46] Center Map of December 2017 Lease Parcels in relation to RFD.
[47] *See* Ex. A at 5-42.
[48] U.S. Forest Service, Final Environmental Impact Statement, Land and Resource Management Plan, George Washington National Forest, 3-428 (2014).

Area unreclaimed (for production)	5.08	10.22
Area used for production	0.23	0.52
Pipeline area disturbed (acres/mile of road)	2.91	2.91
Access road miles	1	2
Total pipeline area disturbed (acres)	2.91	5.82
Surface area disturbed per well pad (acres) (taking into account reclaimed areas)	7.99	16.04

In June 2016, the state of New York banned fracking after performing a seven-year study on the environmental impacts of high-volume hydraulic fracturing and horizontal drilling in the Marcellus shale play ("New York SGEIS").[49] The ban arose out of concerns about these practices' higher water depletion rates, larger waste volumes, more intensive drilling activities, and greater public health hazards compared to conventional drilling, along with their potential to industrialize previously undeveloped areas:

> Although horizontal drilling has the potential to result in fewer well pads than traditional vertical well drilling, pads where high-volume hydraulic fracturing would be employed are larger and the industrial activity associated with high-volume hydraulic fracturing on the pads would be more intense. Indeed, the average disturbance associated with a multi-well pad, access road and proportionate infrastructure during the drilling and fracturing stage is estimated at 7.4 acres, compared to the average disturbance associated with a well pad for a single vertical well during the drilling and fracturing stage, which is estimated at 4.8 acres. Horizontal drilling also facilitates natural gas extraction from many areas where conventional natural gas extraction had been commercially unprofitable. Therefore, drilling, well construction and well operation would likely be widespread in regions of the State and would impact areas that have previously not been subject to significant oil and gas development. Also, high-volume hydraulic fracturing requires significantly more water, and chemical additives, which may pose public health hazards through potential exposure. The high volumes of fracturing liquids associated with this type of well completion raise concerns about potential significant adverse impacts to water supplies, wastewater treatment and disposal and truck traffic. Horizontal wells also generate greater volumes of drilling waste (cuttings) than vertical wells drilled to the same target formation. In addition, development of low-permeability reservoirs using high-volume hydraulic fracturing has the potential to industrialize rural areas of New York. Industry projections of the level of drilling, as reflected in the intense development activity in neighboring Pennsylvania, have raised additional concerns relating to air quality, truck traffic, noise, habitat, cultural,

[49] NYDEC, New York State Officially Prohibits High-Volume Hydraulic Fracturing (June 29, 2015), available at http://www.dec.ny.gov/press/102337.html.

> historic and natural resources, agriculture, community character and socioeconomics. [50]

With larger well pads and larger equipment with a larger surface footprint required for horizontal drilling, [51] greater fragmentation and runoff pollution impacts on local water sources can be expected.

The New York SGEIS also describes four primary differences between horizontal and conventional drilling, which could result in more severe impacts than compared to conventional drilling:

> One is that larger rigs may be used for all or part of the drilling, with longer per-well drilling times than were described in the 1992 GEIS [or compared to conventional drilling]. The second is that multiple wells are likely to be drilled from each well site (or well pad). The third is that drilling mud rather than air may be used while drilling the horizontal portion of the wellbore to lubricate and cool the drill bit and to clean the wellbore. Fourth and finally, the volume of rock cuttings returned to the surface from the target formation will be greater for a horizontal well than for a vertical well.[52]

Larger rigs could mean greater air pollution and public health risks, while multi-well pad sites would result in more intensive and prolonged drilling and truck traffic in a given location, worsening public health risks and impacts to wildlife. "The rig work for a single horizontal well – including drilling, casing and cementing – would generally last about four to five weeks, subject to extension for slow drilling or other unexpected problems or delays.[53] In the Marcellus shale, one to two drill rigs can operate at one time on a well pad.[54] Accordingly, denser development of multiple horizontal wells on a single pad could last many months, increasing and concentrating noise, air pollution, and heavy truck traffic over an extended period.

In addition, increased waste generation from larger volumes of drilling mud and rock cuttings would increase public health hazards, as these wastes may be laced with toxic materials, such as heavy metals, radioactive material, or hydrocarbons. Accidental spills of these wastes could cause serious harm. In Ohio, horizontal drilling operations for a pipeline resulted in a 2-million gallon spill of drilling mud laced with diesel into a high-quality wetland over roughly 500,000 square feet near the Tuscarawas River."[55] According to Ohio officials, the drilling mud

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[50]; NYDEC, Final Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Regulatory Program for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs Findings Statement (June 2016), available at http://www.dec.ny.gov/docs/materials_minerals_pdf/findingstatehvhf62015.pdf. The underlying studies ("Final SGEIS 2015") are available at http://www.dec.ny.gov/energy/75370.html.

[51] Final SGEIS 2015 vol. 1 at 5-6 – 5-7.

[52] *Id*. at 5-20.

[53] *Id*. at 5-23.

[54] *Id*. at 5-26.

[55] Renault, Marion, Ohio pipeline construction spill sends 2 million gallons of mud into two Ohio wetlands, The Columbus Dispatch, (Apr. 20, 2017), http://www.dispatch.com/news/20170420/pipeline-construction-spill-sends-2-million-gallons-of-drilling-mud-into-two-ohio-wetlands.

has the potential to "kill just about everything in that wetland," and the wetland will not recover to its previous pristine condition for decades.[56]

Another concern is the increasing problem of uncontrolled fractures created by hydraulic fracturing operations causing "frack hits"—"an unplanned surge of pressurized fluid into another well, often resulting in surface spills" and causing damage to the well.[57] Recently, in Oklahoma, a jury awarded damages to a vertical well owner whose well was damaged by a frack hit caused by horizontal well fracking operations; the high-pressured fracking fluid shot past the area where production was to occur, and toward the vertical well's production area, and the day after, frack fluid started erupting from the well into the air.[58] Numerous similar lawsuits have been filed against horizontal well operators.[59] The defendant claimed that it could not be held liable, because the fractures created by fracking were too hard to control, and cited a previous ruling noting that such fractures are "of immeasurable length and uncontrollable direction."[60] Oklahoma state officials have recently confirmed 20 incidents in which horizontal wells caused frack hits damaging neighboring vertical wells, while 55 alleged incidents are awaiting review; they believe many other incidents have gone unreported.[61] Clearly, frack hits are an inherent risk of horizontal drilling, especially in areas like the Grand Junction and Colorado River Valley field offices, where new horizontal drilling is occurring in areas with historic development.

Indeed, the problem of frack hits and communication between horizontal and existing vertical wells has plagued Colorado as well, but neither the Grand Junction nor Colorado River Valley RMP-EISs address how these risks will be avoided.[62] Because existing wells may not have been constructed to isolate the well from formations targeted by horizontal wells (which were considered to be non-producing at the time they were constructed), fluids may escape from formations targeted by horizontal wells into existing vertical wells.[63] Further, this risk of communication (and the risk of surface or groundwater contamination) could be worsened when

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[56] Mufson, Steven, Pipeline spill by Dakota Access company could have a "deadly effect", The Washington Post, (May 8, 2017), https://www.washingtonpost.com/news/energy-environment/wp/2017/05/08/pipeline-spill-by-dakota-access-company-could-have-a-deadly-effect/?utm_term=.0ff8270e7d7f; Renault, Marion, Feds shut down new drilling along Rover pipeline project, Columbia Dispatch (May 11, 2017), available at http://www.dispatch.com/news/20170511/feds-shut-down-new-drilling-along-rover-pipeline-project.

[57] Oil and Gas; Hydraulic Fracturing on Federal and Indian Lands, 80 Fed. Reg. 16128-01 (March 25, 2015).

[58] Soraghan, Mike, Small producer wins verdict against Devon in 'frack hit' case, E&ENews (Aug. 17, 2017), available at https://www.eenews.net/energywire/2017/08/17/stories/1060058877.

[59] *Id*.

[60] *Id*.; *see also* H&S Equipment, Inc. v. Devon Energy Production Co., Case No. Civ-15-12440HE, Defs.' Mot. for Summary Judgment, 23 (W.D.Okla. March 15, 2017) (Dkt. 35) (citing *Coastal Oil & Gas Corp. v. Garza Energy Tr.*, 268 S.W.3d 1, 7, 32 (Tex. 2008)); *Coastal Oil*, 268 S.W.3d at 7 ("Estimates of [fracture] distances are dependent on available data and are at best imprecise. Clues about the direction in which fractures are likely to run horizontally from the well may be derived from seismic and other data, but virtually nothing can be done to control that direction…").

[61] Vamburkar, Meenal, Ruined old wells in Oklahoma are the shale boom's dark secret, Pittsburgh Post-Gazette (Oct. 5, 2017), available at http://www.post-gazette.com/powersource/companies/2017/10/04/Ruined-old-wells-in-Oklahoma-are-the-shale-boom-s-dark-secret/stories/201710030190.

[62] *See* Webb, Dennis, Well problem spurs change in state policy, GJ Sentinel, Feb. 4, 2014, http://www.gjsentinel.com/news/articles/well-problem-spurs-change-in-state-policy (noting BLM "has no rules or policies addressing potential communication between horizontal and existing wells.).

[63] *Id*.

older existing wells are improperly sealed or their casing is corroded and degrading.[64] The failure of operators to routinely test mechanical integrity of older wells compounds the threat.[65]

BLM must analyze the unique risks of horizontal drilling and mitigation of these risks, but has failed to do so in the Grand Junction and Colorado River Valley RMP-EISs, or in a proper NEPA analysis of its leasing decision.

The RMP-EISs Fail to Fully Analyze Greenhouse Gas Emissions and Social Cost of Carbon

The Grand Junction and Colorado River Valley RMPs fails to analyze the full lifecycle greenhouse gas emissions from oil and gas development within these planning areas, but recent NEPA documents for lease sales in Colorado and Ohio indicate that analysis of downstream GHG emissions from oil and gas development is feasible. The EA for the December 2016 Royal Gorge Field Office lease sale estimates cumulative downstream emissions from oil and gas development within certain segments of the Royal Gorge planning area, where proposed parcels are located, totaling over 95 million metric tons of CO2 per year.[66] Elsewhere, the EA describes a straightforward methodology for making these estimates:

> A reasonable down-stream/end-use consumption estimate could be made for the ranges of potential [oil and gas] development (RFD) on the Lease Parcels by using per-well annual production values (see production data for each County and RFD ranges for each Lease Parcel in tables above) converted to energy equivalent and ranges of RFD for Lease parcels 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; these factors were derived using the Annual Energy Outlook (AEO) 2014 Report."[67]

In addition, BLM's programmatic EA for oil and gas leasing in Ohio's Wayne National Forest projects lifecycle emissions resulting from shale gas development in the Utica shale, including upstream emissions from well site investigation, preparation of the well pad, carbon loss due to vegetative clearing, well drilling, hydraulic fracturing and well completion, and downstream emissions from production, processing, transmission, distribution, and combustion.[68] To estimate pre-production emissions, the EA relied on Jiang et al. 2011, which estimates per well emissions factors in the Marcellus shale play.[69] To calculate post-production

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[64] *Id*.
[65] *See* Webb, Dennis, Driller is fined, agrees to well tests, GJ Sentinel, Dec. 23, 2016, http://www.gjsentinel.com/news/articles/driller-is-fined-agrees-to-well-tests; Webb, Dennis, Leaking well, company draw state's notice, GJ Sentinel, Jan. 6, 2014, http://www.gjsentinel.com/news/articles/leaking-well-company-draw-states-notice/; Webb, Dennis, Nearby frack job investigated in leak at well, GJ Sentinel, Dec. 16, 2013, http://www.gjsentinel.com/breaking/articles/nearby-frack-job-investigated-in-leak-at-well/.
[66] BLM, Environmental Assessment for the Royal Gorge Field Office, December 2016 Competitive Oil & Gas Lease Sale, DOI-BLM-CO-F020-2016-0013-EA, 24 (Dec. 2016).
[67] *Id*. at 34.
[68] BLM, Environmental Assessment, DOI-BLM-Eastern States-0030-2016-0002-EA, Oil and Gas Leasing, Wayne National Forest, Marietta Unit of the Athens Ranger District, Monroe, Noble, and Washington Counties, Ohio ("Wayne NF EA"), 85-92 (Oct. 2016).
[69] *See* Jiang, M., Griffin, W. M, Hendrickson, C., Jaramillo, P., VanBriesen, J., & Venkatesh, A. (2011). Life cycle

emissions, the EA multiplied the average energy production amount of a natural gas well in Ohio by emissions factors provided by Venketesh et al. 2011.[70] The EA calculated total lifecycle GHGs for developing 60 horizontal wells in the Wayne National Forest would total over 4.2 million metric tons of CO2e per year.[71]

BLM has also conducted downstream emissions estimates for the Reasonably Foreseeable Development Scenario for oil and gas development in Montana, North Dakota, and South Dakota.[72] EPA has also recently estimated lifecycle GHG emissions for offshore oil and gas exploration and development activities that could result from the issuance of a NPDES permit.[73] Accordingly, there is no reason why

Finally, BLM has failed to conduct any meaningful analysis of the significance of GHG emissions in the context of existing carbon budgets. Immediate and aggressive greenhouse gas emissions reductions are necessary to keep warming well below 2°C rise above pre-industrial levels. The IPCC Fifth Assessment Report and other expert assessments have established global carbon budgets, or the total amount of 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 percent probability of limiting warming to 2°C above pre-industrial levels, and to 400 $GtCO_2$ from 2011 onward for a 66 percent probability of limiting warming to 1.5°C.[74] These carbon budgets have been reduced to 850 $GtCO_2$ and 240 $GtCO_2$, respectively, from 2015 onward.[75]

Published scientific studies have estimated the United States' portion of the global carbon budget by allocating the remaining global budget across countries based on factors including equity and economics. Estimates of the U.S. carbon budget vary depending on the temperature target used by the study (1.5°C versus 2°C), the likelihood of meeting the temperature target (50% or 66% probability), the equity principles used to apportion the global budget among countries, and whether a cost-optimal model was employed. The U.S. carbon budget for limiting temperature rise to well below 2°C has been estimated at 38 $GtCO_2$, while the estimated budget for limiting temperature rise to 2°C ranges from 34 $GtCO_2$ to 158 $GtCO_2$.

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greenhouse gas emissions of Marcellus shale gas. Environmental Research Letters, 6(3), 1-10, http://dx.doi.org/10.1088/1748-9326/6/3/034014 & supplementary data available at http://iopscience.iop.org/1748-9326/6/3/034014/media/erl381437suppdata.pdf.

[70] The EA does not provide a full citation for this source.

[71] Wayne NF EA at 92.

[72] BLM, Climate Change Supplementary Information Report for Montana, North Dakota, and South Dakota (2010); Air Resource Technical Support Document for Emission Inventories and Near-Field Modeling (March 8, 2013).

[73] USEPA, Draft Environmental Assessment, National Pollutant Discharge Elimination System (NPDES) General Permit for Eastern Gulf of Mexico Offshore Oil and Gas Exploration, Development, and Production, 4-35 – 4-35 (July 2016).

[74] 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," (2013), at 25; IPCC, "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," [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland (2014), at 63-64 and Table 2.2.

[75] Rogelj, Joeri et al., "Differences between carbon budget estimates unraveled,"6 Nature Climate Change 245, (2016), at Table 2.

Du Pont et al. (2017) averaged across five IPCC-AR5 sharing principles (e.g. capability, equal per capita, greenhouse development rights, equal cumulative per capita, and constant emissions ratio) to estimate the U.S. carbon budget through 2100 based on a cost-optimal model.[76] Du Pont et al. (2017) estimated the U.S. carbon budget at 57 $GtCO_2eq$ (equal to ~ 38 $GtCO_2$) [77] for a 50% chance of returning global average temperature rise to 1.5°C by 2100, which is the only target among the studies that is consistent with the "well below 2°C" temperature commitment of the Paris Agreement. The U.S. carbon budget for a 66% probability of keeping warming below 2°C was estimated at 104 $GtCO_2eq$ (equal to ~ 69 $GtCO_2$). [78]

For a 66% probability of keeping warming below 2°C, Peters et al. (2015) estimated the U.S. carbon budget at 34 $GtCO_2$ based on an equity approach for allocating the global carbon budget, and 123 $GtCO_2$ under an inertia approach.[79] The "inertia" approach bases sharing on countries' current emissions, while the "equity" approach bases sharing on population size and provides for equal per-capita emissions across countries. Similarly using a 66% probability of keeping warming below 2°C, Gignac et al. (2015) estimated the U.S. carbon budget at 78 to 97 $GtCO_2$, based on a contraction and convergence framework, in which all countries adjust their emissions over time to achieve equal per-capita emissions.[80] Although the contraction and convergence framework corrects current emissions inequities among countries over a specified time frame, it does not account for inequities stemming from historical emissions differences. When accounting for historical responsibility, Gignac et al. (2015) estimated that the United States has an additional cumulative carbon debt of 100 $GtCO_2$ as of 2013. Using a non-precautionary 50% probability of limiting global warming to 2°C, Raupach et al. (2014) estimated the U.S. carbon budget at 158 $GtCO_2$ based on a "blended" approach of sharing principles that averages the "inertia" and "equity" approaches.[81]

Under any scenario, the remaining U.S. carbon budget consistent with limiting global average temperature rise to 1.5°C or 2°C is extremely small and is rapidly being consumed. In 2015 alone, global CO_2 emissions totaled 36 $GtCO_2$[82] and U.S. emissions totaled 6.5 $GtCO_2eq$.[83]

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[76] Du Pont, Yann Robiou et al., Equitable mitigation to achieve the Paris Agreement goals, 7 Nature Climate Change 38 (2017).
[77] *See* Meinshausen, Malte et al., Greenhouse gas emission targets for limiting global warming to 2 degrees Celsius, 458 Nature 1158 (2009); we used a conversion factor of 1 $GtCO_2$ = 1.5 $GtCO_2eq$ based on Table 1 in Meinshausen et al. 2009.
[78] *Id.* 1 $GtCO_2$ = 1.5 $GtCO_2eq$ based on Table 1 in Meinshausen et al. 2009.
[79] Peters, Glen P. et al., Measuring a fair and ambitious climate agreement using cumulative emissions, 10 Environmental Research Letters 105004 (2015).
[80] Gignac, Renaud and H. Damon Matthews, Allocating a 2C cumulative carbon budget to countries, 10 Environmental Research Letters 075004 (2015). In a contraction and convergence approach, national emissions are allowed to increase or decrease for some period of time until they converge to a point of equal per capita emissions across all regions at a given year, at which point all countries are entitled to the same annual per capita emissions.
[81] Raupach, Michael et al., Sharing a quota on cumulative carbon emissions, 4 Nature Climate Change 873 (2014) at Supplementary Figure 7.
[82] *See* Le Quéré, Corrine, et al., Global Carbon Budget 2016, 8 Earth Syst. Sci. Data 605 (2016), www.globalcarbonproject.org/carbonbudget/16/data.htm.
[83] EPA: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

In the context of this lease sale, the more than 2.9 million metric tons of CO_2 that would be emitted[84] comprises a substantial portion of the remaining U.S. carbon budget of 38 $GtCO_2$ for a 50% chance of returning global average temperature rise to 1.5°C by 2100. This is measurable and significant.

BLM's failure to fully analyze the lifecycle GHG emissions from oil and gas leasing and their significance in the context of global carbon budgets violates NEPA. Further, its failure to analyze the significance of GHG emissions using the social cost of carbon tool is arbitrary and capricious, as previously discussed in our comments on the DNA. *See* Ex. A at 19-24.

The RMP-EISs Lack a Full Accounting of Water Resource Impacts from Fracking

The EPA recently completed its study on the impacts of fracking on drinking water resources, which found scientific evidence that hydraulic fracturing activities can impact drinking water resources under some circumstances.[85] The report identifies certain conditions under which impacts from hydraulic fracturing activities can be more frequent or severe.[86] The EPA identified a number of risk factors that may increase the risks of drinking water contamination, some of which are present in Colorado:

- **Risk factor 1:** Water withdrawals for hydraulic fracturing in times or areas of low water availability, particularly in areas with limited or declining groundwater resources.

  Western Colorado is an area of extreme water stress, due to its semi-arid climate and limited groundwater and surface water resources. The EPA notes the potential for water demand from horizontal well development to stress local water resources in this region—water use in the Uintah-Piceance Basin is expected to quadruple in coming years with the rise of horizontal drilling.[87]

  Colorado does not track where oil and gas operators withdraw water for fracking or other oil and gas activities,[88] and nothing in the Grand Junction or Colorado River Valley RMPs restricts the timing, rate, or location of water withdrawals, or limits freshwater use. According to EPA, without management of the rate and timing of withdrawals, surface water withdrawals have the potential to affect both drinking water quantity and quality, especially in seasonal low-flow periods.[89]

- **Risk factor 2:** Spills during the handling of hydraulic fracturing fluids and chemicals or produced water that result in large volumes or high concentrations of chemicals reaching groundwater resources.

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[84] *See* Exhibit A at 21.
[85] USEPA, Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States (2016) ("USEPA 2016").
[86] *See id*. at ES-3.
[87] *Id*. at 4-34.
[88] FracTracker Alliance, Groundwater Threats in Colorado (Sept. 20, 2016), available at https://www.fractracker.org/2016/09/groundwater-threats-in-colorado/.
[89] USEPA 2016 at 4-37.

A study of spills reported to the Colorado Oil and Gas Conservation Commission identified 125 spills during well stimulation (i.e., a part of the life of an oil and gas well that often, but not always, includes hydraulic fracturing) between January 2010 and August 2013. [90] Of these spills, 51% were caused by human error and 46% were due to equipment failure.

A new study analyzing spill records in several states (Colorado, New Mexico, North Dakota, and Pennsylvania) show spills are a chronic risk of oil and gas development: 2-16% of wells report a spill each year, while 75-94% of spills occur within the first three years of well life when wells were drilled, completed, and had their largest production volumes.[91] According to another nationwide review of oil and gas spills since 2009, 2,500 spills have been reported to have affected groundwater, but this is likely an undercount as many oil and gas agencies don't track whether spills affect water, or even spills.[92] Overall, 10,348 spills, blowouts and other mishaps at oil and gas sites occurred in 2015; 11,283 such events occurred in 2014.[93] At least 609 spills occurred in Colorado in 2015, 91 of which affected water resources.[94]

The potential for massive quantities of frack fluids and wastewater to cause catastrophic impacts to water resources is illustrated by spill incidents in the Utica and Marcellus shale plays:

- In June 2014, the Statoil Eisenbarth well pad located in Monroe County, Ohio close to the Wayne National Forest, caught fire and took nearly a week to completely extinguish. As a result, 54,000 gallons of hazardous fracking chemicals and 300,000 gallons of water and foam used to control the blaze washed into a tributary of the Ohio River, killing 70,000 fish in a 5-mile long fish kill.[95]

- In 2010, a fracturing flowback pit in Ohio was cut by a track hoe, causing more than 1.5 million gallons of fluid to spill into the environment.[96]

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[90] *Id*. at ES-22.
[91] Patterson, Lauren A. et al. Unconventional Oil and Gas Spills: Risks Mitigation Priorities, and State Reporting Requirements, Environ. Sci. Technol., 51(5), pp 2563–2573 (2017), doi: 10.1021/acs.est.6b05749.
[92] Soraghan, Mike & Pamela King, Drilling mishaps damage water in hundreds of cases, Energywire (Aug. 8, 2016), available at https://www.eenews.net/stories/1060041279.
[93] *Id*.
[94] *Id*.
[95] Ohio Citizen Action Fund, The Eisenbarth well fire: Ohio fails in a fracking emergency, 6 (Oct. 2014), available at http://www.theoec.org/sites/default/files/OhioCitizenAction.Eisenbarth%20Report.pdf; *see also* U.S. Environmental Protection Agency Pollution/Situation Report, Statoil Eisenbarth Well Response, POLREP #1, available at http://www.theoec.org/sites/default/files/Eisenbarth%20well%20pad%20fire.pdf; Junkins, Casey, EPA: 70K Fish, Aquatic Life Killed, Wheeling Intelligencer, July 22, 2014, available at http://www.theintelligencer.net/page/content.detail/id/607167.html; Ohio Environmental Protection Agency, Directors Final Findings & Orders NPDES In the Matter of Statoil USA Onshore Properties, Inc. (November 6, 2015).
[96] ODNR, Notice of Violation No. 1278508985 (June 21, 2010).

- Recently, in Pennsylvania, a shale gas driller was fined $1.2 million when a wastewater impoundment leaked and contaminated the drinking water of five Westmoreland County families.[97] The families are still without adequate, permanent water supplies and still depend on bottled water.

Frack chemicals and wastewater may have chronic effects on aquatic organisms aside from immediate lethal effects, including endocrine-disrupting effects,[98] and impacts on microbial community structure and functioning in sediments and stream waters, altering nutrient cycling and antibiotic resistance.[99] Of the hundreds of chemical compounds used in fracking fluid, fifteen often-used chemicals are of particular concern because they are both toxic and able to stick around in the environment for a long time.[100]

- **Risk factor 3:** Injection of hydraulic fracturing fluids into wells with inadequate mechanical integrity, allowing gases or liquids to move to groundwater resources.

  Studies show that well casing failures are a chronic problem regardless of whether wells are old or new, fracked or not fracked.[101] For example, a ProPublica review of well records, case histories and government summaries of more than 220,000 well inspections found that structural failures inside injection wells are routine. From late 2007 to late 2010, one well integrity violation was issued for every six deep injection wells examined — more than 17,000 violations nationally. More than 7,000 wells showed signs that their walls were leaking. Records also show wells are frequently operated in violation of safety

[97] Hopey, Don, Shale gas driller fined $1.2M for contaminating drinking water in Westmoreland, Pittsburgh Post-Gazette (Feb. 28, 2017), available at http://www.post-gazette.com/local/westmoreland/2017/02/28/WPX-Energy-Appalachia-shale-gas-company-fined-Pennsylvania-water-contamination-Westmoreland-County/stories/201702280305.

[98] He, Yuhe, et al., Effects on Biotransformation, Oxidative Stress, and Endocrine Disruption in Rainbow Trout (Oncorhynchus mykiss) Exposed to Hydraulic Fracturing Flowback and Produced Water, Environ. Sci. Technol., (2017) 51, 940−947, doi: 10.1021/acs.est.6b04695.

[99] Fahrenfeld, N.L., Shifts in microbial community structure and function in surface waters impacted by unconventional oil and gas wastewater revealed by metagenomics, Science of the Total Environment, 580 (2017) 1205–1213, http://dx.doi.org/10.1016/j.scitotenv.2016.12.079.

[100] Univ. of Colo. Boulder, New study identifies organic compounds of potential concern in fracking fluids, CU Boulder Today (June 30, 2015), available at http://www.colorado.edu/today/2015/06/30/new-study-identifies-organic-compounds-potential-concern-fracking-fluids.

[101] Johnson, R. et al., The Environmental Costs and Benefits of Fracking, Annu. Rev. Environ. Resour. 2014. 39:7.1-7.36 (see pp. 7.11-7.14 for discussion of well failure rates); Johnson, Robert B., The integrity of oil and gas wells, 111 Proceedings of the National Academy of Science 1092 (2014), available at http://www.pnas.org/content/111/30/10902; Ingraffea, A., Fluid Migration Mechanisms Due to Faulty Well Desgin and/or Construction: An Overview and Recent Experiences in the Pennsylvania Marcellus Play, Physicians Scientists & Engineers for Healthy Energy (Oct. 2012) (noting casing failures are "not rare" in the oil and gas industry"); *see also* studies cited in Ex. A ns.81 & 147; Environment America Report at 11 (noting data from fracking wells in Pennsylvania from 2010 to 2012 show a 6 to 7 percent rate of well failure due to compromised structural integrity).

regulations and under conditions that greatly increase the risk of fluid leakage and the threat of water contamination.[102]

Recent studies in Colorado and Texas confirm this phenomenon is widespread. In Colorado, studies show that well casing failures of horizontal wells in the Denver Julesburg Basin have caused the migration of methane to water wells.[103] Further, a recent study focused on the southern Eagle Ford Shale region found evidence of "episodic contamination events potentially attributed to unconventional oil and gas development or other anthropogenic activities."[104] Elevated levels of bromide were detected in groundwater, along with multiple volatile organic compounds and dissolved gas effervescence, suggesting contamination by unconventional oil and gas activities. In another study of groundwater in the Permian Basin, researchers monitored water quality in 42 private water wells over a 13-month period in three contiguous counties as unconventional oil and gas activities increased within the area.[105] Over time, the researchers found significant changes in total organic carbon and pH and ephemeral detections of ethanol, bromide, dichloromethane, and multiple volatile organic compounds after the initial sample phase. Detections of metal ions including barium, iron, selenium, and strontium also fluctuated over the 13-month period.[106] The paper noted a potential link between the contamination and unconventional oil and gas development, and that the most likely mechanism would be physical degradation of the protective casing in the vertical segments of fracked wells—a phenomenon observed in the Barnett and Marcellus shales.[107] Additionally, the accumulation of bromide and alcohol species "indicates that there may be longer standing residual changes in groundwater chemistry that can persist in regions engaged in unconventional oil and gas development."[108]

- **Risk factor 6:** Disposal or storage of hydraulic fracturing wastewater in unlined pits resulting in contamination of groundwater resources.

  While Colorado requires the use of liners for wastewater disposal pits, dozens of active "centralized exploration and production waste management facilities" are found throughout the state, including several near proposed lease sale parcels COC78678-9 outside of De Beque.[109] These facilities are mostly open-air pits used for storage or disposal, or land-application sites. According to FracTracker, "[g]roundwater monitoring

[102] Lustgarten, Alexander, Are Fracking Wastewater Wells Poisoning Groundwater Beneath Our Feet?, Scientific American (June 2012), available at https://www.scientificamerican.com/article/are-fracking-wastewater-wells-poisoning-ground-beneath-our-feeth/.
[103] Sherwood, Owen et al., Groundwater methane in relation to oil and gas development and shallow coal seams in the Denver-Julesburg Basin of Colorado, Proceedings of the National Academy of Sciences, vol. 113, no. 30, 8391–8396 (2016), doi: 10.1073/pnas.1523267113 available at http://www.pnas.org/content/113/30/8391.full.
[104] Hildenbrand, Z.L., et al., A reconnaissance analysis of groundwater quality in the Eagle Ford shale region reveals two distinct bromide/chloride populations, Science of the Total Environment, 575 (2017) 672-680.
[105] Hildenbrand, Z.L., et al. Temporal variation in groundwater quality in the Permian Basin of Texas, a region of increasing unconventional oil and gas development, Science of the Total Environment, 562 (2016) 906-913.
[106] *Id*. at 912.
[107] *Id*.
[108] *Id*.
[109] FracTracker 2016.

wells around these sites measure the levels of some contaminants. Inspection reports show that sampling of the wastewater is not usually – if ever – conducted. The only regulatory requirement is that oil is not visibly noticeable as a sheen on the wastewater fluids in impoundments…."[110] Weak monitoring requirements could therefore lead to the application of toxic wastewaters on lands resulting in contamination of groundwater.

Recent news reports also reveal that in Colorado, landfills have been illegally accepting radioactive drilling waste that they are not authorized to handle, which could risk groundwater contamination and other public health risks.[111] In addition, for those landfills that have been authorized to accept such waste, monitoring wells to detect leaks into groundwater may be non-existent or inadequate.[112]

BLM's failure to analyze the various impacts of fracking generally on water resources and on site-specific resources violates NEPA.

Public Health Risks Are Ignored

The RMP-EISs fail to fully analyze public health impacts of unconventional horizontal well development, fracking, and oil and gas development generally. Due to the frequent and heavy use of chemicals in fracking operations, proximity to fracked wells is associated with higher rates of cancer, birth defects, poor infant health, and acute health effects for nearby residents who must endure long-term exposure. Numerous studies finding these effects are summarized in Exhibits A and B. In addition:

- A new study using data from rural Colorado shows a link between proximity to oil and gas development and childhood leukemia. Researchers found children diagnosed with acute lymphocytic leukemia were more likely to live in areas of high-density oil and gas development compared to children with other types of cancer.[113]

- A new study found that prenatal exposure of female mice to chemicals associated with fracking and unconventional oil and gas development had adverse effects on reproductive and developmental health, including altered hormone levels, increased body weights, altered uterine and ovary weights, increased heart weights and collagen deposition, disrupted development of ovary follicles, and other adverse health effects. Even the lowest dosage exposures—equivalent to concentrations reported in drinking water sources in drilling regions—caused adverse health effects.[114]

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[110] *Id*.
[111] Finley, Bruce, Colorado landfills are illegally burying low-level radioactive waste from oil and gas industry, Denver Post learns, Denver Post (Sept. 22, 2017), available at http://www.denverpost.com/2017/09/22/colorado-landfills-illegally-burying-radioactive-waste-oil-gas/.
[112] Finley, Bruce, Low-level radioactive waste a hot issue near Last Chance, Denver Post (Aug. 17, 2012), available at http://www.denverpost.com/2012/08/17/low-level-radioactive-waste-a-hot-issue-near-last-chance/.
[113] McKenzie, Lisa M., et al., Childhood hematologic cancer and residential proximity to oil and gas development, PLoS ONE 12(2): e0170423 (2017), http://dx.doi.org/10.1371/journal.pone.0170423.
[114] Kassotis, Christopher D., et al., Adverse Reproductive and Developmental Health Outcomes Following Prenatal Exposure to a Hydraulic Fracturing Chemical Mixture in Female C57Bl/6 Mice, Endocrinology, 157(9):3469–3481 (2016), doi: 10.1210/en.2016-1242.

- A survey found agreement among experts that a minimum setback of a quarter mile from oil and gas development is necessary to protect public health. [115] Half of the experts recommended a 1 to 1 ¼ mile setback. The panel also agreed that additional protections are necessary for vulnerable populations such as children and the elderly.[116]

- A report from a researcher at Colorado State University shows that ozone smog that results from oil and gas industry pollution poses a real threat to children who suffer from asthma.[117] Nationally, there are more than 750,000 summertime asthma attacks in children under the age of 18 due to ozone smog resulting from oil and gas pollution. Each summer, there are more than 2,000 asthma-related emergency room visits and over 600 respiratory related hospital admissions nationally due to ozone smog resulting from oil and gas pollution.

- A nationwide study of stillbirth risk among 223,375 births during 2002-2008 linked chronic and acute exposure to ground level ozone during pregnancy to an increased risk of stillbirth.[118] Ozone exposure in the week prior to delivery was associated with a 13–22% increased stillbirth risk, while chronic exposure over the course of pregnancy increased risk by nearly 40%. These findings suggest that 200 stillbirths per 100,000 births each year might be attributable to chronic ozone exposure in the U.S., which translates to approximately 8,000 stillbirths per year in the U.S.

- A study of long-term exposure to ozone and fine particulate matter in a cohort of more than 60 million U.S. Medicare beneficiaries between 2000 and 2012 reported "significant evidence of adverse effects related to exposure to PM2.5 and ozone at concentrations below current national standards."[119] Specifically, there was an important effect of ozone and PM2.5 on mortality, even for pollution exposures below National Ambient Air Quality Standards, which was strongest among self-identified racial minorities and people with low income. The effect was at least as great in individuals living in a rural environment as in those in cities. This study suggests that simply meeting current EPA standards will still result in a significant number of older individuals losing their lives due to ozone and particulate matter pollution in Utah.

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[115] Brown, David et al. The Problem of Setback Distance for Unconventional Oil & Gas Development: An analysis of expert opinions. Southwest Pennsylvania Environmental Health Project Technical Reports, Issue 2 (May 9, 2016).
[116] *Id*.; *see also* Webb, Ellen et al. Potential hazards of air pollutant emissions from unconventional oil and natural gas operations on the respiratory health of children and infants, Review Envtl. Health 2016, available at http://ecowatch.com/wp-content/uploads/2016/05/fracking_study.pdf (suggesting greater protection from unconventional oil and gas development necessary for children and infants).
[117] Fleischman, Lesley, Gasping for Breath: An Analysis of the health effects from the oil and gas industry, Clean Air Task Force (Aug. 2016), available at http://www.catf.us/resources/publications/files/Gasping_for_Breath.pdf.
[118] Mendola, P. et al. Chronic and Acute Ozone Exposure in the Week Prior to Delivery is Associated with the Risk of Stillbirth, 14 Int. J. Environmental Research and Public Health 731 (2017).
[119] Di, Q. et al. Air Pollution and Mortality in the Medicare Population. New England Journal of Medicine 376:2513–2522 (2017).

Given these known health risks, BLM should have analyzed site-specific impact on towns and recreation areas located near the proposed parcels, including the towns of De Beque, Molina, and Mesa, and on important water supplies such as Plateau Creek and groundwater below the Grand Mesa.[120] Highline State Park, which is a popular campground, water sports recreation, and birdwatching area contains two lakes and is less than half a mile from lease parcels (COC78695) but the potential impacts of oil and gas development so close to these lakes is ignored.[121]

BLM must address the potential public health impacts of oil and gas development, fracking, and horizontal drilling generally, and public health risks to specific communities near and around the areas for lease, in compliance with NEPA.

BLM Fails to Take a Hard Look at Seismic Risks

The RMP-EISs fail to acknowledge that fracking and not just wastewater injection can cause earthquakes, or perform any site-specific analysis of potential seismic risks. Induced seismicity has been linked to fracking events in Ohio, Pennsylvania, Oklahoma, and Canada.[122] A 2015 study showed that 77 earthquakes occurring in March 2014 near Youngstown, Ohio triggered a microfault previously unknown to operators and regulators, including a magnitude 3.0 earthquake.[123]

The RMP-EISs also fail to acknowledge seismic risks to Highline State Park's Highline and Mack Mesa Lakes, which are both dams within less than a mile of lease parcel COC78695, and less than a few miles from other lease parcels (e.g., COC78687, -78693, -78695, -78682). As described in Exhibits D and E, fracking and wastewater injection beneath and around dams is especially dangerous, given the risk of induced seismicity causing dam failure and jeopardizing downstream communities. In light of these risks, a recent study that outlines a framework for risk assessment to analyze potential harm to sensitive infrastructure from induced seismicity in Canada, recommends an "exclusion zone within a 5 km radius (in horizontal space) surrounding vulnerable high-consequence facilities…[and] monitoring and response protocol to ensure that activity rates beyond the exclusion zone, to approximately 25 km, are kept below a specified

[120] Center Lease Parcels Map; also available at http://center.maps.arcgis.com/apps/View/index.html?appid=5c7c934d5093482689f5dc8d52d79218.
[121] USGS, Characterization of Water Quality in Government Highline Canal at Camp Diversion and Highline Lake, Mesa County, Colorado, July 2000 through September 2003, Scientific Investigations Report 2004–5281 (2004),
[122] Arenschield, Laura, Study ties 77 Ohio earthquakes to two fracking wells, Columbus Dispatch (Jan. 8, 2015) ("Arenschield 2015"), available at http://www.dispatch.com/content/stories/local/2015/01/08/Research-ties-Ohio-quakes-to-fracking.html; Skoumal, Richard, et al., Earthquakes Induced by Hydraulic Fracturing in Poland Township, Ohio (2015), available at http://www.bssaonline.org/content/early/2015/01/01/0120140168.abstract; Frazier, Reid, Pennsylvania confirms first fracking-related earthquakes, The Allegheny Front / StateImpact NPR (Feb 18, 2017), https://stateimpact.npr.org/pennsylvania/2017/02/18/pennsylvania-confirms-first-fracking-related-earthquakes/; Soraghan, Mike, Okla. officials link some quakes to fracking, E&E News Energywire (Dec. 12, 2016), available at http://www.eenews.net/energywire/stories/1060047006/; Gronewold, Nathaniel, New research suggests fracking triggered active faults, E&E News Energywire (November 28, 2016), available at http://www.eenews.net/energywire/stories/1060046240/; Mahani, Alireza B. et al., Fluid Injection and Seismic Activity in the Northern Montney Play, British Columbia, Canada, with Special Reference to the 17 August 2015 Mw 4.6 Induced Earthquake, 107 Bulletin of the Seismological Soc'y of Am. 542 (2017).
[123] Arenschield 2015.

limit."[124] The study stresses that these recommendations are meant to address induced seismicity from the hydraulic fracturing process, and that wastewater disposal wells may require a larger exclusion zone of 10 km.[125] BLM, however, has failed to analyze whether dormant faults exist in the vicinity of the lakes, or conduct any risk assessment, or determine whether setbacks should be required.

That fracking- or wastewater-injection-induced earthquakes have not yet been detected near or around the areas for lease is not a basis for dismissing these risks. Because shale drilling typically occurs in deeper formations where dormant faults are more likely to be present, these previously untapped areas may not have yet been triggered.[126] In addition, cumulative fluid injections leading to pore pressure build-up over time is likely to blame for induced seismicity. *See* Exhibit E. Accordingly, it may only be a matter of time until additional fluid pressure builds up and an earthquake is triggered.

BLM's failure to acknowledge and analyze the potential for wastewater injection and fracking to induce earthquakes and harm dam structures near the lease parcels violates its public disclosure duties under NEPA.

B. BLM Has Violated the Endangered Species Act by Failed to Consult with the Fish and Wildlife Service Regarding Effects to Listed Species.

BLM must also consult with U.S. Fish and Wildlife Service regarding the effects of oil and gas development on endangered fish near the lease parcels, and cannot rely on the 2008 PBO to fulfill its consultation obligation under Section 7 of the ESA. *See* Ex. A at 33-42; *see also* Ex. C. As described above in Section A(1), new information and circumstances compel completion of consultation before new leasing is allowed. BLM should also consider the following new information in an updated consultation:

1. New Studies Confirm that Climate Change Is Reducing Colorado River Flows

A recent study has formally linked the Upper Colorado River system's declining flows to warming temperatures in the region.[127] The 2017 study examined historical and recent temperatures, precipitation, and river flows, and concluded that temperatures averaging 1.6ºF above normal in the Upper Basin contributed to one-third or more of the river's 19%/year decline in flow from 2000 to 2014: "Fifteen years into the 21st century, the emerging reality is that climate change is already depleting Colorado River water supplies at the upper end of the

[124] Atkinson, Gail, Strategies to prevent damage to critical infrastructure due to induced seismicity. Department of Earth Sciences, Western University, Canada (2017) ("Atkinson 2017"), available at http://www.inducedseismicity.ca/wp-content/uploads/Atkinson2017-FACETS.pdf.
[125] *Id.*
[126] Nikiforuk, Andrew, Do Energy Industry Activities Threaten Dams? BC Hydro Now Says Yes, The Tyee, Oct. 6, 2017, https://thetyee.ca/News/2017/10/06/Energy-Industry-Activities-Threaten-Dams-BC-Hydro-Yes/.
[127] Bradley Udall and Jonathan Overpeck, The 21st Century Colorado River Hot Drought and Implications for the Future, Water Resources Research 53 (2017), doi:10.1002/2016WR019638.

range suggested by previously published projections."[128] Projecting these results into the future based on current greenhouse gas emissions and trends, the authors concluded that "[u]nabated greenhouse gas emissions will lead to continued substantial warming, translating to 21st century flow reductions of 35% or more."[129]

Moreover, scientists have recently projected a 70-99% megadrought risk in the southwest by the end of the century under a business-as-usual GHG emissions scenario.[130] A megadrought could last several decades and "would impose unprecedented stress on the limited water resources of the area."[131] The probability of megadrought is virtually certain (99% likely) if precipitation drops below normal. But regardless of how or whether precipitation changes, regional warming would significantly increase the risk of megadrought.[132]

Another recent publication by the Colorado River Research Group notes that the Colorado River Basin has already warmed by roughly 2° F, and is already locked in to roughly 5° F of additional warming by mid-century "regardless of any behavioral changes that may or may not be implemented by the world's governments."[133] Beyond 2050, "[d]epending on the climate model and the GHG emissions scenario used, the range of additional warming likely falls within the 6 to 10° F range by 2100."[134] The researchers further note that significant temperature-driven runoff declines in the Basin are likely, and that it is "increasingly evident that the strong warming trend is likely to overwhelm any modest changes in precipitation."[135] Given the 15% decline in Colorado River flows this century compared to the previous century, the researchers suggest that average streamflows will decline significantly more than Bureau of Reclamation's projections of a roughly 9% decline in average streamflows by 2060: "[W]ith 16 years of the 21st century already passed, there is now considerable evidence that a 9 percent decline is likely an optimistic scenario."[136]

2. The 2016 Sufficient Progress Assessment Confirms that Endangered Fish Populations Are Not Being Recovered

Colorado pikeminnow populations are in decline throughout the Upper 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.

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[128] *Id.*
[129] *Id.*
[130] Ault, Toby R. et al., Relative impacts of mitigation, temperature, and precipitation on 21st-century megadrought risk in the American Southwest**,** Science Advances, Vol. 2, no. 10, e1600873 (2016), DOI: 10.1126/sciadv.1600873.
[131] *Id*.
[132] *Id*.
[133] Colorado River Research Group, Climate Change and the Coloardo River: What We Already Know, 2 (October 2016), available at http://www.coloradoriverresearchgroup.org/uploads/4/2/3/6/42362959/crrg_climate_change.pdf.

[134] *Id*.
[135] *Id*.
[136] *Id*. at 3.

FWS's latest Sufficient Progress Assessment for the Endangered Fish Recovery Program, which includes the latest population estimates for 2015, show endangered fish populations have continued to decline.[137] In the Colorado River sub-basin, Colorado pikeminnow populations have steadily declined since 2005.[138] The long-term and short-term population estimates of 596 and 446 adults fall far short of the downlisting criteria of 700 adults.[139] Recruitment rates "may not be frequent enough to support stability in the adult populations in the long term."[140] Data from 2015 showing the absence of pikeminnow smaller than 300 mm "suggests spawning success and/or recruitment has been poor the previous three years."[141] Nonnative predation and competition are a major threat to the Colorado pikeminnow population in this sub-basin.[142]

The Recovery Program has also failed to meet the downlisting criteria that recruitment of age-6, naturally-produced fish equal or exceed mean annual adult mortality. The abundance of adult recruits has failed to exceed annual adult mortality "in most years" and "appears insufficient to offset overall adult mortality since 2000."[143] Compounding this problem, population densities of age-0 fish in the middle Green River from 1994 to 2008 were "precariously low."[144] New research reveals that the "mechanisms driving frequency and strength of recruitment events was likely the strength of age-0 Colorado pikeminnow production in backwater nursery habitats.[145] Further, "multiple consecutive years of age-0 densities" are important to the strength of adult populations seven to ten years later.[146]

One of the main causes of declines in the Green River sub-basin population is "too much variability in August and September base flow management."[147] Research by Bestgen and Hill (2015) shows that declines in summer base flows in August and September were correlated with declining densities of age-0 Colorado pikeminnow in the lower and middle reaches of the Green River.[148] The researchers recommended increased base flow magnitudes to support increased age-0 production (1,700 and 3,000 cfs in the middle Green River and 1,700 and 3,800 cfs in the lower Green River).

In 2015, releases from Flaming Gorge Dam resulted in base flow levels within these ranges, and "a significant increase in fall recruitment was observed, underscoring the value of manipulating Flaming Gorge Dam releases as a main recovery action to benefit Colorado pikeminnow recruitment in the Green River."[149] However, it is unclear to what extent Bureau of

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[137] USFWS, 2015-2016 Assessment of Sufficient Progress Under the Colorado River Endangered Fish Recovery Program in the Upper Colorado River Basin, and Implementation of Action Items in the January 10, 20015, Final Programmatic Biological Opinion on the Management Plan for Endangered Fishes in the Yampa River Basin, 4-14 (Dec. 20, 2016) ("2016 Sufficient Progress Assessment")
[138] *Id*. at 4.
[139] *Id*. at 4, 6.
[140] *Id*. at 4.
[141] *Id*. at 8.
[142] *See id*. at 7.
[143] *Id*. at 4.
[144] *Id*.
[145] *Id*. at 11.
[146] *Id*.
[147] *Id*. at 12.
[148] *Id*.
[149] *Id*. at 11-12.

Reclamation or other water users have committed to these base flow increases, and whether they will be sustained as water supplies dwindle with increased water demand and climate change effects on stream flows. The Sufficient Progress Assessment only notes that "Reclamation's summer base flow releases [from Flaming Gorge Dam] now target a preferred flow range to improve survival of young Colorado pikeminnow."[150]

Another main cause of recent declines in pikeminnow throughout the Green River subbasin is "persistent competition and predation from nonnative predatory species (northern pike, smallmouth bass, and walleye), particularly in the Yampa River and lower portions of the Green River mainstem."[151] In the Yampa River portion of the sub-basin, northern pike outnumber Colorado pikeminnow at least 3:1, and Colorado pikeminnow continued to decline between 2011 and 2013.[152] Bestgen et al. 2016 (in review), "report[s] that the decline in adult and subadult Colorado pikminnow has spread though the entire Green River Subbasin."[153]

Humpback chub numbers are also low. Population numbers for the Black Rocks and Westwater core populations remain "below core criteria level."[154] For the Black Rocks population, the average of five estimates since 2004 is 403 adults compared to 579 adults since 1998; for West Water Canyon, the average of five estimates since 2004 is 1,426 adults compared to an average of 2,490 adults since 1998.[155] "Colorado State University's recent robust population analysis more clearly indicated that declines in the Westwater and Black Rock humpback chub populations are due to lapses in recruitment."[156]

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.

3. The 2016 Sufficient Program Assessment Confirms that the Recovery Program Is Failing to Meet Recommended Flows

According to the 2016 Sufficient Progress Assessment, "[t]he Recovery Program still struggles to meet flow recommendations in drought years. [FWS] emphasizes the importance of meeting the flow recommendation. Some of these recommendations have not been met historically and may be unattainable."[157] 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.

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[150] *Id*. at 41.
[151] *Id*. at 12.
[152] *Id*.
[153] *Id*.
[154] *Id*. at 15.
[155] *Id*. at 15.
[156] *Id*. at 20.
[157] 2016 Sufficient Progress Assessment at 38.

BLM must take into account the above new information in an EIS and in an updated Section 7 consultation for its leasing decision, in compliance with NEPA and the ESA.

III. Conclusion

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, surface and ground water resources, seismic potential, or human, animal, and plant health and safety concerns present in the area to be leased. Unconventional oil and gas development not only fuel the climate crisis but entail significant public health risks and harms to the environment. Should BLM proceed with the proposed oil and gas leasing, 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.

For the reasons set forth above, BLM must defer the inclusion of all parcels in the proposed lease sale, and 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 this protest.

Sincerely,

Wendy Park
Senior Attorney
Center for Biological Diversity

John Weisheit
Conservation Director
Living Rivers

Matthew Sandler
Staff Attorney
Rocky Mountain Wild

Eric E. Huber
Managing Attorney
Sierra Club

Kate Hudson
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List of References

Arenschield, Laura, Study ties 77 Ohio earthquakes to two fracking wells, Columbus Dispatch, Jan. 8, 2015 http://www.dispatch.com/content/stories/local/2015/01/08/Research-ties-Ohio-quakes-to-fracking.html

Atkinson, Gail, Strategies to prevent damage to critical infrastructure due to induced seismicity, FACETS (2017)

Ault, Toby R. et al., Relative impacts of mitigation, temperature, and precipitation on 21st-century megadrought risk in the American Southwest**,** 2 Science Advances, 10, e1600873, DOI: 10.1126/sciadv.1600873 (2016)

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 (2015)

Black Hills Plateau Production, LLC, 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

Brown, David et al., The Problem of Setback Distance for Unconventional Oil & Gas Development: An analysis of expert opinions, Southwest Pennsylvania Environmental Health Project Technical Reports, Issue 2 (May 9, 2016)

Center for Biological Diversity, Map of December 2017 Lease Parcels & Reasonably Foreseeably Development Scenario (2017)

Center for Biological Diversity, Map of December 2017 Lease Parcels and Watersheds (2017)

Center for Biological Diversity, Map of December 2017 Lease Parcels (2017)

Colorado River Research Group, Climate Change and the Colorado River: What We Already Know (October 2016)

Di, Q. et al., Air Pollution and Mortality in the Medicare Population. 376 New England Journal of Medicine 2513 (2017)

Du Pont, Yann Robiou et al., Equitable mitigation to achieve the Paris Agreement goals, Nature Climate Change (2017)

Environment America, Fracking by the Numbers: The Damage to Our Water, Land and Climate from a Decade of Dirty Drilling (April 2016)

Fahrenfeld, N.L., Shifts in microbial community structure and function in surface waters impacted by unconventional oil and gas wastewater revealed by metagenomics, 580 Science of the Total Environment 1205 (2017)

Ferrar, Kyle, Groundwater threats in Colorado, FracTracker Alliance, Sept. 20, 2016, https://www.fractracker.org/2016/09/groundwater-threats-in-colorado/

Finley, Bruce, Colorado landfills are illegally burying low-level radioactive waste from oil and gas industry, Denver Post, Sept. 22, 2017, http://www.denverpost.com/2017/09/22/colorado-landfills-illegally-burying-radioactive-waste-oil-gas/

Finley, Bruce, Low-level radioactive waste a hot issue near Last Chance, Denver Post, Aug. 17, 2012, http://www.denverpost.com/2012/08/17/low-level-radioactive-waste-a-hot-issue-near-last-chance/

Fleischman, Lesley, Gasping for Breath: An Analysis of the health effects from the oil and gas industry, Clean Air Task Force (2016)

Frazier, Reid, Pennsylvania confirms first fracking-related earthquakes, The Allegheny Front / StateImpact NPR, Feb 18, 2017, https://stateimpact.npr.org/pennsylvania/2017/02/18/pennsylvania-confirms-first-fracking-related-earthquakes/

Gignac, Renaud and H. Damon Matthews, Allocating a 2C cumulative carbon budget to countries, 10 Environmental Research Letters 075004 (2015)

Gronewold, Nathaniel, New research suggests fracking triggered active faults, E&E News Energywire, November 28, 2016, http://www.eenews.net/energywire/stories/1060046240/

Harpole, John, Piceance Basin to the Pacific: The Economic Advantage the Piceance Basin Has Over Other North American Shale Plays, Colorado Mesa University, Unconventional Energy Institute (April 2017)

He, Yuhe, et al., Effects on Biotransformation, Oxidative Stress, and Endocrine Disruption in Rainbow Trout (Oncorhynchus mykiss) Exposed to Hydraulic Fracturing Flowback and Produced Water, 51 Environ. Sci. Technol. 940 DOI: 10.1021/acs.est.6b04695 (2017)

Hildenbrand, Z.L., et al., Temporal variation in groundwater quality in the Permian Basin of Texas, a region of increasing unconventional oil and gas development, 562 Science of the Total Environment 906 (2016)

Hildenbrand, Z.L., et al., A reconnaissance analysis of groundwater quality in the Eagle Ford shale region reveals two distinct bromide/chloride populations, 575 Science of the Total Environment 672 (2017)

Hopey, Don, Shale gas driller fined $1.2M for contaminating drinking water in Westmoreland, Pittsburgh Post-Gazette, Feb. 28, 2017, http://www.post-gazette.com/local/westmoreland/2017/02/28/WPX-Energy-Appalachia-shale-gas-company-fined-Pennsylvania-water-contamination-Westmoreland-County/stories/201702280305

Ingraffea, A., Fluid Migration Mechanisms Due to Faulty Well Design and/or Construction: An Overview and Recent Experiences in the Pennsylvania Marcellus Play, Physicians Scientists & Engineers for Healthy Energy (Oct. 2012)

IPCC, 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 (2014)

IPCC, Climate Change 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 (2013)

Jiang, M., Griffin, et al., Life cycle greenhouse gas emissions of Marcellus shale gas, Environmental Research Letters, http://dx.doi.org/10.1088/1748-9326/6/3/034014 & supplementary data (2011)

Johnson, R. et al., The Environmental Costs and Benefits of Fracking, Annu. Rev. Environ. Resour. (2014)

Jackson, Robert B., The integrity of oil and gas wells, 111 Proceedings of the National Academy of Science 1092 http://www.pnas.org/content/111/30/10902 (2014)

Junkins, Casey, EPA: 70K Fish, Aquatic Life Killed, Wheeling Intelligencer, July 22, 2014, http://www.theintelligencer.net/page/content.detail/id/607167.html

Kassotis, Christopher D., et al., Adverse Reproductive and Developmental Health Outcomes Following Prenatal Exposure to a Hydraulic Fracturing Chemical Mixture in Female C57Bl/6 Mice, 157 Endocrinology 9 DOI: 10.1210/en.2016-1242 (2016)

Laramie Energy, LLC, EnerCom Conference (Aug. 16, 2017)

Le Quéré, Corrine, et al., Global Carbon Budget 2016, 8 Earth Syst. Sci. Data 605 www.globalcarbonproject.org/carbonbudget/16/data.htm (2016)

Lustgarten, Alexander, Are Fracking Wastewater Wells Poisoning Groundwater Beneath Our Feet?, Scientific American, June 2012, https://www.scientificamerican.com/article/are-fracking-wastewater-wells-poisoning-ground-beneath-our-feeth/

Mahani, Alireza B. et al., Fluid Injection and Seismic Activity in the Northern Montney Play, British Columbia, Canada, with Special Reference to the 17 August 2015 Mw 4.6 Induced Earthquake, 107 Bulletin of the Seismological Soc'y of Am. 542 (2017)

McKenzie, Lisa M., et al., Childhood hematologic cancer and residential proximity to oil and gas development, 12 PLoS ONE 2: e0170423 http://dx.doi.org/10.1371/journal.pone.0170423 (2017)

Meinshausen, Malte et al., Greenhouse gas emission targets for limiting global warming to 2 degrees Celsius, 458 Nature 1158 (2009)

Mendola, P. et al., Chronic and Acute Ozone Exposure in the Week Prior to Delivery is Associated with the Risk of Stillbirth, 14 Int. J. Environmental Research and Public Health 731 (2017)

Mufson, Steven, Pipeline spill by Dakota Access Company could have a "deadly effect", Washington Post, May 8, 2017, https://www.washingtonpost.com/news/energy-environment/wp/2017/05/08/pipeline-spill-by-dakota-access-company-could-have-a-deadly-effect/?utm_term=.0ff8270e7d7f

New York Department of Environmental Conservation, Final Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Regulatory Program for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs, Vols. 1-2 (May 2015)

New York Department of Environmental Conservation, Final Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Regulatory Program for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs Findings Statement (June 2015)

New York Department of Environmental Conservation, New York State Officially Prohibits High-Volume Hydraulic Fracturing, June 29, 2015, http://www.dec.ny.gov/press/102337.html

Nikiforuk, Andrew, Do Energy Industry Activities Threaten Dams? BC Hydro Now Says Yes, The Tyee, Oct. 6, 2017, https://thetyee.ca/News/2017/10/06/Energy-Industry-Activities-Threaten-Dams-BC-Hydro-Yes/

Ohio Department of Natural Resources, Notice of Violation No. 1278508985 (June 21, 2010)

Ohio Citizen Action Fund, The Eisenbarth well fire: Ohio fails in a fracking emergency (2014)

Ohio Environmental Protection Agency, Directors Final Findings & Orders NPDES In the Matter of Statoil USA Onshore Properties, Inc. (November 6, 2015)

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, (1995)

Patterson, Lauren A. et al. Unconventional Oil and Gas Spills: Risks Mitigation Priorities, and State Reporting Requirements, 51(5) Environ. Sci. Technol.2563, DOI: 10.1021/acs.est.6b05749 (2017)

Peters, Glen P. et al., Measuring a fair and ambitious climate agreement using cumulative emissions, 10 Environmental Research Letters 105004 (2015)

Raupach, Michael et al., Sharing a quota on cumulative carbon emissions, Nature Climate Change (2014)

Renault, Marion, Feds shut down new drilling along Rover pipeline project, Columbia Dispatch, May 11, 2017, http://www.dispatch.com/news/20170511/feds-shut-down-new-drilling-along-rover-pipeline-project

Renault, Marion, Ohio pipeline construction spill sends 2 million gallons of mud into two Ohio wetlands, Columbus Dispatch, Apr. 20, 2017, http://www.dispatch.com/news/20170420/pipeline-construction-spill-sends-2-million-gallons-of-drilling-mud-into-two-ohio-wetlands

Rogelj, Joeri et al., "Differences between carbon budget estimates unraveled," Nature Climate Change (2016)

Rocky Mountain Wild, Species Maps

Sherwood, Owen et al., Groundwater methane in relation to oil and gas development and shallow coal seams in the Denver-Julesburg Basin of Colorado, 113 Proceedings of the National Academy of Sciences 30, DOI: 10.1073/pnas.1523267113 (2016)

Skoumal, Richard, et al., Earthquakes Induced by Hydraulic Fracturing in Poland Township, Ohio, 2015, http://www.Debssaonline.org/content/early/2015/01/01/0120140168.abstract

Soraghan, Mike & Pamela King, Drilling mishaps damage water in hundreds of cases, Energywire, Aug. 8, 2016, https://www.eenews.net/stories/1060041279

Soraghan, Mike, Okla. officials link some quakes to fracking, E&E News Energywire, Dec. 12, 2016, http://www.eenews.net/energywire/stories/1060047006/

Soraghan, Mike, Small producer wins verdict against Devon in 'frack hit' case, E&ENews, Aug. 17, 2017, https://www.eenews.net/energywire/2017/08/17/stories/1060058877

The Associated Press, Drilling in Piceance Basin in northwest Colorado picking up, Denver Post, Feb. 13, 2017, htt://www.denverpost.com/2017/02/13/piceancer-basin-drilling-increasing/

Udall, Bradley and Jonathan Overpeck, The 21st Century Colorado River Hot Drought and Implications for the Future, 53 Water Resources Research DOI:10.1002/2016WR019638 (2017)

University of Colorado Boulder, New study identifies organic compounds of potential concern in fracking fluids, CU Boulder Today, June 30, 2015, http://www.colorado.edu/today/2015/06/30/new-study-identifies-organic-compounds-potential-concern-fracking-fluids

U.S. Bureau of Land Management, Climate Change Supplementary Information Report for Montana, North Dakota, and South Dakota (2010); Air Resource Technical Support Document for Emission Inventories and Near-Field Modeling (March 8, 2013)

U.S. Bureau of Land Management, Environmental Assessment for the Royal Gorge Field Office, December 2016 Competitive Oil & Gas Lease Sale, DOI-BLM-CO-F020-2016-0013-EA, 24 (Dec. 2016)

U.S. Bureau of Land Management, Environmental Assessment, Black Hills DeBeque Exploratory Proposal EA, DOI-BLM-CO-130-2012-0021-EA & Decision Record (May 2013)

U.S. Bureau of Land Management, Environmental Assessment, DOI-BLM-Eastern States-0030-2016-0002-EA, Oil and Gas Leasing, Wayne National Forest, Marietta Unit of the Athens Ranger District, Monroe, Noble, and Washington Counties, Ohio (Oct. 2016)

U.S. Bureau of Land Management, Hydraulic Fracturing on Federal and Indian Lands, 80 Fed. Reg. 16128 (March 25, 2015)

U.S. Bureau of Land Management, Grand Junction Reasonably Foreseeable Development Scenario for Oil and Gas, Grand Junction Field Office, Colorado, (June 18, 2012)

U.S. Bureau of Land Management, Programmatic Biological Assessment, (May 2017)

U.S. Bureau of Land Management, White River Field Office Proposed Resource Management Plan Amendment and Final Environmental Impact Statement for Oil and Gas Development (2015)

U.S. Environmental Protection Agency, Greenhouse Gas Emissions (Aug. 2016) https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

U.S. Environmental Protection Agency, Draft Environmental Assessment, National Pollutant Discharge Elimination System (NPDES) General Permit for Eastern Gulf of Mexico Offshore Oil and Gas Exploration, Development, and Production (July 2016)

U.S. Environmental Protection Agency, Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States (2016)

U.S. Environmental Protection Agency, Pollution/Situation Report, Statoil Eisenbarth Well Response, POLREP #1, http://www.theoec.org/sites/default/files/Eisenbarth%20well%20pad%20fire.pdf

U.S. Fish and Wildlife Service, 2015-2016 Assessment of Sufficient Progress Under the Colorado River Endangered Fish Recovery Program in the Upper Colorado River Basin, and Implementation of Action Items in the January 10, 20015, Final Programmatic Biological Opinion on the Management Plan for Endangered Fishes in the Yampa River Basin (Dec. 20, 2016)

U.S. Fish and Wildlife Service, Biological Opinion for BLM Price Resource Management Plan (RMP), Price Field Office (PFO) Oct. 27, 2008,

U.S. Fish and Wildlife Service, Biological Opinion for BLM Resource Management Plan Vernal Field Office (Oct. 23, 2008)

U.S. Fish and Wildlife Service, 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 (Oct. 7, 2015)

U.S. Fish and Wildlife Service, Final 2015-2016 Sufficient Progress Assessment (Dec. 20, 2016)

U.S. Fish and Wildlife Service, 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 (Dec. 1999)

U.S. Fish and Wildlife Service, 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 (Nov. 2008)

U.S. Forest Service, Final Environmental Impact Statement, Land and Resource Management Plan, George Washington National Forest, (2014)

U.S. Geological Survey, Assessment of Continuous (Unconventional) Oil and Gas Resources in the Late Cretaceous Mancos Shale of the Piceance Basin, Uinta-Piceance Province, Colorado and Utah (June 2016)

U.S. Geological Survey, Characterization of Water Quality in Government Highline Canal at Camp Diversion and Highline Lake, Mesa County, Colorado, July 2000 through September 2003, Scientific Investigations Report (2004)

U.S. Geological Survey, Estimated Withdrawals and Use of Water in Colorado 2005, (2010)

Vamburkar, Meenal, Ruined old wells in Oklahoma are the shale boom's dark secret, Pittsburgh Post-Gazette, Oct. 5, 2017, http://www.postgazette.com/powersource/companies/2017/10/04/Ruined-old-wells-in-Oklahoma-are-the-shale-boom-s-dark-secret/stories/201710030190

Webb, Dennis, Congress advised about potential of Mancos Shale gas, GJ Sentinel, July 12, 2016, http://www.gjsentinel.com/news/articles/congress-advised-about-potential-of-mancos-shale-g

Webb, Dennis, Driller is fined, agrees to well tests, GJ Sentinel, Dec. 23, 2016, http://www.gjsentinel.com/news/articles/driller-is-fined-agrees-to-well-tests

Webb, Dennis, Leaking well, company draw state's notice, GJ Sentinel, Jan. 6, 2014, http://www.gjsentinel.com/news/articles/leaking-well-company-draw-states-notice/

Webb, Dennis, Nearby frack job investigated in leak at well, GJ Sentinel, Dec. 16, 2013, http://www.gjsentinel.com/breaking/articles/nearby-frack-job-investigated-in-leak-at-well/

Webb, Dennis, Pipeline capacity gives Piceance an edge in gas market, GJ Sentinel, Jun. 17, 2017, http://www.gjsentinel.com/news/articles/pipeline-capacity-gives-piceance-an-edge-in-gas-ma

Webb, Dennis, Well problem spurs change in state policy, GJ Sentinel, Feb. 4, 2014, http://www.gjsentinel.com/news/articles/well-problem-spurs-change-in-state-policy

Webb, Ellen et al., Potential hazards of air pollutant emissions from unconventional oil and natural gas operations on the respiratory health of children and infants, Review Environmental Health (2016)

Western Resources Advocates, Fracking Our Future (July 2012)